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JANUARY 2019
PUBLIC DRAFT

MID-SACRAMENTO VALLEY
REGIONAL CONSERVATION INVESTMENT STRATEGY

CALIFORNIA DEPARTMENT OF WATER RESOURCES
CALIFORNIA NATURAL RESOURCES AGENCY
COLUSA COUNTY
CONSERVATION STRATEGY GROUP
ENVIRONMENTAL DEFENSE FUND
ENVIRONMENTAL INCENTIVES
MID & UPPER SACRAMENTO RIVER REGIONAL FLOOD MANAGEMENT PLAN
RECLAMATION DISTRICT 108
RESOURCES LAW GROUP
S.D. BECHTEL JR. FOUNDATION
SUTTER BUTTE FLOOD CONTROL AGENCY
SUTTER COUNTY

ICF

PUBLIC DRAFT

MID-SACRAMENTO VALLEY REGIONAL CONSERVATION INVESTMENT STRATEGY

PREPARED FOR:

Reclamation District 108
975 Wilson Bend Road
PO Box 50, Grimes CA, 95950
Contact: Meegan Nagy, Deputy Manager
530-812-6269

STEERING COMMITTEE:

California Department of Transportation
California Department of Water Resources
California Natural Resources Agency
Colusa County
Reclamation District 108
Sutter Butte Flood Control Agency
Sutter County

PREPARED BY:

ICF
630 K Street, Suite 400
Sacramento, CA 95814
Contact: Aaron Gabbe, Project Manager
408-216-2810

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Acronyms and Abbreviations

ACE	Area of Conservation Emphasis
BWFS	Basin-Wide Feasibility Study
Caltrans	California Department of Transportation
CBDD	Colusa Basin Drainage District
CBI	Conservation Biology Institute
CCED	California Conservation Easement Database
CDFW	California Department of Fish and Wildlife
CEHC Project	California Essential Habitat Connectivity Project
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CNRA	California Natural Resources Agency
Corps	U.S. Army Corps of Engineers
CPAD	California Protected Area Database
CPU	Conservation Planning Unit
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
DPS	Distinct Population Segment
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Federal Endangered Species Act
ESU	Evolutionary Significant Unit
FGC	California Fish and Game Code
FMMP	Farmland Mapping and Monitoring Program
FR	Federal Register
FRAP	California Department of Forestry and Fire Protection Fire and Resource Assessment Program
GIS	Geographic Information System
HCP	Habitat Conservation Plan
HUC	Hydrologic Unit Code
LCP	Local Conservation Plan
MCA	Mitigation Credit Agreement
Mid-Upper Sacramento River RFMP	Mid and Upper Sacramento Regional Flood Management Plan

MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NCCP	Natural Community Conservation Plan
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NWR	National Wildlife Refuge
PG&E	Pacific Gas & Electric
Program Guidelines	Regional Conservation Investment Strategies Program Guidelines
RCIS	Regional Conservation Investment Strategy
RD	Reclamation District
RFMP	Regional Flood Management Plan
RTP	Regional Transportation Plan
SACOG	Sacramento Area Council of Governments
SBFCA	Sutter Butte Flood Control Agency
SCS	Sustainable Communities Strategy
SGCN	Species of Greatest Conservation Need
SR	State Route
SSURGO	Soil Survey Geographic
SWAP	State Wildlife Action Plan
USFWS	U.S. Fish and Wildlife Service
WAPA	Western Area Power Administration
WHERCPP	Waterbird Habitat Enhancement Regional Conservation Partnership Program

Chapter 1
Introduction

1.1 Background

The Mid-Sacramento Valley Regional Conservation Investment Strategy (Mid-Sacramento Valley RCIS) is a locally-driven, non-binding, and voluntary conservation strategy to guide conservation investments and compensatory mitigation in portions of Colusa and Sutter counties. This RCIS is an outgrowth of the Mid and Upper Sacramento Regional Flood Management Plan (Mid-Upper Sacramento River RFMP) (Mid and Upper Sacramento River Regional Flood Management Plan Partners 2014), which provides a framework for integrating conservation into flood management systems. The Mid-Sacramento Valley RCIS is intended to support implementation of the Mid-Upper Sacramento River RFMP by identifying conservation and habitat enhancement actions that can be used to provide compensatory mitigation for flood management and other infrastructure projects in the region addressed by this RCIS. Agriculture plays a central role in the economy, environment, and culture of the region; this Mid-Sacramento Valley RCIS emphasizes the continued economically-viable stewardship of working lands in ways that benefit native biodiversity and ecosystem processes.

1.2 What is a Regional Conservation Investment Strategy

In 2016, the California State Legislature passed a law to guide non-binding and voluntary and non-binding conservation and mitigation actions for the state's most vulnerable species and resources and to help streamline the compensatory mitigation process for state and local projects, such as infrastructure development, rehabilitation, and improvements. The law amends the California Fish and Game Code (FGC), Division 2, Chapter 9, to add Sections 1850–1861. The law created the Regional Conservation Investment Strategies Program (Program). The "Program encourages public agencies to develop regional conservation planning documents, using the best available science to identify regional conservation priorities and other actions to help California's species populations that may be vulnerable or declining by protecting, restoring, creating, and reconnecting their habitats" (California Department of Fish and Wildlife 2018). The Program complements local Habitat Conservation Plans (HCPs), Natural Community Conservation Plans (NCCPs), and other regional conservation strategies.

The program allows the California Department of Fish and Wildlife (CDFW) or any local or state public agency to develop a Regional Conservation Investment Strategy (RCIS) to guide science-based, non-binding and voluntary conservation and mitigation for a suite of species. The RCIS must include specific information about types of conservation actions, and conservation priorities necessary to eliminate or reduce stressors and negative pressures on those species. CDFW may approve an RCIS if the RCIS contributes to the state goals of providing for conservation and public infrastructure by providing guidance on investments in resource conservation and infrastructure. Once CDFW approves an RCIS, public agencies or conservation organizations can use it to identify conservation priorities that will help guide their conservation investments. Public infrastructure agencies or private parties can voluntarily use an approved RCIS to inform their mitigation planning and advance mitigation investments.

A person or entity, including a state or local agency, can sponsor the development of a mitigation credit agreement (MCA) for an area within an RCIS area. Once approved, this RCIS will enable MCAs to be developed and executed in the RCIS area. More details on how the RCIS can be used, including preparation of MCAs, are discussed in Chapter 4, Section 4.5, *Regulatory Uses of this RCIS*.

To support and guide development of RCISs, CDFW released the *Regional Conservation Investment Strategies Program Guidelines* (Program Guidelines) in April 2017 (California Department of Fish and Wildlife 2017). These Program Guidelines were updated in June 2017 and were updated again in February and September, 2018 (California Department of Fish and Wildlife 2018). This Mid-Sacramento Valley RCIS was developed consistent with FGC 1850–1861, as well as the September 2018 Program Guidelines. Consistent with the September 2018 Program Guidelines, The Mid-Sacramento Valley RCIS is subject to the June 2017 Program Guidelines because it filed a Notice of Intent pursuant to Fish and Game Code Section 1854(c)(1) before June 30, 2018[1]. A key component of the Program Guidelines is Section 2, *Standard Terminology*, which contains a detailed list of terms, abbreviations, and definitions applicable to RCISs. As required by the Program Guidelines, the Mid-Sacramento Valley RCIS uses the terms provided in the September 2018 Guidelines. Appendix A, *Glossary*, integrates these terms and includes additional terms and abbreviations specific to this Mid-Sacramento Valley RCIS.

[1] As described in the September, 2018 Program Guidelines, "All RCISs are subject to these September 2018 Guidelines, except for RCISs that were initiated prior to January 1, 2017 or filed a Notice of Intent (NOI) pursuant to Fish and Game Code Section 1854(c)(1) on or before September 13, 2018. To be considered for exemption from these September 2018 Guidelines, RCIS proponents must provide CDFW with adequate written documentation that they have met either one of the criteria. Those RCISs that meet the criteria will be subject to the June 2017 RCIS Guidelines unless they choose to follow the September 2018 Guidelines. Any RCIS subject to the June 2017 Guidelines must be submitted to CDFW for completeness review by March 29, 2019. In the event the RCIS is not submitted by that date, it will thereafter be subject to the September 2018 Guidelines. Notwithstanding the above, all RCISs not already submitted for CDFW review prior to September 13, 2018 are subject to requirements in the following sections (including subsections) of the September 2018 Guidelines: 1.4 – Program Contacts; 2.1 – Terms, Abbreviations, Acronyms, and Definitions; 4.2.2 – Description of the RCIS Area; 4.2.4 - Consultation, Consistency and Compliance; 4.2.5.3 – Non-focal Species Information; 4.6 – Review and Approval Process; 4.7 – Amending an RCIS; and 4.8 – Updating and Extending an RCIS."

The RCIS is centered on *conservation actions*[2] and *habitat enhancement actions*[3] for *focal species*[4] and *other conservation elements*[5] such as working lands and natural communities to achieve this RCIS's conservation goals and objectives. The RCIS is developed to advance the conservation of focal species and their habitats, including working lands and natural communities, to sustain those species over time as environmental conditions in the RCIS change (e.g., through increased development or climate change). The focal species act as a guide for the RCIS to identify "conservation priorities, investments in ecological resource conservation, or identification of priority location for compensatory mitigation for impacts on species and natural resources" (California Department of Fish and Wildlife 2018).

1.2.1 Voluntary Strategy

This Mid-Sacramento Valley RCIS is a non-binding and voluntary strategy. Adoption of this Mid-Sacramento Valley RCIS by CDFW is consistent with FGC 1850(e) and 1852(c)(7). By authorizing CDFW to approve RCISs, it is not the intent of the California State Legislature to regulate the use of land, establish land use designations, or to affect, limit, or restrict the land use authority of any public agency. Nothing in the Mid-Sacramento Valley RCIS is intended to, nor shall it be interpreted to conflict with state law or local ordinances. Therefore, actions carried out as a result of this RCIS will be in compliance with all applicable state and local requirements. Furthermore, this Mid-Sacramento Valley RCIS does not preempt the authority of local agencies to implement infrastructure and urban development described in local general plans, as this RCIS was developed in consultation with local agencies that have land use authority in the RCIS area.

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[2] The Program Guidelines define a *conservation action* as an action identified in an RCIS that, when implemented, would permanently protect or restore, and perpetually manage, conservation elements, including focal species and their habitats, natural communities, ecological processes, and wildlife corridors. In contrast, a habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat – see habitat enhancement action. A conservation action is developed to achieve one or more conservation objectives. A conservation action may be implemented through a variety of conservation investments or MCAs. A conservation action that is implemented through an MCA would create conservation credits to be used as compensatory mitigation.

[3] The Program Guidelines define a *habitat enhancement action* as an action identified in an RCIS that, when implemented, is intended to improve the quality of wildlife habitat, or to address risks or stressors to wildlife. A habitat enhancement action is developed to achieve one or more conservation objectives. A habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. In contrast, a conservation action would permanently protect or restore, and perpetually manage, conservation elements – see Conservation Action. Examples of habitat enhancement actions include improving in-stream flows to benefit fish species, enhancing habitat connectivity, and controlling or eradicating invasive species. A habitat enhancement action may be implemented through a variety of conservation investments or MCAs. A habitat enhancement action that is implemented through an MCA would create habitat enhancement credits intended for use as compensatory mitigation for temporary impacts.

[4] The Program Guidelines define a *focal species* as a sensitive species that are identified and analyzed in an RCIS and will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Focal species may benefit through both conservation investments and MCAs. See also, "sensitive species", "special-status species", and "non-focal species".

[5] The Program Guidelines define a *conservation elements* as an element that is identified and analyzed in an RCIS that will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Conservation elements include focal species and their habitats, natural communities, biodiversity, habitat connectivity, ecosystem functions, water resources, and other natural resources. Conservation elements may benefit through both conservation investments and MCAs.

In addition, this Mid-Sacramento Valley RCIS does not do any of the following.[6]

- Modify in any way the standards for issuance of incidental take permits or consistency determinations pursuant to Section 2081 or 2080.1, issuance of take authorizations pursuant to Section 2835, issuance of lake or streambed alteration agreements pursuant to Section 1602, or any other provision of this code or regulations adopted pursuant to this code.
- Modify in any way the standards under the California Environmental Quality Act (CEQA) (Division 13 [commencing with Section 21000] of the Public Resources Code), or in any way limit a lead agency's or responsible agency's discretion, in connection with any determination of whether a proposed project may or may not result in significant environmental effects or in any way establish a presumption in connection with any determination of whether a proposed project may or may not result in significant environmental effects or whether a proposed project's impacts would be mitigated.
- Prohibit or authorize any project or project impacts.
- Create a presumption or guarantee that any proposed project will be approved or permitted, or that any proposed impact will be authorized, by any state or local agency.
- Create a presumption that any proposed project will be disapproved or prohibited, or that any proposed impact will be prohibited, by any state or local agency.
- Alter or affect, or create additional requirements for, the general plan of the city, county, or city and county, in which it is located.
- Constitute any of the following, for the purposes of CEQA (Division 13 [commencing with Section 21000] of the Public Resources Code).
    a. A plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.
    b. A local policy or ordinance protecting biological resources.
    c. An adopted local, regional, or state HCP.

1.3 Purpose and Intent

This Mid-Sacramento Valley RCIS provides a framework, using the best available science, to guide voluntary conservation investments and compensatory mitigation to enhance the conservation benefits of working lands and natural communities for focal species in the portions of Colusa and Sutter counties within the Mid-Sacramento Valley RCIS area (Section 1.6.1, *Mid-Sacramento Valley RCIS Area*). The RCIS does not specify mitigation requirements, but it can provide a framework within which mitigation can be designed to support desired conservation in the region.

As stated in FGC 1852(a), CDFW may only approve an RCIS if the proposed RCIS contributes to meeting the state goals relating to conservation and public infrastructure or forest management. To achieve those goals, as stated in FGC 1852(b), the purpose of an RCIS is to provide science-based,

[6] Consistent with FGC 1855(b).

non-binding and voluntary guidance for one or more of the following components, in ways that will enhance the long-term viability of native species, habitat, and other natural resources.

1. Identification of wildlife and habitat *conservation priorities*,[7] including actions to address the impacts of climate change and other wildlife stressors.
2. Investments in resource conservation.
3. Infrastructure planning, including but not limited to public infrastructure (e.g., flood control) and forest management.
4. Identification of areas that can provide compensatory mitigation for impacts on species and natural resources.

The intent of this Mid-Sacramento Valley RCIS is to contribute to the recovery and resiliency of the focal species through identification of priority conservation and habitat enhancement actions (e.g., land acquisition, restoration, or habitat enhancement) in the RCIS area (California Department of Fish and Wildlife 2018).

Development of this Mid-Sacramento Valley RCIS began as an outgrowth, in part, of the Mid-Upper Sacramento River RFMP (Mid and Upper Sacramento River Regional Flood Management Plan Partners 2014). The Mid-Upper Sacramento River RFMP was developed through the participation of a range of stakeholders to address flood management in a seven-county region in northern California that comprises portions of Butte, Colusa, Glenn, Lake, Sutter, Tehama, and Yolo Counties (Figure 1-1). The result of this regional planning effort is a vision for a flood-safe region that identifies challenges and opportunities for flood risk reduction, and a prioritized list of actions. The Mid-Upper Sacramento River RFMP provides a framework for integrating conservation efforts into the overall flood management system in ways that are supported locally.

As the lead agency for preparing the Mid-Upper Sacramento River RFMP, Reclamation District 108 (RD 108) initiated development of this Mid-Sacramento Valley RCIS to aid in the implementation of needed flood risk reduction measures, and to provide incentives for landowners to propose conservation actions or habitat enhancement actions on their properties that would benefit species in need of mitigation offsets from flood management projects. To achieve this goal quickly, RD 108 and the Mid-Sacramento Valley RCIS Steering Committee (Section 1.4.3, *Steering Committee*) began developing this RCIS within a subset of the Mid-Upper Sacramento River RFMP planning area in Colusa County and Sutter County, with a small extension of the RCIS area into the Feather River RFMP planning area in Sutter County. Shortly after beginning development of the RCIS, the Steering Committee elected to expand the RCIS area farther east in Sutter County to include California Department of Water Resources (DWR) facilities and more of the Feather River RFMP planning area (Section 1.6.1, *Mid-Sacramento Valley RCIS Area*).

RD 108 and other Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies are already conducting conservation measures, partnering with state and local agencies and non-profit organizations to implement habitat restoration projects. However, the addition of the RCIS

[7] A *conservation priority* is a conservation or habitat enhancement action (e.g., land acquisition, restoration, or habitat enhancement) that is ranked based on its importance for contributing to the conservation and recovery of focal species and their habitats, or other conservation elements within an RCIS area.

program would benefit the implementation of the Mid-Upper Sacramento River and Feather River RFMPs within the Mid-Sacramento Valley RCIS area in the following ways.

- Historically, implementation of conservation measures on lands within the Mid-Upper Sacramento River and Feather River RFMP's planning area are performed with public grants with a local cost share. The local cost share is not reimbursed through mitigation fees. This Mid-Sacramento Valley RCIS would allow MCAs to be developed, which would provide a new source of revenue to participating landowners through mitigation credits.
- The MCA program creates a way to monetize and help pay for conservation actions and habitat enhancement actions such as riparian restoration and fish passage barrier improvements.
- The RCIS and MCA provide a way to directly connect needed flood risk reduction projects with local conservation efforts.
- The RCIS and MCA are both approved by CDFW, providing important state agency endorsement for local projects informed by the RCIS and MCA.
- The RCIS provides a useful approach to synthesize disparate conservation strategies and actions into one document, unifying actions and facilitating collaboration and partnerships.

The Mid-Sacramento Valley RCIS development team, including RD 108 and other Mid-Sacramento Valley RCIS Steering Committee member agencies and organizations, share the goals of FGC 1852 (b) listed previously, and believe investments in conservation, infrastructure, and compensatory mitigation should occur in a manner that avoids or minimizes conflicts with other local priorities, while providing multiple conservation benefits. A long-term approach for improving riverine and floodplain ecosystems through multi-benefit planning and projects that integrates conservation benefits into the flood management system is foremost among such priorities. Other local priorities include the continued preservation of farmland and a robust agricultural industry—in particular, high-value crops such as rice—and protecting the natural resources of the Mid-Sacramento Valley RCIS area. The Mid-Sacramento Valley RCIS development team envisions the RCIS as a means to align habitat conservation and similar efforts contemplated in FGC Sections 1850–1861 with these longstanding local priorities.

CDFW envisions this RCIS as a vehicle to support implementation of multi-benefit flood system projects. The 2012 Central Valley Flood Protection Plan, prepared by DWR and adopted by the Central Valley Flood Protection Board, recommends a State Systemwide Investment Approach for improvements to the Central Valley flood management system (California Department of Water Resources 2012). The 2017 Central Valley Flood Protection Plan Update (California Department of Water Resources 2017) incorporates new information and provides greater specificity to help guide both short-term and long-term investments. This new information includes a Conservation Strategy (California Department of Water Resources 2016), which provides a comprehensive, long-term approach to the improvement of ecosystem functions through the integration of ecological restoration with flood risk reduction and management projects. DWR envisions the RCIS as a potential vehicle to support implementation of multi-benefit flood system projects that contribute to environmental and biological goals and objectives through actions by DWR and its partners in flood management and conservation in the strategy area. These partners include federal and state agencies, local maintaining agencies, local communities, and non-governmental organizations.

To more effectively achieve the goals of FGC 1852(b), this Mid-Sacramento Valley RCIS was developed in concert with other key infrastructure and conservation planning efforts that overlap the RCIS area. Primarily, it builds on existing efforts of the Mid-Upper Sacramento River RFMP and the Feather River RFMP, the Central Valley Flood Protection Plan, the Central Valley Flood Protection Plan's Conservation Strategy, the Central Valley Habitat Exchange. The Mid-Sacramento Valley RCIS also recognizes the Yolo County HCP/NCCP (ICF 2018a) and Yolo RCIS/Local Conservation Plan (ICF 2018b) being prepared to the south of the Mid-Sacramento Valley RCIS area (see Chapter 2, Section 2.2.1, *Natural Community Conservation Plans and Habitat Conservation Plans in and Adjacent to the Strategy Area*, for descriptions of these plans and the Central Valley Habitat Exchange). It is anticipated that Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies (within the RCIS area) will coordinate and collaborate to effectively implement this RCIS (see Chapter 4, *Implementation* for implementation activities and responsibilities).

1.4 Planning Process

1.4.1 RCIS Proponent

RD 108, on behalf of the Mid-Upper Sacramento River RFMP member agencies, is the public agency proposing this strategy and will submit it to CDFW for approval. The role of the RCIS proponent is described further in Chapter 4, *Implementation*.

RD 108 is located along the western edge of the Sacramento River and delivers water to nearly 48,000 acres of farmland within southern Colusa County and northern Yolo County. RD 108 receives water from the Sacramento River under riparian water rights, licenses for appropriation of surface water, and a Settlement Contract with the U.S. Bureau of Reclamation. RD 108 was formed in 1870 under the Reclamation District Law of 1868 for the purpose of forming a district to build levees and “reclaim” land subject to periodic overflow from neighboring rivers and water bodies. At that time, the government was promoting reclamation to develop wetlands for cultivation of thousands of acres in California.

RD 108 lands are protected on three sides by levees, which include the Sacramento River west levee from Colusa to Knights Landing, a back levee along RD 108’s western boundary to prevent flooding from the Colusa Basin Drain, and another along the slough in the south that at one time took drainage water from the Colusa Basin back to the Sacramento River (Figure 1-1). RD 108 works in coordination with the Sacramento River Westside Levee District and the Knights Landing Ridge Drainage District to maintain over 90 miles of levees. All of the levees were originally built by the local landowners using whatever materials were available and whatever criteria they chose. Today, these levees are part of the federally authorized Sacramento River Flood Control Project.

1.4.2 State Agency Sponsor

FGC Section 1852(a) requires that, in order for CDFW to approve an RCIS, one or more state agencies must sponsor the RCIS. The state agency sponsor requests approval of the strategy through a letter to CDFW indicating that the proposed RCIS would contribute to meeting state goals for conservation and public infrastructure or forest management. DWR is a key state agency partner on this Mid-Sacramento Valley RCIS. As such, DWR is the RCIS state agency sponsor for this Mid-Sacramento Valley RCIS. DWR may also use this Mid-Sacramento Valley RCIS to guide its own project mitigation planning. DWR has requested approval of this Mid-Sacramento Valley RCIS through a state agency sponsor letter sent to the Director of Fish and Wildlife, as required by FGC

1852(a). The letter summarizes the purpose of this RCIS from both a conservation perspective and an infrastructure planning perspective. The letter is included in Appendix B, *Letter of Support*.

1.4.3 Steering Committee

The coordination and development of the Mid-Sacramento Valley RCIS is guided by a Steering Committee. The Steering Committee is composed of representatives from Colusa County, Sutter County, Sutter Butte Flood Control Agency, DWR, California Natural Resources Agency (CNRA) (through April 2018), Environmental Defense Fund, Environmental Incentives, California Department of Transportation (Caltrans), RD 108, and Conservation Strategy Group. The Steering Committee met approximately twice monthly from August 2017 through September 2018 to provide guidance on the development of this RCIS, including the application of a science-based approach for the identification of the RCIS area and focal species; the development of conservation goals, objectives, and priorities; the development of the Mid-Sacramento Valley RCIS implementation structure; and the development of initial MCAs under this Mid-Sacramento Valley RCIS. The Steering Committee coordinated outreach to stakeholders and the public (Appendix C, *Public Outreach*). The Steering Committee also reviewed a complete Administrative Draft RCIS.

1.4.4 Consultation with Local Counties and Cities

The Program Guidelines (California Department of Fish and Wildlife 2018) requires that an "RCIS shall be developed in consultation with local agencies that have land use authority (i.e., a city, a county, or a city and county) within the geographic area of the RCIS." The RCIS area overlaps two counties, Colusa and Sutter, and four cities, Williams, Colusa, Live Oak, and Yuba City (Section 1.6.1, *Mid-Sacramento Valley RCIS Area* and Figure 1-1).

Representatives from both counties were participating members of the Steering Committee and provided guidance throughout the RCIS planning and development process (Section 1.4.3, *Steering Committee* and Chapter 6, *Preparers and Reviewers*). Guidance included the following.

- Advising strategy for public outreach efforts, including feedback on the public meeting process (Section 1.7, *Public Outreach and Involvement*).
- Determining the RCIS strategy area (Section 1.6.1, *Mid-Sacramento Valley RCIS area*).
- Determining focal species (Section 1.6.3, *Focal Species*).
- Determining the RCIS implementation process (Chapter 4, *Implementation*).
- Developing and reviewing drafts of this RCIS.

Representatives from RD 108 and other Steering Committee member agencies also consulted with county staff (e.g., planners), and provided briefings to the Colusa County Board of Supervisors (September 28, 2018), and the Sutter Resource Conservation District and Yuba-Sutter Farm Bureau Environment Committee (July 23, 2018), which included Sutter County representatives. The Steering Committee representative from the Sutter Butte Flood Control Agency regularly briefed the Sutter Butte Flood Control Agency's Board, which included elected representatives of the counties of Sutter and Butte and the cities of Live Oak and Yuba City.

Representatives from RD 108 and other Steering Committee member agencies consulted with representatives of the cities within the RCIS area, including the mayor and a city councilman of Live

Oak, and the city managers of Yuba City, Williams, and Colusa. Consultation included briefings about this RCIS and an invitation to review (and provide comments and edits) the administrative draft Mid-Sacramento RCIS.

Consultation with each city and county also included notification of the intent to prepare the Mid-Sacramento River RCIS, as well as notification of two public meetings (Section 1.7, *Public Outreach and Involvement*). Notices were sent to the city and county clerks of cities and counties within and adjacent to the RCIS area.

1.5 Approach

To approve this Mid-Sacramento Valley RCIS, CDFW must determine that it meets all of the requirements in the FGC for an RCIS. To assist CDFW with this determination, Table 1-1 lists the requirements in the order they appear in FGC and the sections in this RCIS where these requirements are addressed.

To develop this Mid-Sacramento Valley RCIS, the following tasks were completed with direction from the Steering Committee.

- Applied a science-based selection criteria and selected focal species for the RCIS (Section 1.6.3, *Focal Species*).
- Mapped natural community types as the basis for habitat distribution models for focal species. These maps are based on existing geographic information system data on the distribution of natural communities and land cover types in the RCIS area. Chapter 2, Section 2.5.2, *Mapping Methods,* identifies the data sources used and methods to compile the data, and provides maps and descriptions of the natural communities.
- Developed species profiles for focal species, provided in Chapter 2, Section 2.9.2, *Focal Species Profiles.*
- Conducted a gap analysis using land cover, species habitat distribution models, and a protected land database (Chapter 3, Section 3.3.1, *Data Sources*) to estimate how much (i.e., acres or miles) of each land cover and focal species' habitat is protected. The methods used in the conservation gap analysis are provided in Chapter 3, Section 3.3, *Gap Analysis*.
- Evaluated existing conservation, development, and state infrastructure plans to assess ways the Mid-Sacramento Valley RCIS could identify conservation priorities that complement, support, and do not conflict with existing plans (Chapter 2, Section 2.2, *Regional Conservation Planning Environment*).
- Developed conservation goals and objectives for focal species and other conservation elements such as key natural communities, habitat connectivity, and working lands, and identified conservation actions and habitat enhancement actions to achieve these goals and objectives. The conservation goals and objectives, and associated conservation actions and habitat enhancement actions, are provided in Chapter 3, *Conservation Strategy*.
- Described the process by which RD 108, the Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies, and Sutter Butte Flood Control Agency, in coordination with CDFW and potentially with the support of an implementation committee and advisory committee, will implement this RCIS (Chapter 4, *Implementation*).

Table 1-1. Checklist of Required Elements in an RCIS

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1852(a)	The department may approve a regional conservation investment strategy pursuant to this chapter. A regional conservation investment strategy may be proposed by the department or any other public agency, and shall be developed in consultation with local agencies that have land use authority within the geographic area of the regional conservation investment strategy. The department may only approve a regional conservation investment strategy if one or more state agencies request approval of the regional conservation investment strategy through a letter sent to the director indicating that the proposed regional conservation investment strategy would contribute to meeting both of the following state goals: (1) Conservation. (2) Public infrastructure or forest management.	Section 1.4.2 *State Agency Sponsor*
1852(c)(1)	An explanation of the conservation purpose of and need for the strategy.	Section 1.3, *Purpose and Intent*
1852(c)(2)	The geographic area of the strategy and rationale for the selection of the area, together with a description of the surrounding ecoregions and any adjacent protected habitat areas or linkages that provide relevant context for the development of the strategy.	Section 1.6.1, *Mid-Sacramento Valley RCIS Area* Section 2.6, *Protected Areas* Section 2.7, *Ecoregions* Section 2.10, *Habitat Connectivity*
1852(c)(3)	The focal species included in, and their current known or estimated status within, the strategy.	Section 1.6.3, *Focal Species* Appendix E, *Focal Species Habitat Models*
1852(c)(4)	Important resource conservation elements within the RCIS area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements.	Section 2.6, *Protected Areas* Section 2.7, *Ecoregions* Section 2.4.3, *Watersheds* Section 2.8, *Natural Communities, Agricultural Lands, and Urban/Developed Lands* Section 2.9, *Focal Species* Section 2.10, *Habitat Connectivity* Section 2.11, *Working Landscapes*
1852(c)(5)	A summary of historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, on the focal species, habitat, and other natural resources, as identified in the best available scientific information, including, but not limited to, the State Wildlife Action Plan.	Section 2.13, *Pressures and Stressors on Focal Species and other Conservation Elements*

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1852(c)(6)	Consideration of major water, transportation, and transmission infrastructure facilities; urban development areas; and city, county, and city and county general plan designations that accounts for reasonably foreseeable development of major infrastructure facilities, including, but not limited to, renewable energy and housing in the RCIS area.	Section 2.3, *Development and Major Infrastructure*
1852(c)(7)	Provisions ensuring that the strategy will be in compliance with all applicable state and local requirements and does not preempt the authority of local agencies to implement infrastructure and urban development in local general plans.	Section 1.2.1, *Voluntary Strategy* Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*
1852(c)(8)	Conservation goals and measurable objectives for the focal species and important conservation elements identified in the strategy that address or respond to the identified stressors and pressures on focal species.	Section 3.2.2, *Conservation Goals and Objectives* Section 3.6, *Landscape-Level Conservation Strategy* Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities* Section 3.8, *Conservation Strategy for Focal Species*
1852(c)(9)	Conservation actions, including a description of the general amounts and types of habitat that, if preserved or restored and permanently protected, could achieve the conservation goals and objectives, and a description of how the conservation actions and habitat enhancement actions were prioritized and selected in relation to the conservation goals and objectives.	Section 3.2.3, *Actions and Priorities* Section 3.8, *Conservation Strategy for Focal Species*
1852(c)(10)	Provisions ensuring that the strategy is consistent with and complements any administrative draft natural community conservation plan, approved natural community conservation plan, or federal habitat conservation plan that overlaps with the RCIS area.	Section 2.2, *Regional Conservation Planning Environment* Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies* Section 4.5.1, *Mitigation Credit Agreements*
1852(c)(11)	An explanation of whether and to what extent the strategy is consistent with any previously approved strategy or amended strategy, state or federal recovery plan, or other state or federal approved conservation strategy that overlaps with the RCIS area.	Section 2.2, *Regional Conservation Planning Environment* Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*
1852(c)(12)	A summary of mitigation banks and conservation banks approved by the department or the U.S. Fish and Wildlife Service that are located within the RCIS area or whose service area overlaps with the RCIS area.	Section 2.6.2, *Conservation and Mitigation Banks*

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1852(c)(13)	A description of how the strategy's conservation goals and objectives provide for adaptation opportunities against the effects of climate change for the strategy's focal species.	Section 3.5, *Adaptations against the Effects of Climate Change*
1852(c)(14)	Incorporation and reliance on, and citation of, the best available scientific information regarding the RCIS area and the surrounding ecoregion, including a brief description of gaps in relevant scientific information, and use of standard or prevalent vegetation classifications and standard ecoregional classifications for terrestrial and aquatic data to enable and promote consistency among regional conservation investment strategies throughout California.	Section 2.7, *Ecoregions* Section 2.8, *Natural Communities, Agricultural Lands, and Urban/Developed Lands* Section 2.12, *Gaps in Scientific Information* Section 3.3, *Gap Analysis* Section 4.3.1, *Updating and Extending this RCIS*
1852(d)	A regional conservation investment strategy shall compile input and summary priority data in a consistent format that could be uploaded for interactive use in an Internet Web portal and that would allow stakeholders to generate queries of regional conservation values within the RCIS area.	Section 3.2.3, *Actions and Priorities*
1852(e)	In addition to considering the potential to advance the conservation of focal species, regional conservation investment strategies shall consider all of the following: (1) The conservation benefits of preserving working lands for agricultural uses. (2) Reasonably foreseeable development of infrastructure facilities. (3) Reasonably foreseeable projects in the RCIS area, including, but not limited to, housing. (4) Reasonably foreseeable development for the production of renewable energy. (5) Draft natural community conservation plans within the area of the applicable regional conservation investment strategy.	Section 2.3, *Development and Major Infrastructure* Section 2.11, *Working Landscapes* Section 3.7.1, *Working Landscapes* Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*
1854(a)	The department may prepare or approve a regional conservation investment strategy, or approve an amended strategy, for an initial period of up to 10 years after finding that the strategy meets the requirements of Section 1852.	Section 1.6.2, *Strategy Term* Section 4.6, *Amending the RCIS*
1854(c)(1)	A public agency shall publish notice of its intent to create a regional conservation investment strategy. This notice shall be filed with the Governor's Office of Planning and Research and the county clerk of each county in which the regional conservation investment strategy is found in part or in whole. If preparation of a regional conservation investment strategy was initiated before January 1, 2017, this notice shall not be required.	

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1854(c)(3)(*A*)	A public agency proposing a strategy or amended strategy shall hold a public meeting to allow interested persons and entities to receive information about the draft regional conservation investment strategy or amended strategy early in the process of preparing it and to have an adequate opportunity to provide written and oral comments. The public meeting shall be held at a location within or near the strategy area.	Section 1.7, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(c)(3)(*B*)	In a draft regional conservation investment strategy or amended strategy submitted to the department for approval, the public agency shall include responses to written public comments submitted during the public comment period.	Section 1.7, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(c)(4)	At least 30 days before holding a public meeting to distribute information about the development of a draft regional conservation investment strategy or amended strategy, a public agency proposing a strategy shall provide notice of a regional conservation investment strategy or amended strategy public meeting as follows. (A) On the public agency's internet website and any relevant LISTSERV. (B) To each city, county, and city and county within or adjacent to the regional conservation investment RCIS area. (C) To the implementing entity for each natural community conservation plan or federal regional habitat conservation plan that overlaps with the RCIS area. (D) To each public agency, organization, or individual who has filed a written request for the notice, including any agency, organization, or individual who has filed a written request to the department for notices of all regional conservation investment strategy public meetings.	Section 1.7, *Public Outreach and Involvement* Appendix C, *Public Outreach*
1854(c)(5)	At least 60 days before submitting a final regional conservation investment strategy or amended strategy to the department for approval, the public agency proposing the investment strategy or amended strategy shall notify the board of supervisors and the city councils in each county within the geographical scope of the strategy and provide the board of supervisors and the city councils with an opportunity to submit written comments for a period of at least 30 days.	Section 1.7, *Public Outreach and Involvement* Appendix C, *Public Outreach*

California Fish and Game Code	Required Element	Relevant RCIS Section(s)
1854(e)	The department shall require the use of consistent metrics that incorporate both the area and quality of habitat and other natural resources in relation to a regional conservation investment strategy's conservation objectives to measure the net change resulting from the implementation of conservation actions and habitat enhancement actions.	Section 3.3, *Gap Analysis* Section 3.6, *Landscape-Level Conservation Strategy* Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities* Section 3.8, *Conservation Strategy for Focal Species* Section 4.3.1, *Updating and Extending this RCIS*
1856(b)	For a conservation action or habitat enhancement action identified in a regional conservation investment strategy to be used to create mitigation credits pursuant to this section, the regional conservation investment strategy shall include, in addition to the requirements of Section 1852, all of the following. (1) An adaptive management and monitoring strategy for conserved habitat and other conserved natural resources. (2) A process for updating the scientific information used in the strategy, and for tracking the progress of, and evaluating the effectiveness of, conservation actions and habitat enhancement actions identified in the strategy, in offsetting identified threats to focal species and in achieving the strategy's biological goals and objectives, at least once every 10 years, until all mitigation credits are used. (3) Identification of a public or private entity that will be responsible for the updates and evaluation required pursuant to paragraph (2).	Section 3.10, *Adaptive Management and Monitoring Strategy* Section 4.3, *Required RCIS Implementation to Create MCAs* Section 4.3.1, *Updating and Extending this RCIS*

RCIS = Regional Conservation Investment Strategy; MCA = mitigation credit agreement

1.6 Scope of the Strategy

1.6.1 Mid-Sacramento Valley RCIS Area

A key first step in developing the Mid-Sacramento Valley RCIS was defining the RCIS area. The RCIS area, also known as the *strategy area*, is important for a number of reasons.

- All analyses for this Mid-Sacramento Valley RCIS have been conducted within the strategy area, and all conservation goals, objectives, and priorities identified and described fall within the strategy area.
- Any MCA developed under the RCIS must occur within the strategy area, or an adjacent RCIS strategy area if the conservation goals and objectives are consistent.

Initially, the Mid-Upper Sacramento River RFMP stakeholders elected to develop an RCIS for a subset of the Mid-Upper Sacramento River RFMP area in Colusa County and Sutter County. Shortly after beginning development of the RCIS, the RCIS Steering Committee elected to expand the RCIS area farther east in Sutter County to include DWR facilities and more of the Feather River RFMP planning area. In addition to using the boundaries from the Mid-Upper Sacramento River RFMP as a starting point, the following types of information were considered when determining the RCIS area boundary.

- Natural community and U.S. Department of Agriculture ecoregional boundaries.
- Topographic boundaries (i.e., Sutter Buttes) and hydrologic boundaries (i.e., the U.S. Geological Survey's standard database of watershed boundaries).
- Areas where conservation may occur that existing scientific information, such as species' recovery plans, other regional conservation plans, and scientific literature suggests could contribute to species recovery or sustain populations of the expected focal species.
- Areas of core habitat or recovery units for one or more focal species.
- Jurisdictional boundaries (e.g., cities, counties, resource agencies) to identify potential users of the RCIS.
- Boundaries of approved or in-process conservation plans, including the Mid-Upper Sacramento River RFMP and Feather River RFMP.
- Boundaries of approved or in-process RCISs, HCPs, or NCCPs.
- Locations of key projects or activities expected to use this RCIS.

The Mid-Sacramento Valley RCIS area now covers approximately 635,626 acres in eastern Colusa County and western Sutter County, and includes the cities of Williams, Colusa, Live Oak, and Yuba City. This area includes the southern portion of the Mid-Upper Sacramento River RFMP and the central portion of the Feather River RFMP (Figure 1-1).

The northern boundary of the RCIS area is the Colusa County and Sutter County borders with Glenn County and Butte County. The eastern boundary is the Yuba County and Sutter County border, which generally aligns with the Feather River. The southeastern boundary follows the east bank of the Feather River (defined by the eastern boundary of the Lower Feather River Hydrologic Unit Code [HUC] 10[8] watershed) to the confluence with the Sacramento River, which is the southern tip of the RCIS area.

Yolo County, the Yolo Habitat Conservancy, DWR, CNRA, and others are currently preparing an RCIS for all of Yolo County, including the Yolo County portion of the Mid-Upper Sacramento River RFMP. Because the Program Guidelines do not allow RCISs to overlap, the southern border of the Mid-Sacramento Valley RCIS area follows the Sutter and Yolo County boundary to exclude Yolo County. This county line generally follows the Sacramento River, moving between the river centerline and each river bank. In two instances, the county line leaves the river and follows two old alignments of the river which are now oxbow lakes. The RCIS boundary also follows the Yolo and Colusa County boundary, which is a straight east-west line. The western boundary of the RCIS area is generally

[8] U.S. Geological Survey's 10-digit Hydrologic Unit Code (HUC 10) which indicates a major watershed in the Mid-Sacramento Valley RCIS area.

aligned with the western Great Valley Ecoregion boundary in Colusa County (Griffith et al. 2016), to limit the RCIS to the Great Valley ecoregion subsection (Chapter 2, Section 2.7.1.1, *Great Valley*). A small stretch of the western boundary extends a little farther west (a little more than a half a mile) of the Great Valley ecoregion subsection to include all of RD 2047.

The Mid-Sacramento Valley RCIS Steering Committee elected to exclude the Sutter Buttes from the RCIS area to limit the RCIS area to Central Valley working lands, natural communities, and habitats where Steering Committee member agencies primarily operate (Section 1.4.3, *Steering Committee*), and to be consistent with the overlapping draft Yuba-Sutter Regional Conservation Plan (Chapter 2, Section 2.2.1.4, *Yuba-Sutter Regional Conservation Plan*).

As required by the Program Guidelines (California Department of Fish and Wildlife 2018) this RCIS includes a description of the following to provide context to for this RCIS's conservation strategies (Chapter 3, *Conservation Strategy*).

- A description of the ecoregions overlapping and surrounding the RCIS area (Chapter 2, Section 2.7, *Ecoregions*).
- A description of the watersheds that overlap the RCIS area (Chapter 2, Section 2.4.3, *Watersheds*).
- A description of protected habitats within and adjacent to the RCIS area (Chapter 2, Section 2.6, *Protected Areas*).
- A description of landscape-level habitat connectivity and linkages between habitats within and beyond the RCIS area (Chapter 2, Section 2.10, *Habitat Connectivity*).

1.6.2 Strategy Term

CDFW may approve an RCIS for an initial period of up to 10 years after finding that the RCIS meets the requirements of FGC 1852. Although CDFW may approve an RCIS, an approved RCIS is voluntary, non-binding, and non-regulatory. CDFW may extend the duration of an approved or amended RCIS for additional periods of up to 10 years after the RCIS is updated with the best available scientific information and a new finding that the RCIS continues to meet the requirements of Section 1852. The proposed term of this RCIS is 10 years.

1.6.3 Focal Species

Focal species are species that are identified and analyzed in an RCIS that will benefit from the conservation actions and habitat enhancement actions set forth in the RCIS. Conservation priorities are described in the context of their importance for contributing to the conservation and, if applicable, recovery of focal species and their habitats, as well as for other conservation elements in the RCIS area (Chapter 3, *Conservation Strategy*).

Focal species must be native species. Focal species and other species must be included in an RCIS to be considered for credits in an MCA. Focal species do not need to be restricted to species with anticipated mitigation needs, however, and can be common species, to expand the breadth of an RCIS to more comprehensively address the conservation needs of the RCIS area (California Department of Fish and Wildlife 2018).

1.6.3.1 Focal Species Selection

A two-step process was used to select the focal species for this Mid-Sacramento Valley River RCIS to be consistent with Program Guideline requirements (California Department of Fish and Wildlife 2017), and to identify species that the Steering Committee considered important to address in this RCIS.

- Step 1. Identify potential focal species.
- Step 2. Apply screening criteria to select focal species.

Step 1. Identify Potential Focal Species

The first step in developing the list of focal species was to compile a comprehensive list of native declining and vulnerable species that may occur in the Mid-Sacramento Valley RCIS area. Species included on this list are those that may benefit from conservation investments and/or creation of credits through an MCA, and indicator species that are not declining or vulnerable but whose protection confers additional conservation benefits to important habitats (e.g., riparian) or ecological processes (e.g., corridors for movement through the landscape).

This potential focal species list (provided in Appendix D, *Evaluation of Species for Inclusion as Focal Species*) was compiled by consulting publicly available sources to identify species that could occur in the RCIS area, and be in need of conservation investments and advance mitigation. The list included those taxa identified as Species of Greatest Conservation Need (SGCN) in the State Wildlife Action Plan (SWAP) (California Department of Fish and Wildlife 2015), species that have documented occurrences in the California Natural Diversity Database (CNDDB), and species listed as threatened or endangered under the California Endangered Species Act or Federal Endangered Species Act. Other sources that were consulted when identifying potential species to be addressed in the RCIS included the following.

- The Complete List of Amphibian, Reptile, Bird, and Mammal Species in California (California Department of Fish and Wildlife 2016).
- A list of federally listed endangered and threatened species obtained from the U.S. Fish and Wildlife Service for the RCIS area (Information for Planning and Consultation tool[9]).
- CNDDB Special Animals List (California Department of Fish and Wildlife, Natural Diversity Database 2018).
- CNDDB Special Vascular Plants, Bryophytes, and Lichens List (California Department of Fish and Wildlife, Natural Diversity Database 2018).
- California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (California Native Plant Society, Rare Plant Program 2018).

Step 2. Apply Screening Criteria to Select Focal Species

Once the potential focal species were identified, the following criteria were applied to each species to determine if it should be further considered for inclusion as a focal species in the RCIS. The

[9] https://ecos.fws.gov/ipac/

criteria are divided into *Required* and *Optional* criteria. Many species meet one or a few of the focal species selection criteria. To pare the list of potential focal species to a manageable number of species to be included in the Mid- Sacramento Valley RCIS as focal species, those species that meet all three of the following *Required* criteria and meet at least two of the three *Optional* criteria were selected as focal species. Some species that met focal species selection criteria were not selected as focal species if it was determined that their conservation needs would be met by conservation strategies developed for other species selected as focal species, or other conservation elements at the level of landscapes, working lands and natural communities. For example, the vernal pool natural community conservation strategy was (Chapter 3, Section 3.7.2, *Grassland*) was developed to benefit vernal pool systems in the RCIS area, including native species that rely on vernal pools, so species that rely on vernal pools for habitat were not selected as focal species. A rationale for not including these types of species as focal species in this RCIS is provided in the "evaluation notes" column in Appendix D, *Evaluation of Species for Inclusion as Focal Species*.

Required Screening Criteria

- **Status.** The species is listed by state or federal resource agencies as threatened, endangered, or a candidate for such listing; or the species is reasonably expected to be considered for listing within 10 years of RCIS approval; or, the species is identified as a CDFW animal SGCN; or is described as a SGCN or Climate Vulnerable (CV) in the SWAP; or is recognized by the CNPS as Rare, Threatened, or Endangered in California and elsewhere (1B) or Rare, Threatened or Endangered in California, but more common elsewhere (2B).
- **Occurrence.** The species is known or likely to occur in the Mid-Sacramento Valley RCIS area. Occurrence data should be based on credible evidence. Species only known to occur on protected and managed lands in the RCIS area, such as national wildlife refuges, may not be selected as focal species if other criteria are met, as the species already benefits from conservation actions throughout its known range in the RCIS area (e.g., habitat protection, and likely, habitat management).
- **Data.** Drawing on best available science and emerging data, sufficient data on the species' life history, habitat requirements, and occurrence within the Mid-Sacramento Valley RCIS area are available to develop conservation goals and objectives, assess stressors and pressures, and propose viable conservation actions[10].

Optional Screening Criteria

- **Indicator species.** A species whose presence or absence is indicative of a particular natural community, or set of environmental conditions.
- **Wide-ranging species.** Species that require large, contiguous, or connected blocks of habitat, whereby the species could effectively inform conservation planning and habitat enhancement actions involving habitat connectivity and other important ecological processes within the Mid-Sacramento Valley RCIS area.

[10] Sufficient data may include published literature cited in Step 1, species recovery plans, or other species-specific conservation or planning documents.

- **Near Term Mitigation Needs.** Species that would be of greatest benefit from implementation of mitigation actions, and potentially served by the development of mitigation credit agreements, in the near term[11]. In addition to using species' status as a guide to identifying species that may have near term mitigation needs, the Steering Committee provided guidance on species their agencies and organizations anticipate future permit requirements for compensatory mitigation for in the RCIS area.

Appendix D, Table D-1 shows the species and criteria used to evaluate these species for inclusion as focal species for the Mid-Sacramento Valley RCIS.

1.6.3.2 Proposed Mid- Sacramento Valley RCIS Focal Species List

A total of 59 wildlife species (including subspecies, evolutionary significant units, and distinct population segments) and 30 plant species (including subspecies and varieties) were assessed for inclusion as focal species in this Mid-Sacramento Valley RCIS, using the data sources described in Section 1.6.3.1, *Focal Species Selection*, under Step 1 (Appendix D, *Evaluation of Species for Inclusion as Focal Species*, Table D-1). Of the species considered, 12 wildlife species were selected as focal species for this Mid-Sacramento Valley RCIS (Table 1-2).

Table 1-2. Mid-Sacramento Valley RCIS Focal Species

		Status[a]			Optional Screening Criteria[b]	
Scientific Name	**Common Name**	**Federal**	**State**	**Global**	**I, WR, NTM**	**Value as Indicator for Specific Resources**
Invertebrate						
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	FT	–	G3T2 S2	I, WR, NTM	Lacustrine/Riverine vegetation community ecosystem health and function; sensitive to fragmentation
Fish						
Acipenser medirostris	Green sturgeon	FT	–	G3 S1S2	I, WR, NTM	Lacustrine/Riverine vegetation community health and function, including in-stream habitat and connectivity
Oncorhynchus mykiss	Central Valley steelhead	FT	–	G5T2Q S2	I, WR, NTM	Lacustrine/Riverine vegetation community health and function, including in-stream habitat and connectivity

[11] Near term mitigation needs are generally dependent on the species' status. For example, species are more likely to need mitigation if they are listed by state or federal resource agencies as threatened or endangered or are a candidate for such listing.

Scientific Name	Common Name	Status[a] Federal	State	Global	Optional Screening Criteria[b] I, WR, NTM	Value as Indicator for Specific Resources
Onchorhynchus tshawytscha	Sacramento River winter-run Chinook salmon	FE	SE	G5 S1	I, WR, NTM	Lacustrine/Riverine vegetation community health and function, including in-stream habitat and connectivity
Onchorhynchus tshawytscha	Central Valley spring-run Chinook salmon	FT	ST	G5 S1	I, WR, NTM	Lacustrine/Riverine vegetation community health and function, including in-stream habitat and connectivity
Onchorhynchus tshawytscha	Central Valley fall/late fall-run Chinook salmon	SOC	SSC	G5 S2	I, WR, NTM	Lacustrine/Riverine vegetation community health and function, including in-stream habitat and connectivity
Reptile						
Thamnophis gigas	Giant garter snake	FT	ST	G2 S2	WR, NTM	Working lands that benefit native species; and freshwater emergent wetlands vegetation community
Emys marmorata	Western pond turtle	UR	SSC	G3G4	I, WR	Freshwater emergent wetlands vegetation community; and Lacustrine/Riverine health and function, and adjacent upland nesting habitat
Birds						
Buteo swainsoni	Swainson's hawk	–	ST	G5 S3	WR, NTM	Working lands that benefit native species; and grasslands
Agelaius tricolor	Tricolored blackbird	UR	ST	G2G3 S1S2	I, WR, NTM	Freshwater emergent wetland vegetation community health and function; working lands that benefit native species; and grasslands
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	FT	SE	G5T2T3 S1	I, WR, NTM	Lacustrine/Riverine vegetation community health and function; sensitive to fragmentation
Riparia riparia	Bank swallow	–	ST	G5 S2	I, NTM	Lacustrine/Riverine vegetation community health, processes, and function

Scientific Name	Common Name	Status[a] Federal	State	Global	Optional Screening Criteria[b] I, WR, NTM	Value as Indicator for Specific Resources

[a] Status

Federal

- FE = listed as endangered under the federal Endangered Species Act.
- FT = listed as threatened under the federal Endangered Species Act.
- UR = under review. Species that have been petitioned for listing and for which a 90-day finding has not been published or for which a 90-day substantial has been published but a 12-month finding has not yet been published in the Federal Register. Also includes species that are being reviewed through the candidate process, but the Candidate Notice of Review has not yet been signed.
- SOC = Species of concern.
- – = no listing.

State (California Department of Fish and Wildlife, Natural Diversity Database 2018, Special Animals List (April, 2018), Available: http://www.dfg.ca.gov/wildlife/nongame/genplantsanimals.html)

- SE = listed as endangered under the California Endangered Species Act.
- ST = listed as threatened under the California Endangered Species Act.
- SSC = listed as a California Species of Special Concern by the California Department of Fish and Wildlife
- – = no listing.

Global Conservation Status (Nature Serve 2015. Available http://explorer.natureserve.org/granks.htm)

- G1 = critically imperiled- high risk of extinction due to extreme rarity (often 5 or fewer populations)
- G2 = imperiled- high risk of extinction due to very restricted range, very few populations (often 20 or fewer populations)
- G3 = vulnerable- moderate risk of extinction due to restricted range and very few populations (often 80 or fewer populations)
- G4 = apparently secure- uncommon but not rare
- G5 = secure- common, widespread and abundant
- G#G# = Range rank; numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.
- Q = Questionable taxonomy; taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid.
- T# = Infraspecific taxon; the status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.
  Rules for assigning T-ranks follow the same principles outlined for global conservation.

[b] **Screening Criteria**

- I = Indicator species
- WR = Wide-ranging species
- NTM = Near term mitigation needs

1.6.4 Other Conservation Elements

FGC 1852(c)(4) states that an RCIS will include, "important resource conservation elements within the strategy area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements."

This Mid-Sacramento Valley RCIS includes working landscapes, important natural communities such as riparian and vernal pool complex, ecological processes such as riverine hydrogeomorphic processes, and habitat connectivity, as other conservation elements.

Working landscapes dominate and characterize the RCIS area and are a vital conservation element for this RCIS. Working lands are important to the economy and social fabric of the RCIS area, and provide important habitat for native birds and other wildlife, including focal species such as tricolored blackbird, Swainson's hawk, and giant garter snake (Chapter 2, *Environmental Setting*, Section 2.11, *Working Landscapes*). The conservation strategy for working landscapes seeks to conserve cultivated land and working landscapes and the habitat values they provide for focal species, native wildlife, and natural communities (Chapter 3, *Conservation Strategy*, Section 3.7.1, *Working Landscapes*).

Natural communities provide important habitats for focal species and native biodiversity. Important natural communities include those that provide primary habitat for focal species and include grassland, riverine and riparian, and wetland (Section 2.8, *Natural Communities, Agricultural Lands, and Urban/Developed Lands*). This RCIS does not include chaparral and scrub and woodland as conservation elements because they are sparsely distributed in small patches in the RCIS area and conservation opportunities for these natural communities are very limited. This RCIS includes important natural communities as conservation elements as a means to protect and manage natural habitats, and restore natural communities (Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities*) and processes that maintain them to benefit focal species and native biodiversity (Section 3.6.2, *Conservation Strategy for Ecological Processes and Conditions*).

Habitat connectivity is included as a conservation element because movement is essential for wildlife to find mates, seasonal habitat, shelter, and food; to disperse to new habitats; and to track shifting habitats or find new habitat in a changing climate (Section 2.10, *Habitat Connectivit*y). The conservation strategy for habitat connectivity seeks to maintain interconnected working landscapes and natural communities (both terrestrial and aquatic) to provide for the movement and genetic interchange among populations of focal species, support adaptive adjustments in species distributions in response to climate change, and sustain native biodiversity (Section 3.6.1, *Conservation Strategy for Habitat Connectivity*).

1.7 Public Outreach and Involvement

Public outreach and involvement has been an important part of the process of developing this Mid-Sacramento Valley RCIS. The Steering Committee led the public outreach and involvement process to ensure that FGC public meeting requirements were met and to engage potential users of this RCIS throughout the RCIS development process.

The requirements for public outreach prior to the approval of an RCIS, as described in FGC 1854, and presented in Table 1-1, and summarized here, along with a description of how the Steering Committee met these requirements. See Section 1.4.4, *Consultation with Local Counties and Cities*, for a description of how staff from RD 108 and other Steering Committee member agencies consulted with the cities and counties within the RCIS area during the RCIS development process.

FGC 1854(c)(1) requires a public agency to publish notice of its intent to create an RCIS. As the proponent for this Mid-Sacramento Valley RCIS, RD 108 published a notice of its intent to create this RCIS on November 3, 2017 (see Appendix C, *Public Outreach*, for this notice). This notice was filed with the Governor's Office of Planning and Research and sent to CDFW, as required by FGC 1854(c)(1). Notices were sent to the city and county clerks of the cities and counties within and adjacent to the RCIS area, including the counties of Colusa, Sutter, Yolo, Glenn, Yuba, and Butte; and the cities of Colusa, Williams, Yuba City, Live Oak, and Marysville.

FGC 1854(c)(3)(A) requires that the public agency preparing an RCIS (in the case of this RCIS, RD 108) hold a public meeting to allow interested persons and entities to receive information about the RCIS early in the preparation process and to have adequate opportunity to provide written and oral comments. RD 108 and the Mid-Sacramento Valley RCIS Steering Committee hosted two public meetings. The first was held December 6, 2017, at the Colusa Casino Resort in Colusa, California. RD 108 and the Steering Committee provided notice of the public meeting on November 3, 2017, more than 30 days before the public meeting, as required in FGC 1854(c)(4). RD 108 and the Steering Committee provided notice of the development of the draft Mid-Sacramento Valley RCIS on RD 108's website; to CDFW; to the Mid-Upper Sacramento River RFMP LISTSERV; and to each city and county within and adjacent to the RCIS area. The second public meeting was held on March 20, 2018, at RD 108's office in Grimes, California. RD 108 and the Steering Committee provided notice of the meeting on February 15, 2018, on RD 108's website and Sutter Butte Flood Control Agency's website; to the Mid-Upper Sacramento River RFMP LISTSERV; to each city and county within and adjacent to the RCIS area; and to each public agency, organization, and individual who filed a written request for the notice, including any agency, organization, and individual who filed a written request to CDFW for notices of all RCIS public meetings. Interested persons were invited to provide oral and written comments to RD 108 at both public meetings.

FGC 1854(c)(4)(C) requires the public agency proposing an RCIS to also provide notice of the public meeting to the implementing entity for each NCCP or regional HCP that overlaps with the RCIS area. There are no approved NCCPs or HCPs that overlap the Mid-Sacramento Valley RCIS area, so no notices were sent to NCCP and HCP implementing entities.

FGC 1854(c)(5) requires that at least 60 days before submitting a final RCIS to CDFW for its review and approval, the RCIS proponent (i.e., RD 108) shall notify the board of supervisors and the city councils in each county within the RCIS area and provide the board of supervisors and the city councils an opportunity to submit written comments for at least 30 days. On January X, 2019 (*placeholder*), RD 108 notified the Colusa and Sutter County boards of supervisors and the Colusa, Williams, Yuba City, and Live Oak city councils, and invited the boards of supervisors and city councils to submit written comments on the Mid-Sacramento Valley RCIS.

FGC 1854(c)(3)(*B*) requires that in a draft RCIS submitted to CDFW for approval, the public agency shall include responses to written public comments submitted to the RCIS proponent before and during the public comment period. The Steering Committee included responses to written public comments in the Mid-Sacramento Valley RCIS submitted to CDFW on October 17, 2018, and the final RCIS submitted to CDFW in April 2019 (*placeholder*), in Appendix C, *Public Outreach*.

In addition to the required public outreach measures described above, outreach and engagement efforts were conducted with RD 108 landowners, potential conservation partners, regulatory agencies, reclamation districts, flood control districts, and the Farm Bureau. Refer to Appendix C, *Public Outreach*, for a summary of all stakeholder and public outreach and involvement efforts, including lists of participants.

1.8 Document Organization

This Mid-Sacramento Valley RCIS and supporting information are presented in the chapters and appendices listed below.

- **Chapter 1, Introduction.** Chapter 1 discusses the background, purpose of, and need for this RCIS; the planning process; the strategy term; the RCIS area; and the focal species selection process.
- **Chapter 2, Environmental Setting.** Chapter 2 provides a current assessment of the built environment, including major infrastructure in the RCIS area; the natural resources in the RCIS area, including natural communities and working lands; stressors and pressures to focal species; and other conservation elements.
- **Chapter 3, Conservation Strategy.** Chapter 3 presents this Mid-Sacramento Valley RCIS's conservation goals, objectives, and priorities; actions and enhancements for landscapes, natural communities; and working lands; and focal species and other conservation elements.
- **Chapter 4, Implementation.** Chapter 4 discusses how this Mid-Sacramento Valley RCIS will be implemented, including coordination with other resource agencies, development of MCAs, and planning for adaptive management.
- **Chapter 5, References.** Chapter 5 is a bibliography of printed references and personal communications cited in the text.
- **Chapter 6, Preparers and Reviewers**
- **Appendix A, Glossary**
- **Appendix B, Letter of Support**
- **Appendix C, Public Outreach**
- **Appendix D, Evaluation of Species for Inclusion as Focal Species**
- **Appendix E, Focal Species Habitat Models**
- **Appendix F, Regulatory Processes**

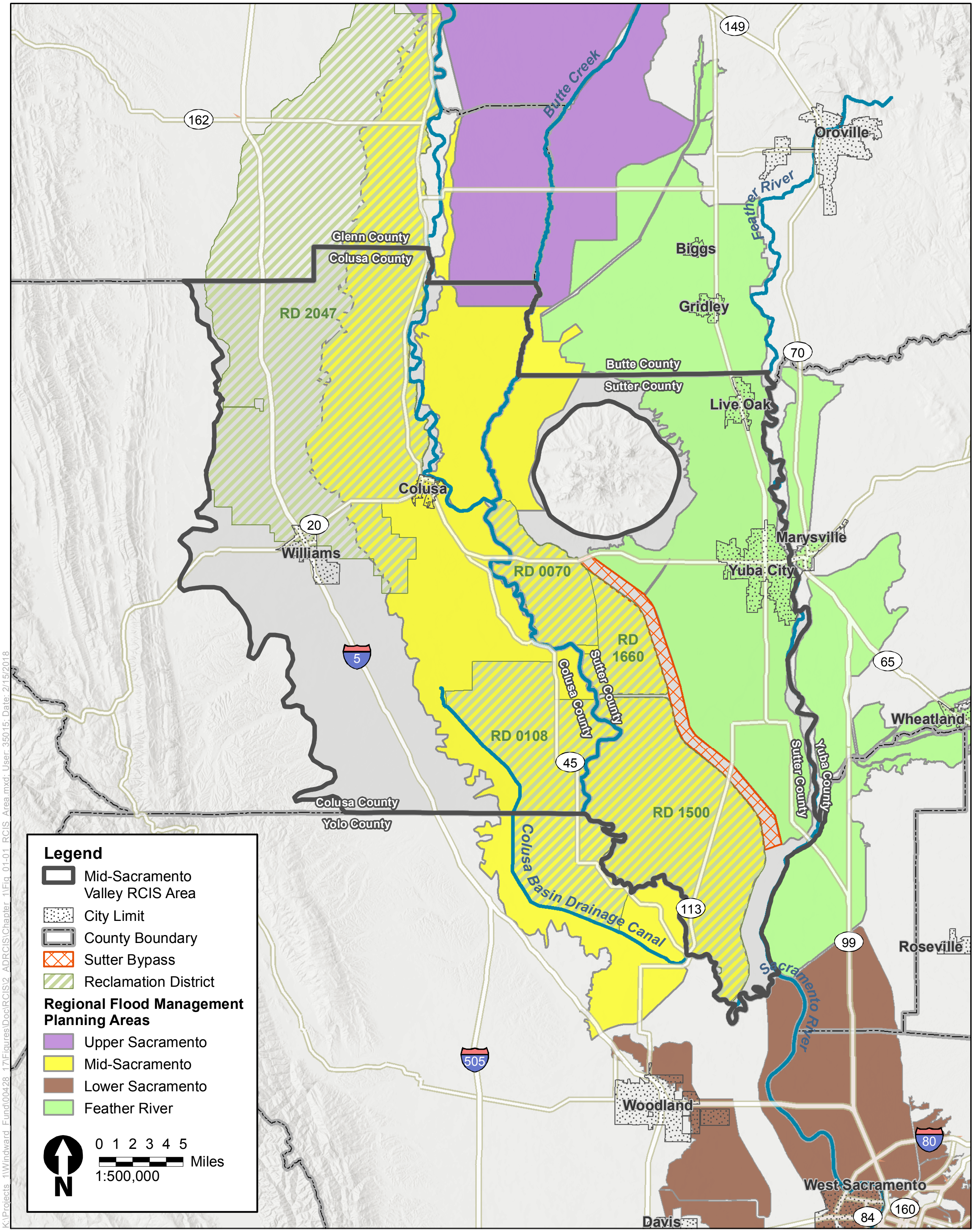

Figure 1-1
Mid-Sacramento Valley RCIS Area and Regional Flood Management Planning Areas

Chapter 2
Environmental Setting

2.1 Introduction

This chapter presents an overview of the natural resources and built environment in the Mid-Sacramento Valley Regional Conservation Investment Strategy (RCIS) area to provide context for this RCIS's voluntary conservation and enhancement actions (Chapter 3, *Conservation Strategy*). This overview consists of the best available information on government planning boundaries, major infrastructure, and natural resources for the RCIS area relevant to the focal species, natural communities in the RCIS area, and the RCIS's conservation goals and objectives.

The built environment in the RCIS area is described in the context of the following subject areas, as required in the California Fish and Game Code (CFGC) Section 1850.

- Major infrastructure, including water, transportation, and transmission infrastructure.
- Reasonably foreseeable urban development.

The environmental setting of the RCIS area is described for the following subject areas.

- Physical environment, including climate, geology and topography, watersheds, hydrology, and soils.
- Protected areas.
- Ecoregions.
- Natural communities and land cover types.
- Focal species.

This chapter also identifies the following conservation elements that inform the conservation strategy.

- Habitat connectivity.
- Working landscapes.

Finally, this chapter addresses the *pressures*[1] and *stressors*[2] in the RCIS area, and how those pressures and stressors affect focal species and other conservation elements including natural communities, habitat connectivity, and working landscapes.

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[1] The Program Guidelines (California Department of Fish and Wildlife 2018a) define *pressure* as an anthropogenic (human-induced) or natural driver that could result in changing the ecological conditions of a focal species or other conservation element. Pressures can be positive or negative depending on intensity, timing, and duration. Negative or positive, the influence of a pressure to the target focal species or other conservation elements is likely to be significant.

[2] The Program Guidelines define *stressor* as a degraded ecological condition of a focal species or other conservation element that resulted directly or indirectly from a negative impact of pressures such as habitat fragmentation.

2.2 Regional Conservation Planning Environment

FGC Section 1852(c)(10) requires that an RCIS include "provisions ensuring that the strategy is consistent with and complements any administrative draft natural community conservation plan, approved natural community conservation plan, or federal habitat conservation plan that overlaps with the RCIS area." Furthermore, FGC 1852(c)(11) requires an explanation of whether and to what extent an RCIS is consistent with any previously approved strategy or amended RCIS, state or federal recovery plan, or other state or federally approved conservation strategy that overlaps with the RCIS area. Section 2.2.1, *Natural Community Conservation Plans and Habitat Conservation Plans in and Adjacent to the Strategy Area*, briefly summarizes the Natural Community Conservation Plans (NCCPs) and Habitat Conservation Plans (HCPs) that overlap or are adjacent to the RCIS area. Section 2.2.2, *Safe Harbor Agreements*, summarizes the safe harbor agreements that overlap the RCIS area. Section 2.2.3, *Regional Conservation Investment Strategy Adjacent to the RCIS Area*, briefly describes the Yolo County RCIS (ICF 2018a), which is adjacent to the southern border of the Mid-Sacramento Valley RCIS area. Section 2.2.4, *Other Regional Conservation Plans and Programs*, summarizes conservation plans, programs, and projects in the RCIS area to provide context of some other relevant conservation planning efforts in the RCIS area. It is not the intent of this section to summarize all regional conservation plans, programs, and projects that overlap the RCIS area, only those currently active and most relevant to the RCIS. Section 2.2.5, *Species Recovery Plans*, summarizes state and federal recovery plans that overlap the RCIS area, and Section 2.2.6, *Critical Habitat Designations*, describes the designated critical habitat in the RCIS area.

Chapter 3, Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*, describes how this Mid-Sacramento Valley RCIS is consistent with and complements administrative draft and approved NCCPs and HCPs, and state or federally approved recovery plans that overlap the RCIS area.

2.2.1 Natural Community Conservation Plans and Habitat Conservation Plans in and Adjacent to the Strategy Area

There are no approved NCCPs or HCPs overlapping the Mid-Sacramento Valley RCIS area. The approved Natomas Basin HCP almost borders the Mid-Sacramento Valley RCIS area to the south (Figure 2-1). Several NCCPs and HCPs in progress overlap or are adjacent to the Mid-Sacramento Valley RCIS area. Regional conservation plans and strategies within and adjacent to the RCIS area are shown in Figure 2-1. Table 2-1 lists the approved and in-development HCPs and NCCPs overlapping or adjacent to the RCIS area, covered species or species proposed for coverage, and those species that overlap the Mid-Sacramento Valley RCIS focal species. Each of these plans is summarized below Table 2-1.

Table 2-1. Approved and In-development HCPs and NCCPs Overlapping or Adjacent to the RCIS Area

Plan	Location (relative to RCIS)	Status	Plan Area Size (acres)	Species Covered[a]
Yolo County HCP/NCCP	Adjacent to	In Development; approval expected in 2018	653,549	Western burrowing owl (*Athene cunicularia*), **western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)**, least Bell's vireo (*Vireo bellii*), **bank swallow (*Riparia riparia*)**, **tricolored blackbird (*Agelaius tricolor*), Swainson's hawk (*Buteo swainsoni*)**, white-tailed kite (*Elanus leucurus*), **giant garter snake (*Thamnophis gigas*)**, **western pond turtle (*Emys marmorata*)**, California tiger salamander (Central California DPS) (*Ambystoma californiense*), **valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)**, palmate-bracted bird's beak (*Chloropyron palmatum*)
Feather River HCP	Overlap with	In Development	264,921	**Valley elderberry longhorn beetle**, vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), **Chinook salmon – Central Valley fall/late fall-run ESU (*Onchorhynchus tshawytscha*)**, **Chinook salmon – Central Valley spring-run ESU (*O. tshawytscha*)**, **Chinook salmon—Sacramento River winter-run ESU (*O. tshawytscha*)**, **North American green sturgeon – southern DPS (*Acipenser medirostris*)**, **Steelhead – California Central Valley DPS (*O. mykiss*)**, **giant garter snake**, **bank swallow**, **Swainson's hawk**, **tricolored blackbird**, **western yellow-billed cuckoo**

Plan	Location (relative to RCIS)	Status	Plan Area Size (acres)	Species Covered[a]
Yuba-Sutter Regional Conservation Plan (HCP)	Overlap with	In Development	350,000	Vernal pool fairy shrimp, vernal pool tadpole shrimp, **valley elderberry longhorn beetle**, **giant garter snake**, **Swainson's hawk**, **western yellow-billed cuckoo**, **bank swallow**, California black rail (*Laterallus jamaicensis coturniculus*), greater sandhill crane (*Grus canadensis tabida*), western spadefoot (*Spea hammondii*), **western pond turtle**, western burrowing owl, **tricolored blackbird**, dwarf downingia (*Downingia pusilla*), Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*), legenere (*Legenere limosa*)
Butte Regional Conservation Plan (HCP/NCCP)	Adjacent to	In Development; approval expected in 2018	564,203	Western burrowing owl, **western yellow-billed cuckoo**, greater sandhill crane, California black rail, **Swainson's hawk**, white-tailed kite, **giant garter snake**, **western pond turtle**, foothill yellow-legged frog (*Rana boylii*), western spadefoot, **Central Valley steelhead**, **Central Valley spring-run Chinook salmon**, **Central Valley fall/late fall-run Chinook salmon**, **green sturgeon**, **valley elderberry longhorn beetle**, vernal pool tadpole shrimp, Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool fairy shrimp, Hoover's spurge (*Euphorbia hooveri*), Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*), hairy orcutt grass (*Orcuttia pilosa*), slender orcutt grass (*O. tenuis*), Butte County checkerbloom (*Sidalcea robusta*), Greene's tuctoria (*Tuctoria greenei*)

Plan	Location (relative to RCIS)	Status	Plan Area Size (acres)	Species Covered[a]
Natomas Basin HCP	Adjacent to	Approved in 2003	53,537	Aleutian Canada goose (*Branta hutchinsii leucopareia*), **bank swallow**, western burrowing owl, loggerhead shrike (*Lanius ludovicianus*), **Swainson's hawk**, **tricolored blackbird**, white-faced ibis (*Plegadis chihi*), **giant garter snake**, western pond turtle, California tiger salamander, western spadefoot toad, **valley elderberry longhorn beetle**, midvalley fairy shrimp (*Branchinecta mesovallensis*), vernal pool fairy shrimp, Boggs Lake hedge-hyssop (*Gratiola heterosepala*), Colusa grass (*Neostapfia colusana*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii),* legenere, Sacramento orcutt grass (*Orcuttia viscida*), Sanford's arrowhead (*Sagittaria sanfordii*), slender orcutt grass

[a] Covered species as of the latest publicly-available working draft, draft, or final document. Species in bold type overlap with the Mid-Sacramento Valley RCIS.

RCIS = regional conservation investment strategy; HCP = Habitat Conservation Plan; NCCP = Natural Community Conservation Plan; DPS = distinct population segment; ESU = evolutionarily significant unit

2.2.1.1 Yolo Habitat Conservation Plan/Natural Communities Conservation Plan

The *Yolo Habitat Conservation Plan/Natural Communities Conservation Plan* (Yolo HCP/NCCP) (ICF 2018b) is a countywide plan providing for the conservation of 12 sensitive species and the natural communities and agricultural land on which they depend. The Yolo HCP/NCCP provides a streamlined permitting process and countywide conservation strategy to address the effects of a range of future anticipated activities on the 12 covered species, of which 7 are also focal species in this RCIS (Table 2-1).

The Yolo Habitat Conservancy, which consists of Yolo County and the incorporated cities of Davis, West Sacramento, Winters, and Woodland, developed the Yolo HCP/NCCP. The Yolo HCP/NCCP provides the basis for issuance of 50-year permits under the federal Endangered Species Act (ESA) and California Natural Community Conservation Planning Act that cover an array of public and private activities, including activities essential to the ongoing viability of Yolo County's agricultural and urban economies. Specifically, the Yolo HCP/NCCP will provide the Permittees (i.e., Yolo County, the four incorporated cities, and the Yolo Habitat Conservancy) with incidental take permits from both the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) for the 12 covered species. In addition to the Permittees, the Yolo HCP/NCCP permits may cover the activities of other entities through certificates of inclusion.

The Yolo HCP/NCCP plan area is adjacent to the Mid-Sacramento Valley RCIS area along the southern boundary (Figure 2-1). The Yolo Habitat Conservancy released a public draft of this plan in the spring and summer of 2017. It is expected to be finalized and permitted by CDFW and the USFWS in the summer of 2018.

2.2.1.2 Western Placer County Habitat Conservation Plan/Natural Community Conservation Plan

The Placer County Conservation Program applies to western Placer County (to the east of the RCIS area [Figure 2-1]) and specific conservation activity areas where conservation activities will take place in neighboring Sutter County (outside of the RCIS area). The goal of the Placer County Conservation Program is to provide an effective framework to protect, enhance, and restore the natural resources in specific areas of western Placer County while streamlining environmental permitting for covered activities. Within this framework, the Placer County Conservation Program will achieve conservation goals, comply with state and federal environmental regulations, accommodate anticipated urban and rural growth, and permit the construction and maintenance of infrastructure needed to serve the population of the western third of the county. The Placer County Conservation Program includes three separate, but complementary, components that support two sets of state and federal permits.

- **Western Placer County Habitat Conservation Plan and Natural Community Conservation Plan**, referred to as the HCP/NCCP or "Plan." The Plan is a joint HCP and NCCP that will protect fish and wildlife and their habitats and fulfill the requirements of the ESA and the NCCP Act.
- **Western Placer County Aquatic Resources Program***.* The Western Placer County Aquatic Resources Program will protect streams, wetlands, and other water resources and fulfill the requirements of the federal Clean Water Act and analogous state laws and regulations.
- **In-Lieu Fee Program** is a program under which compensatory mitigation requirements under Section 404 of the federal Clean Water Act can be fulfilled by payment of a fee. The In-Lieu Fee Program will provide wetland mitigation credits that can be used to fulfill Section 404 compensatory mitigation requirements. The In-Lieu Fee Program will provide compensatory mitigation for impacts on aquatic resources for all projects and activities that are covered under the HCP/NCCP and the Western Placer County Aquatic Resources Program.

The *Western Placer County Habitat Conservation Plan and Natural Community Conservation Plan* describes how to avoid, minimize, and mitigate effects on endangered and threatened species, thereby addressing the permitting requirements relevant to these species for activities conducted in the Plan Area by the Permittees. The Plan also describes the responsibilities associated with operating and maintaining the new habitat reserves that will be created to mitigate anticipated effects resulting from growth and development activities and contribute to the recovery of covered species.

2.2.1.3 Feather River Habitat Conservation Plan

The California Department of Water Resources (DWR) is developing the Feather River HCP to support implementation of the 2017 Central Valley Flood Protection Plan (CVFPP) and Central Valley Flood System Conservation Strategy (Conservation Strategy) (Section 2.2.4.1, *Central Valley Flood Protection Plan and Conservation Strategy*). The Feather River HCP planning area overlaps with the Mid-Sacramento Valley RCIS area primarily in Sutter County (Figure 2-1), though the final HCP permit area is likely to be smaller.

The Feather River HCP will cover CVFPP and Conservation Strategy activities, including routine maintenance, structural repairs, reconstruction, improvements to or development of new levee construction, and conservation actions and habitat enhancement actions, such as levee setbacks, ecosystem restoration and enhancement, including the removal of fish passage barriers.

The Feather River HCP will also accomplish the following.

- Provide a regional incidental take permit in the Feather River HCP planning area for DWR and participating Local Maintaining Agencies for ESA and California Endangered Species Act (CESA) compliance.
- Establish mitigation requirements (e.g., mitigation ratios) for unavoidable incidental take.
- Establish avoidance and minimization measures.
- Support more efficient maintenance and project construction processes.

The Feather River HCP will provide a streamlined permitting process and conservation strategy to address the effects of flood management activities on the 13 covered species, of which 11 are focal species in the Mid-Sacramento Valley RCIS (Table 2-1).

2.2.1.4 Yuba-Sutter Regional Conservation Plan

Sutter County, Yuba County, the City of Yuba City, and the City of Live Oak are preparing a regional HCP to conserve covered species and their habitats, while allowing for compatible economic development. This plan has been in preparation since 2004. The status of the plan is unknown, but it may be several years away from a public draft. The proposed Yuba-Sutter Regional Conservation Plan area overlaps the Mid- and Upper Sacramento River RCIS area in Sutter County (Figure 2-1).

The Yuba-Sutter Regional Conservation Plan aims to conserve species and habitats while still allowing for economic development. The plan will provide for streamlined ESA, CESA and wetlands permitting for transportation projects, land development, and other covered activities over the proposed 50-year term of the permits. The plan will also provide comprehensive species, wetlands, and ecosystem conservation and contribute to the recovery of endangered species in the plan area. As part of the plan's conservation strategy rice, grasslands, and riparian habitat will be restored to benefit several of the RCIS focal species. The plan provides a conservation strategy for 17 covered species, of which 7 are focal species in the Mid- and Upper Sacramento River RCIS (Table 2-1).

2.2.1.5 Butte Regional Conservation Plan

The Butte County Association of Governments is leading development of the Butte Regional Conservation Plan (an HCP/NCCP) on behalf of Butte County, four cities (Chico, Oroville, Gridley, and Biggs), California Department of Transportation (Caltrans) District 3, and several local irrigation and drainage districts (Western Canal Water District, Richvale Irrigation District, Biggs West-Gridley Water District, and Butte Water District). A public draft of the HCP/NCCP and associated Environmental Impact Report/Environmental Impact Statement (EIR/EIS) were released in December 2015. The HCP/NCCP applicants are currently revising the documents and preparing to rerelease a public draft in early 2018, after substantial revisions to the original plan have been made in response to public comments. The Butte Regional Conservation Plan planning area is adjacent to the Mid-Sacramento Valley RCIS area in the northwest corner of the RCIS area, where Colusa County and Sutter County border Butte County (Figure 2-1).

The Butte Regional Conservation Plan provides for the contribution to recovery of covered species, conservation of ecosystems, natural communities, and the ecological processes that support them, while providing for the mitigation of impacts by covered activities. The plan will provide streamlined ESA, CESA, and wetlands permitting for transportation projects, land development and other covered activities over the 50-year term of the permits. The Butte Regional Conservation Plan covers 38 species, 9 of which are focal species in the Mid-Sacramento Valley RCIS (Table 2-1).

2.2.1.6 Natomas Basin Habitat Conservation Plan

The Natomas Basin HCP was approved in 2003, and is the longest running HCP in the Sacramento Valley. The Natomas Basin HCP area almost borders the RCIS area to the south (Figure 2-1). The Natomas Basin HCP covers the interior of the Natomas Basin, located in the northern portion of Sacramento County and the southern portion of Sutter County. The Natomas Basin HCP is designed to support applications for permits under the ESA and CESA, and is implemented by the Natomas Basin Conservancy. The City of Sacramento, Sutter County, Reclamation District 100, Natomas Central Mutual Water Company, and the Natomas Basin Conservancy use the Natomas Basin HCP in their individual applications for ESA and CESA permits. The purpose of the Natomas Basin HCP is to promote biological conservation along with economic development and the continuation of agriculture in the Natomas Basin. The Natomas Basin HCP establishes a multi-species conservation program to mitigate the expected loss of habitat values and incidental take of protected species that would result from urban development, operation of irrigation and drainage systems, and rice farming. The goal of the Natomas Basin HCP is to preserve, restore, and enhance habitat values found in the Natomas Basin while allowing urban development to proceed according to local land use plans. The Natomas Basin Conservancy has overseen one of the longest HCP monitoring programs in Northern California, focused on the status and trends of Swainson's hawk, giant garter snake, and other covered species. The Natomas Basin HCP covers 21 species, 6 of which are focal species in the Mid-Sacramento Valley RCIS (Table 2-1).

2.2.2 Safe Harbor Agreements

The USFWS and National Marine Fisheries Service (NMFS) established a Safe Harbor Policy under the federal ESA of 1973, as amended (64 Federal Register [FR] 32717). This policy is intended to incentivize the maintenance, enhancement, and restoration of habitat for listed species on non-federal lands by providing landowners that enroll their property under a Safe Harbor Agreement with assurances that no additional future regulatory burdens for "incidental take" will be placed on their property as a result of implementing voluntary conservation measures to benefit listed species.

2.2.2.1 Sacramento River Conservation Area Forum Programmatic Safe Harbor Agreement

The Sacramento River Conservation Area Forum entered into a 30-year Programmatic Safe Harbor Agreement with USFWS in 2013. The purpose of this Safe Harbor Agreement is to provide a net conservation benefit to the federally threatened valley elderberry longhorn beetle and giant garter snake.

Properties eligible to enroll under this Safe Harbor Agreement include non-federal properties in or immediately adjacent to the Sacramento River Conservation Area. The Sacramento River Conservation Area extends along approximately 222 miles of the Sacramento River and the adjacent 213,000 acres of land extending from Keswick Dam in Shasta County south to the town of Verona in

Sutter County. The Sacramento River Conservation Area crosses through Butte, Glenn, Colusa, Shasta, Yolo, Sutter, and Tehama Counties. The natural community types generally found on lands eligible for enrollment into this Safe Harbor Agreement include riparian, California prairie, valley oak woodland, and riverine along with working lands.

2.2.2.2 Abbott Lake Unit of the Feather River Wildlife Area Safe Harbor Agreement

The CDFW entered a 20-year Safe Harbor Agreement with USWFS in 2014. The purpose of this Safe Harbor Agreement is to provide a net conservation benefit to the federally threatened valley elderberry longhorn beetle.

The property, the Abbott Lake Unit of the Feather River Wildlife Area, is east of Garden Highway and west of the Feather River. The agreement includes riparian planting and enhancement activities on 265 acres of riverside floodplain that are part of the 439-acre Abbott Lake Unit. Approximately 19,500 native riparian shrubs and trees will be planted, along with an herbaceous understory of native forbs and grasses. Additionally, 1,500 elderberry shrubs will be planted as part of the restoration project.

2.2.3 Regional Conservation Investment Strategy Adjacent to the RCIS Area

The Yolo RCIS (ICF 2018a) is a countywide RCIS that is adjacent to this RCIS area at its southern boundary (Figure 2-1). The Yolo RCIS is being developed by a Steering Committee consisting of the Yolo Habitat Conservancy, Yolo County, California Natural Resources Agency, DWR, and partner organizations and agencies. The Yolo RCIS is being developed based on existing plans and other information, including the Yolo HCP/NCCP and the CVFPP and Conservation Strategy, among others. In addition to being an RCIS, this plan is also a Local Conservation Plan (LCP). The Yolo Habitat Conservancy is leading the voluntary LCP effort in coordination with local stakeholders for the purpose of addressing conservation needs of species not addressed in the Yolo RCIS or HCP/NCCP. The Yolo RCIS/LCP designed to be consistent with and complement the Yolo HCP/NCCP.

The plan promotes implementation of landscape-scale conservation actions and habitat enhancement actions, such as habitat protection, restoration, and enhancement measures including efforts to enhance landscape connectivity for wildlife. It addresses the conservation needs of 41 focal species (all of the Mid-Sacramento Valley RCIS focal species are Yolo RCIS/LCP focal species) for the RCIS/LCP, and over 75 additional special status species for the LCP component only. The RCIS/LCP component of the LCP will provide a basis for future mitigation credit agreements (MCAs) for public infrastructure and other projects in Yolo County not covered by the Yolo HCP/NCCP.

2.2.4 Other Regional Conservation Plans and Programs

There are many ongoing efforts to improve habitat for listed fish and wildlife species in the Mid-Sacramento Valley RCIS area, while also reducing flood risk to private and public landowners. This Mid-Sacramento Valley RCIS aligns its conservation goals, objectives, actions, and priorities with these current and proposed conservation projects with the intent of supporting the objectives of these conservation efforts, and better connecting mitigation needs with viable projects through the MCA process. The regional conservation plans most relevant to this RCIS are summarized below.

2.2.4.1 Central Valley Flood Protection Plan and Conservation Strategy

The CVFPP is a strategic and long-range plan for improving flood risk management in the Central Valley. Prepared by DWR in accordance with the Central Valley Flood Protection Act of 2008 (Act) and adopted by the Central Valley Flood Protection Board[3] (CVFPB) in June 2012, the CVFPP is a critical document to guide California's participation (and influence federal and local participation) in flood risk management in the Central Valley. The CVFPP proposes a system-wide investment approach for sustainable, integrated flood management in areas currently protected by facilities of the State Plan of Flood Control. The CVFPP is required to be updated every 5 years, with each update providing support for subsequent policy, program, and project implementation (California Department of Water Resources 2012).

The 2017 CVFPP Update (California Department of Water Resources 2017) is the first major 5-year update to the CVFPP in accordance with the Act. It updates and refines the overall near- and long-term investment needs established in the 2012 CVFPP, and includes recommendations on policies and funding to support comprehensive flood risk management actions. The planning efforts supporting the 2017 CVFPP Update were developed in close coordination with state, federal, and regional partners, and were informed by a multi-year stakeholder engagement process initiated in 2012.

The approach for developing the 2017 CVFPP Update focused on refining the systemwide investment approach through several technical studies, regional plans, and flood management system document updates completed since 2012, all supported with robust and ongoing communications and engagement with partners and stakeholders. The 2017 CVFPP Update includes a refined State Systemwide Investment Approach, based on the basin-wide feasibility studies, the Regional Flood Management Plans (RFMPs), the CVFPP Conservation Strategy, and other supporting documents. CVFPP also aligned its approach with major statewide strategic plans and desired outcomes: the California Water Action Plan, California Water Plan, and California's Flood Future. This update process brings together technical and policy-level information to refine the systemwide investment approach and its associated cost estimates, funding, and phasing over the next 30 years. The resulting 2017 refined systemwide investment approach portfolio provides a comprehensive set of management actions and investments needed to manage flood waters for the State Plan of Flood Control and produce desired outcomes in the Central Valley.

See Section 2.3.3.1, *Flood Protection*, for more information about flood protection infrastructure and implementing the CVFPP.

Central Valley Flood Protection Plan Conservation Strategy

The Conservation Strategy is an important component of the 2017 CVFPP Update. It is a planning document that focuses on the improvement of ecosystem functions and describes the basis for recommending conservation measures and setting long-term goals and measurable objectives. The 2016 update is an update to the previously published 2015 version of the Conservation Strategy and

[3] The Central Valley Flood Protection Board (CVFPB) is the state regulatory agency responsible for ensuring that appropriate standards are met for the construction, maintenance, and protection of the flood control system that protects life, property, and wildlife habitat in California's vast and diverse Central Valley from the devastating effects of flooding. CVFPB issues encroachment permits and works with other agencies to improve the flood protection structures, enforces removal of problematic encroachments, and keeps watch over the Central Valley's continually improving flood management system.

appendices. It includes some revisions based on comments submitted by non-governmental organizations, private citizens, and other government agencies.

The goals of the CVFPP Conservation Strategy focus on promoting ecosystem functions and address the following ecosystem elements.

- **Ecosystem processes.** Improve dynamic hydrologic (flow) and geomorphic processes in the State Plan of Flood Control.
- **Habitats**. Increase and improve the quantity, diversity, and connectivity of riverine and floodplain habitats.
- **Species**. Contribute to the recovery and sustainability of populations of native species and overall biotic community diversity.
- **Stressors**. Reduce stressors related to the development and operation of the State Plan of Flood Control that negatively affect at-risk species.

The CVFPP Conservation Strategy identifies and provides focused conservation plans for 17 target species; 10 of these target species are Mid-Sacramento Valley RCIS focal species. The CVFPP Conservation Strategy identifies specific tools and approaches to improve riverine and floodplain ecosystems to benefit fish and wildlife through multi-benefit projects. The CVFFP Conservation Strategy identifies five Conservation Planning Areas; the RCIS area is within the Upper Sacramento River Conservation Planning Area and the Feather River Conservation Planning Area (California Department of Water Resources 2016). This RCIS's conservation strategy incorporates elements from the CVFPP Conservation Strategy into the RCIS's conservation goals, objectives, conservation actions and habitat enhancement actions, and conservation priorities (Chapter 3, *Conservation Strategy*).

2.2.4.2 Mid and Upper Sacramento River Regional Flood Management Plan

The Mid and Upper Sacramento River Regional Flood Management Plan (Mid-Upper Sacramento River RFMP) (Mid and Upper Sacramento River Regional Flood Management Plan Partners 2014) was a locally driven assessment of regional flood management issues within the Mid-Sacramento Region and the Upper Sacramento River Region. The Mid and Upper Sacramento River Regions comprise portions of Butte, Colusa, Glenn, Lake, Sutter, Tehama, and Yolo Counties, and are supported by a diverse set of stakeholder groups in urban cities, small communities, and rural areas. As described in Chapter 1, Section 1.3, *Purpose and Intent*, this Mid-Sacramento Valley RCIS is an outgrowth, in part, of the Mid-Upper Sacramento River RFMP. As such, the Mid-Upper Sacramento River RFMP stakeholders and partners will play an important role in implementing this RCIS.

The Mid-Upper Sacramento River RFMP provides the framework for the Mid and Upper Sacramento River Regions' vision for managing flood risk, and was developed using local experience, knowledge, and expertise. It provides a reconnaissance-level assessment of regional flood risks and a prioritized list of short- and long-term flood risk reduction projects for the Mid and Upper Sacramento River Regions. The Mid-Upper Sacramento River RFMP was a follow up to the 2012 CVFPP and was used to inform the 2017 update of the CVFPP. The Mid-Upper Sacramento River RFMP was used by DWR to inform the Sacramento River Basin-Wide Feasibility Study (BWFS), and the Conservation Strategy.

The plan calls for upgrades to the level of 100-year flood protection for multiple small communities Princeton, within the RCIS area, and prioritizes the operation and maintenance of levees, including erosion repairs, slope stability, rodent control, and seepage repairs, in multiple locations throughout the RCIS area.

2.2.4.3 Feather River Regional Flood Management Plan

The Yuba County Water Agency, Three Rivers Levee Improvement Authority, Marysville Levee Commission, and Sutter Butte Flood Control Agency (SBFCA) partnered with DWR, and were informed by a diverse array of stakeholders, to develop the Feather River Regional Flood Management Plan (California Department of Water Resources 2014). The Draft Final Plan reflects the flood management priorities of the Feather River Region, while at the same time aligning with the adopted 2012 CVFPP, to the extent feasible. By clearly establishing regional flood management priorities, the Feather River RFMP facilitates future funding and implementation of much-needed flood risk reduction projects.

The regional goals and objectives are to improve flood risk management in the region while advancing the supporting goals of improving operations and maintenance, promoting ecosystem functions, improving institutional support, and promoting multi-objective projects. These objectives of the regional planning process are founded on, and consistent with, the goals of the CVFPP. The primary goal in the Feather River RFMP is to do the following.

- Improve Flood Risk Management. Reduce the chance of flooding, and damage once flooding occurs, and improve public safety, preparedness, and emergency response through the following.
  - Identifying, recommending, and implementing structural and non-structural projects and actions that benefit lands currently receiving protection from facilities of the State Plan of Flood Control.
  - Formulating standards, criteria, and guidelines to facilitate implementation of structural and non-structural actions for protecting urban areas and other lands of the Sacramento and San Joaquin river basins and the Delta.

Supporting goals established in the Final Feather River RFMP include the following.

- Improve Operations and Maintenance. Reduce system-wide maintenance and repair requirements by modifying the flood management systems in ways that are compatible with natural processes, and adjust, coordinate, and streamline regulatory and institutional standards, funding, and practices for operations and maintenance, including significant repairs.
- Promote Ecosystem Functions. Integrate the recovery and restoration of key physical processes, self-sustaining ecological functions, native habitats, and species into flood management system improvements, to the extent feasible.
- Improve Institutional Support. Develop stable institutional structures, coordination protocols, and financial frameworks that enable effective and adaptive integrated flood management (designs, operations and maintenance, permitting, preparedness, response, recovery, and land use and development planning).
- Promote Multi-Benefit Projects. Describe flood management projects and actions that also contribute to broader integrated water management objectives identified through other programs.

The Final Feather River RFMP will achieve these goals and objectives through both structural and non-structural means (California Department of Water Resources 2014).

2.2.4.4 Sacramento River Basin-Wide Feasibility Study

The Sacramento River BWFS evaluated options for improving the Sacramento River Flood Control System and advancing the CVFPP planning and implementation process by updating and refining the options for improving the flood management system. It includes feasibility evaluations of various combinations system modifications, and storage management opportunities, with integrated conservation actions.

2.2.4.5 Colusa Basin Watershed Management Plan

The Colusa Basin Watershed Management Plan was developed in 2012 as a stakeholder-driven planning process led by the Colusa Resource Conservation District. This plan provides a non-regulatory, community-driven, framework intended to promote projects that serve multiple benefits and will sustain and enhance watershed functions in the Colusa Basin Watershed while balancing human and natural resource needs.

The following eight goals were identified by the Colusa Basin Watershed stakeholders and technical advisory committee are included in the Colusa Basin Watershed Management Plan as priority concerns.

1. Protect, maintain and improve water quality.
2. Promote activities to ensure a dependable water supply for current and future needs.
3. Preserve agricultural land and open space.
4. Manage and reduce invasive plant populations.
5. Reduce destructive flooding.
6. Enhance soil quality and reduce erosion.
7. Preserve and enhance native habitat.
8. Address unknown future effects of climate change.

The Colusa Basin Watershed Management Plan includes approximately 1,045,445 acres. Approximately 447,821 acres of this plan (43%) are located in the northern portion of the RCIS area.

2.2.4.6 Central Valley Habitat Exchange

The Central Valley Habitat Exchange[4] is a program, in partnership with the Environmental Defense Fund and several conservation organizations and state agencies, which creates opportunities for farmers and ranchers to conserve and restore habitat for at-risk wildlife in the Central Valley. The Central Valley Habitat Exchange facilitates investment in conservation and restoration of vital Central Valley habitat by promoting, monitoring, and assisting in habitat transactions. It provides a marketplace and tools to facilitate and incentivize conservation on private land, and has committed

[4] https://www.enviroaccounting.com/cvhe/Program/Home, and https://www.edf.org/ecosystems/central-valley-habitat-exchange

to working with multiple Mid-Upper Sacramento RFMP landowners. It is expected that these projects will form the basis for an MCA tied to this Mid-Sacramento Valley RCIS.

2.2.4.7 Waterbird Habitat Enhancement Regional Conservation Partnership Program

The Waterbird Habitat Enhancement Regional Conservation Partnership Program[5] (WHERCPP) is a voluntary program that pays rice farmers to enhance and restore habitat on 100,000 acres of California ricelands. The WHERCPP emerged from a cooperative effort between the Natural Resources Conservation Service, California Rice Commission, rice growers, Audubon California, Point Blue Conservation Science, and The Nature Conservancy. The WHERCPP strives to sustain production agriculture in the Central Valley while simultaneously providing wildlife with surrogate wetland habitat to help offset the substantial loss of wetlands over the past 150 years. The program is available in eight Sacramento Valley counties, including Colusa and Sutter Counties. Agricultural operations within the WHERCPP project area may be eligible for technical and financial assistance to implement conservation practices. Across the Sacramento Valley, the WHERCPP has enrolled nearly 20% of California's rice land in bird-friendly farming practices (California Rice Commission 2014).

The WHERCPP offers a suite of management practices that provides habitat for waterbirds (e.g., ducks, shorebirds, and waders) and other wildlife. Although the focus of the WHERCPP is to provide habitat for waterbirds, focal species that use rice lands and wetlands such as giant garter snake, western pond turtle, and tricolored blackbird may benefit from the program. The conservation objectives for the WHERCPP include the following (U.S. Department of Agriculture 2017).

- Post-harvest crop residue management with boards-in, to leave at least 60% of crop residues on the ground as forage for wintering and migrating birds. Boards are replaced post-harvest to allow fields to collect seasonal rainwater and to provide flooded waterbird habitat conditions.
- Winter flooding with variable drawdown through February. Fields are flooded after harvest, and hold water during the winter. A variable drawdown is implemented in February to create a matrix of shallow water and mudflat habitat for wintering and migrating birds.
- Seasonal inundation with gradual drawdown. Water is applied to post-harvested, or fallowed fields with at least 60% of crop residues to create shallow water habitat for migrating waterbirds. Fields are flooded for 2 weeks between July 1 and September 15, then followed by 2 weeks of gradual draining.
- Nesting/loafing islands. Nesting/loafing islands are installed to create nesting habitat for waterbirds from March through July, and year-round loafing areas.
- Cover crops for seasonal habitat. Cover crops are planted in the fall on idle rice fields to create nesting habitat for waterbirds.
- Seasonal habitat ponds. Shallow aquatic habitat is created in areas that were previously irrigated cropland and provides habitat for waterbirds, amphibians, and aquatic reptiles. Habitat ponds may be anywhere in a system of irrigated fields, but are typically placed in rice fields where there are cold water inputs.

[5] https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ca/programs/farmbill/rcpp/?cid=nrcseprd996406#EQIP Program Materials

- Wetland restoration. Areas are deleveled for wetland restoration to create long-term habitat (at least 15 years) on previously irrigated rice land to provide aquatic habitat for waterbirds, breeding waterfowl, waders, amphibians and aquatic reptiles.

2.2.5 Species Recovery Plans

Recovery of endangered or threatened animals and plants to the point where they are again secure, self-sustaining members of their ecosystems is a primary goal of the ESA, as amended (16 U.S. Code 1531 et seq.). Recovery means improving the status of listed species to the point at which listing is no longer appropriate under the criteria specified in Section 4(a)(1) of the Act. A recovery plan is one of the most important tools in the recovery process. Recovery plans provide a framework for targeting conservation efforts and modifying actions based on new science and changing circumstances. Recovery plans provide guidance and are voluntary; they do not have the force of law. As such, the success of recovery efforts ultimately depends on partnerships and cooperation to ensure the implementation of actions to advance species' long-term recovery.

A species' recovery plan includes scientific information about the species and provides criteria that enable USFWS to determine whether down-listing or delisting the species is justified. Recovery plans help guide recovery efforts by describing actions that USFWS considers necessary for each species' conservation and by estimating time and costs for implementing needed recovery measures.

The summaries provided in this section are taken primarily from the recovery plans. For more information, follow links provided in footnotes to the recovery plans.

2.2.5.1 Valley Elderberry Longhorn Beetle

In 1984, USFWS published the Valley Elderberry Longhorn Beetle Recovery Plan (U.S. Fish and Wildlife Service 1984). The recovery plan summarizes biological information known of the valley elderberry longhorn beetle, prescribes actions necessary to acquire additional biological data, and describes preliminary recommendations for actions necessary for the beetle's preservation, maintenance, and recovery. At the time of publication of the recovery plan, the specific life history characteristics and ecology of the beetle were unknown. The life histories of related *Desmoscerus* species were used to describe the basic life history of valley elderberry longhorn beetle.

Because there was insufficient information regarding the species' life history, distribution and habitat requirements, interim objectives and actions were outlined in the recovery plan focusing on preventing the further loss and degradation of the beetle's existing habitat. Interim objectives included the following: protect the three known localities, survey riparian vegetation along Central California rivers for beetle colonies and habitat, provide protection to remaining habitat in the species' suspected historic range, and collect additional information necessary to delist the species.

Since the publication of the recovery plan, new information regarding the beetle's distribution, biology, and ecology indicate that the recovery criteria may no longer be appropriate for the species. The USFWS published a 5-Year Review of the Valley Elderberry Longhorn Beetle in 2006 (U.S. Fish and Wildlife Service 2006a), and the Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) in 2017 (U.S. Fish and Wildlife Service 2017c), providing more current information about the species than the recovery plan.

2.2.5.2 Vernal Pools

In 2005, USFWS published The Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service 2005a). The recovery plan addresses 33 species of plants and animals that occur exclusively or primarily within a vernal pool ecosystem in California and southern Oregon. Of these species, the recovery plan addresses 20 federally listed species, including 10 endangered plants, 5 threatened plants, 3 endangered animals, and 2 threatened animals. These vernal pool species occur primarily in vernal pool, swale, or ephemeral freshwater habitats largely confined to a limited area by topographic constraints, soil types, and climatic conditions. Surrounding (or associated) upland habitat is critical to the proper ecological function of these vernal pool habitats. The primary threats to the species are habitat loss and fragmentation due to urban development and associated infrastructure, agricultural conversion, altered hydrology, non-native invasive species, inadequate regulatory mechanisms, exclusion of grazing in areas where grazing has been a historic land use, and inappropriate grazing regimes (overgrazing or undergrazing). Resulting small population sizes are subject to extinction due to random, naturally occurring events.

This recovery plan presents an ecosystem-level strategy for recovery and conservation because all of the listed species and species of concern co-occur in the same natural ecosystem and are generally threatened by the same human activities. The likelihood of successful recovery for listed species and long-term conservation of species of concern is increased by protecting entire ecosystems. This task can be most effectively accomplished through the cooperation and collaboration of various stakeholders.

The recovery plan delineates core areas to identify locations that should be the initial focus for implementation of protection measures. Core areas are the specific sites that the recovery plan deems necessary to recover or conserve endangered or threatened vernal pool species addressed by the recovery plan. Preservation and enhancement of each core area is important to maintain and possibly expand the distribution of the vernal pool species range-wide. Lands preserved within core areas will require long-term protection and management so that existing and reestablished populations remain viable. There are two core areas within the RCIS area: the Sacramento National Wildlife Refuge (NWR) core area and the Dolan core area (Figure 2-2).

This RCIS addresses vernal pool complexes (Section 2.8.1.2, *Vernal Pool Complex*), rather than individual vernal pool species as focal species. This approach is intended to provide a more comprehensive conservation strategy that addresses all species dependent on this community in the RCIS area.

2.2.5.3 Green Sturgeon

In January of 2018, NMFS released the Draft Recovery Plan for the Southern Distinct Population Segment (DPS) of North American Green Sturgeon (National Marine Fisheries Service 2018). The recovery plan is intended to serve as guidance for recovery efforts, including recovery planning, for the green sturgeon – Southern DPS. The draft recovery plan is currently under public review and will be finalized in 2018. The RCIS used the draft recovery plan to inform the RCIS conservation strategy (Chapter 3, Section 3.8.2, *Focal Fish Species—Green Sturgeon – Southern DPS, Central Valley Steelhead, Central Valley Chinook Salmon [Winter-Run, Spring-Run, and Fall/Late Fall-Run]*).

The draft recovery plan sets out a plan to conserve and recover green sturgeon according to the threats and stressors limiting the green sturgeon population. These threats span from the upper

Sacramento River down to the Delta. Some of the major threats are blockage of access to spawning habitat on Sacramento, Feather, and Yuba Rivers; deleterious hydrograph and water temperature regimes below Keswick and Oroville Dams; fisheries bycatch and discard, illegal retention in recreational fisheries, and poaching; activities that affect spawning, rearing, and feeding habitats; entrainment or impingement at water diversions, ocean energy projects, and vessel strikes; displacement of native prey species by non-native invasive species; exposure to contaminants; and loss of estuarine/Delta function.

Both sport and commercial fisheries regulations are currently in effect that do not permit any take of green sturgeon. The recovery potential for the southern DPS of green sturgeon is considered moderate to high; however, because they are long-lived and have delayed maturity, recovery could take many decades (National Marine Fisheries Service 2018).

2.2.5.4 Steelhead and Chinook Salmon

In July 2014, NMFS released the Recovery Plan for the Evolutionarily Significant Units (ESUs) of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014). The recovery plan has two primary objectives: secure existing populations by addressing stressors, and reintroduce populations into historically occupied or other suitable areas. The recovery plan includes a range of actions to secure and restore winter- and spring-run Chinook salmon, Central Valley steelhead, and their habitats. It sets priorities to guide investments and incorporates an adaptive management approach to make adjustments based on new information. Recovery of winter-run Chinook salmon, spring-run Chinook salmon, and steelhead across such a vast and altered ecosystem as the Central Valley will require a broadly focused, science-based strategy.

The recovery plan identifies four recovery units for the Sacramento winter-run and Central Valley spring-run Chinook ESUs and the Central Valley steelhead. The recovery units are based on diversity groups[6] that are organized by tributaries with spawning habitat throughout the spawning range of these ESUs and DPS. Only the Northern Sierra Nevada Diversity Group recovery unit for the Chinook ESUs overlaps the strategy area. The northern Sierra Nevada diversity group is composed of tributaries to the east of the Sacramento River, from Antelope Creek to the Mokelumne River (National Marine Fisheries Service 2014). In the RCIS area, that includes Butte Creek and the northern section of the Sacramento River.

Recovery actions include the following.

- Restoring in-stream flows.
- Restoring connectivity between habitats and improving passage.
- Creating and restoring habitats, including spawning and rearing habitats.
- Reducing erosion and sedimentation in watersheds.

[6] A geographically distinct portion of the ESU or DPS which is ecologically or otherwise identifiable and is essential to the recovery of the entire listed entity (e.g., to conserve genetic robustness, demographic robustness, and important life history stages) (National Marine Fisheries Service 2014).

2.2.5.5 Giant Garter Snake

In October 2017, USFWS released the *Recovery Plan for Giant Garter Snake* (*Thamnophis gigas*)[7] (U.S. Fish and Wildlife Service 2017a). The objective of this recovery plan is to reduce threats to and improve the population status of the giant garter snake sufficiently to warrant delisting. The strategy used to recover the giant garter snake is focused on protecting existing, occupied habitat and identifying and protecting areas for habitat restoration, enhancement, or creation, including areas that are needed to provide connectivity between populations. Appropriate management is needed for all giant garter snake conservation lands to ensure that stable and viable populations can be maintained in occupied areas and that colonization will be promoted in restored and enhanced unoccupied habitat.

To meet the recovery goal of delisting the species, USFWS identified the following objectives in the *Recovery Plan for Giant Garter Snake.*

- Establish and protect self-sustaining populations of the giant garter snake throughout the full ecological, geographical, and genetic range of the species.
- Restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake and its community members.
- Ameliorate or eliminate, to the extent possible, the threats that caused the species be listed or are otherwise of concern, and any foreseeable future threats.

USFWS defined nine recovery units that correspond directly to the nine geographically and genetically distinct populations, to aid in recovery planning: Butte Basin, Colusa Basin, Sutter Basin, American Basin, Yolo Basin, Delta Basin, Cosumnes-Mokelumne Basin, San Joaquin Basin, and Tulare Basin. Three of the recovery units overlap with the RCIS area (Figure 2-3).

The Butte Basin Recovery Unit overlaps the northeast corner of the RCIS area. It extends from Red Bluff south to the Sutter Buttes. The recovery unit encompasses the entire 193,892 acres of the Butte Basin. Three management units have been defined for this unit: Llano Seco, Upper Butte Basin, and Gray Lodge/Butte Sink. State and federal conservation areas within this recovery unit include the Upper Butte Basin Wildlife Area, Butte Sink Wildlife Management Area, and several units of the Sacramento River NWR.

The Colusa Basin Recovery Unit overlaps with the RCIS area and extends from Red Bluff in the north to Cache Creek in the south. Its watershed is dominated by the Sacramento River. The Colusa Basin consists of 686,096 acres, including portions of Tehama, Glenn, Colusa, and Yolo Counties. Three management units have been defined for the Colusa Basin Recovery Unit: Willows, Delevan, and Colusa. Within the Colusa Basin, federal conservation areas include the Sacramento, Delevan, and Colusa NWRs. In addition, about 5,500 acres of private lands are enrolled in the wetland easement program in the area north and south of Delevan NWR. The Colusa Basin includes Dolan Ranch Conservation Bank (252 acres) and the Ridge Cut Conservation Bank (186 acres).

The Sutter Basin Recovery Unit extends south from the Sutter Buttes to the confluence of the Feather and Sacramento Rivers. The Sutter Basin consists of 239,810 acres, including portions of Butte and Sutter Counties. Three management units have been defined for the Sutter Basin Recovery Unit: Sutter, Gilsizer Slough, and Robbins. Within the Sutter Basin, federal and state conservation

[7] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=C057

areas include the Sutter NWR and the Sutter Bypass Wildlife Area (east and west borrow channels of the Sutter Bypass, Tisdale Bypass, and Wadsworth Canal), and Feather River Wildlife Area. Also included are the Sutter Basin Conservation Bank (429 acres), Gilsizer Slough South Conservation Bank (379 acres), and Tule Basin Giant Garter Snake Preserve (150 acres).

According to the recovery plan, habitat must be preserved in multiples of two block pairings of habitat. Each block pair should consist of one, at least 539-acre block of contiguous buffered perennial wetland habitat (existing, restored or enhanced) and one at least 1,578-acre block of contiguous active ricelands separated by no more than 5 miles. Alternatively, a pair of blocks may consist of two 539-acre blocks of buffered perennial wetlands. All pairs of habitat blocks must be connected with the other pairs of habitat blocks within and between the management units by corridors of suitable habitat, and recovery units should be connected to one another by similar corridors. The recovery plan selected paired habitat blocks because perennial wetlands are known to support core populations of giant garter snake throughout a wide range of hydrologic conditions, and rice fields and the associated water conveyance infrastructure provide habitat for the species when the fields are in active production. The size requirement of the perennial wetland habitat block is derived from Wylie et al. (2010), which reported a self-sustaining population of giant garter snake is supported by 539-acres of perennial wetlands; additionally, this amount of perennial wetland is similar to amounts preserved in several giant garter snake conservation banks. The size requirement of the rice lands also originates from Wylie et al. (2010). These values represent the target sizes for perennial wetlands and rice lands, not the minimum or maximum acreage.

The recovery plan identifies habitat protection goals for each recovery unit, including the three units in the RCIS area (Figure 2-3).

- **Butte Basin Recovery Unit.** Minimum of six habitat block pairs with no less than two block pairs per management unit in the Butte Basin Recovery Unit. Additional protection along the following watercourses in the Butte Basin will provide for connectivity between existing populations of giant garter snakes and will protect habitat immediately on either side of the main watercourse at a minimum of 0.25 mile from each bank.
- **Colusa Basin Recovery Unit**. Minimum of six habitat block pairs with no less than two block pairs per management unit in the Colusa Basin Recovery Unit. Additional protection along the following watercourses in the Colusa Basin will provide for connectivity between existing populations of giant garter snakes and will protect habitat immediately on either side of the main watercourse at a minimum of 0.25 mile from each bank (20,800 acres). Final protected canal length should extend at a minimum from the Glenn Colusa Canal in the north to the proximity of Ridge Cut Slough in the south.
- **Sutter Basin Recovery Unit**. Minimum of four habitat block pairs with no less than one block pair per management unit in the Sutter Basin Recovery Unit (areas with high flooding flows within the Sutter Bypass should be considered as unsuitable habitat). To provide connectivity between northern and southern populations, additional protection should focus on the Sutter Bypass: 9,600 acres comprising a continuous corridor along and outside of the western bank (levee) of the Sutter Bypass out to a width of 0.5 mile from the bank, and including the Tisdale Bypass 960 acres.

2.2.5.6 Bank Swallow

In 1992, CDFW (then named California Department of Fish and Game) published a recovery plan for the bank swallow (California Department of Fish and Game 1992). The goal of the recovery plan is the maintenance of a self-sustaining, wild population. The primary objectives necessary to achieve this goal include 1) ensuring that the remaining population does not suffer further declines in either range or abundance, and 2) preservation of sufficient natural habitat to maintain a viable wild population. The plan did not specify a specific population target for recovery or recovery units.

The recovery plan identifies numerous actions needed to protect the banks swallow, including the following.

- Preserving major portions of the remaining bank swallow habitat in California.
- Avoiding impacts on natural bank habitats through use of alternatives to bank stabilization.
- Mitigating impacts from bank stabilization projects.
- Using set-back levees to reestablish river meander-belts.
- Modifications of current preserve plans to include habitat requirements of bank swallow.
- Evaluating the use of artificial bank nesting habitat.

In reviewing existing bank swallow management activities, the Bank Swallow Technical Advisory Committee[8] found that "few of the recommendations included in the recovery plan were implemented to a significant degree" (Bank Swallow Technical Advisory Committee 2013). In response to the continued decline of bank swallow populations, the Bank Swallow Technical Advisory Committee published a conservation strategy in 2013 to guide the preservation, protection, and restoration of natural river processes along the Sacramento River to support the conservation and recovery of bank swallow, as well as benefit other natural river system-dependent species. The conservation strategy emphasizes that natural river processes need to be restored on a significant portion of the Sacramento River and its tributaries to recovery the bank swallow population in California.

The Banks Swallow Conservation Strategy makes the following recommendations.

- Avoid new impacts on river processes, as well as to existing nesting habitat and colonies.
- Use alternatives to bank stabilization.
- Maintain non-impacting flow regimes during the nesting season.
- Maintain appropriate buffers between construction activities and nest colonies.
- Protect suitable habitat and reestablish and connect river floodplains.
- Restore nesting habitat and river processes on the Sacramento and Feather Rivers by removing revetment, restoring floodplains, and managing flow regimes to improve floodplain connectivity and reduce inundation of active bank swallow nest colonies.

[8] The Bank Swallow Technical Advisory Committee is a coalition of State and Federal agency and non-governmental organization staff, created in response to the continued decline of bank swallow populations on the Sacramento River.

- Mitigate unavoidable impacts on bank swallow habitat and river processes by removing revetment and conserving nesting habitat.

2.2.6 Critical Habitat Designations

Critical habitat is a term defined by and used in the ESA as specific geographic areas that contain features essential to the conservation of an endangered or threatened species and that may require special management and protection. Critical habitat may also include areas that are not currently occupied by the species but will be needed for its recovery.

To be included in a critical habitat designation, the habitat within the area occupied by the species must first have features that are ''essential to the conservation of the species.'' Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas on which are found those physical and biological features essential to the conservation of the species (primary constituent elements), as defined at 50 Code of Federal Regulations 424.12(b). Four focal species in this RCIS—Sacramento winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and green sturgeon—and vernal pool tadpole shrimp (not a focal species) have designated critical habitat that occurs in the RCIS area, as described below.

2.2.6.1 Salmonids

In 2005, NMFS designated critical habitat for two ESUs of Chinook salmon and five DPSs of steelhead (*O. mykiss*) (National Marine Fisheries Service 2005a). An ESU is defined as a sub-population of a species that is substantially reproductively isolated from other sub-populations of the species. A DPS is defined as "a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species" (National Marine Fisheries Service 2014). Of the seven salmonids identified in the critical habitat designation, Central Valley spring-run Chinook salmon and Central Valley steelhead are the only two species whose migratory range occurs in the RCIS area. Sacramento River winter-run Chinook salmon had critical habitat designated in June 1993 (National Marine Fisheries Service 1993) and it also has migratory habitat within the RCIS area. Of the 2,308 miles of riverine habitat designated as critical habitat for Central Valley steelhead, approximately 189 miles of riverine habitat are located within or along the edge of the RCIS area (Figure 2-4). Of the 1,158 miles of riverine habitat designated as critical habitat for Central Valley spring-run Chinook salmon, approximately 189 miles (Figure 2-5) of riverine habitat are located within or along the edge of the RCIS area. Of the 302 miles of riverine habitat designated as critical habitat for Sacramento winter-run Chinook salmon, approximately 71 miles of riverine habitat are located within the Sacramento River (Figure 2-6).

2.2.6.2 Green Sturgeon

In 2009, NMFS designated critical habitat for green sturgeon (National Marine Fisheries Service 2009). The area of critical habitat includes approximately 320 miles of freshwater river habitat, 897 square miles of estuarine habitat, 11,421 square miles of coastal marine habitat, 487 miles of habitat in the Sacramento-San Joaquin Delta, and 135 square miles of habitat within the Yolo and Sutter Bypasses, part of the Sacramento River Flood Control Project. There are approximately 101 miles of riverine habitat located along the Sacramento and Feather Rivers within the RCIS area (Figure 2-7).

2.2.6.3 Vernal Pool Tadpole Shrimp

In 2005, USFWS updated the critical habitat designation for four vernal pool crustaceans and 11 vernal pool plants for a total of 858,846 acres designated for critical habitat for vernal pool species (U.S. Fish and Wildlife Service 2005b). In 2006, USFWS subsequently published species-specific critical habitat designations for each of these individual species (U.S. Fish and Wildlife Service 2006b).

Critical habitat (Critical Habitat Unit 6) for vernal pool tadpole shrimp, which is not a focal species in this RCIS, is found in the RCIS area. Approximately 980 acres of the 228,785 acres designated as critical habitat for vernal pool tadpole shrimp are in the RCIS area (Figure 2-2). Found within vernal pools throughout the RCIS area, the primary constituent elements of critical habitat for vernal pool tadpole shrimp are the habitat components that provide topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in swales which connect pools that provide for dispersal and hydroperiods of adequate length for species survival.

2.2.6.4 Western Yellow-Billed Cuckoo

In 2014, USFWS proposed designating habitat for the Western DPS of the yellow-billed cuckoo (U.S. Fish and Wildlife Service 2014b). In total, approximately 546,335 acres of critical habitat was proposed for designation in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming. Found within the RCIS area, the primary constituent elements of critical habitat for western yellow-billed cuckoo include habitat components that contain riparian habitat for nesting and foraging in contiguous or nearly contiguous patches, an adequate prey base consisting of large insect fauna and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas, and river systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g., lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers).

Within the RCIS area, approximately 5,244 acres have been proposed for designation as critical habitat along the Sacramento River north of Colusa (Unit 2, CA-2), and parts of the Sutter Bypass (Unit 3, CA-3) (Figure 2-8). The proposed unit within the RCIS contains all necessary constituent elements required for western yellow-billed cuckoo survival.

2.3 Development and Major Infrastructure

This section describes the local government jurisdictions and plans, as well as the infrastructure in the RCIS area.

2.3.1 Local Government Planning Boundaries and General Plans

FGC 1852(c)(6) requires "consideration of . . . city and county general plan designations that accounts for reasonably foreseeable development of . . . housing in the RCIS area." The RCIS area overlaps with portions of Colusa and Sutter Counties and includes the incorporated cities of Williams and Colusa in Colusa County, and Yuba City and Live Oak in Sutter County. In addition, the

RCIS area includes the unincorporated communities of Arbuckle, College City, Grimes, Maxwell, and Princeton in Colusa County and the communities of Robbins, Meridian, and Sutter in Sutter County. Yuba City is the largest city in the RCIS area with a population of approximately 69,000. The City of Live Oak has approximately 16,000, Williams has approximately 5,000, and Colusa has approximately 6,000.

The RCIS area has a rural character, consisting primarily of lands under agricultural uses, with existing and planned development generally clustered in the incorporated cities. This section includes information from the general plans for each city and Colusa and Sutter Counties. Population, housing, and employment conditions and projections summaries provide an overview of existing and planned development for each city and unincorporated community in Colusa and Sutter Counties.

2.3.1.1 Colusa County

Colusa County is located approximately 70 miles northwest of the city of Sacramento, in north central California. The county encompasses approximately 1,156 square miles. The eastern part of the county is located in the Sacramento Valley; the western portion is in the Klamath/North Coast Range. Existing land uses in Colusa County are primarily agricultural. The land use pattern is typical of rural counties of the Sacramento Valley: a checkerboard of large acreage farms dominates the eastern half of the County, with land ownership and road alignments mostly following square mile section lines. The land is generally flat and covered by fields of rice, orchards, and row crops. Views are expansive, framed only by the rolling foothills of the Coast Range on the west and jagged peaks of the Sutter Buttes on the east. Moving west through the county, large farms give way to larger cattle and sheep ranches, cultivated fields give way to arid rangeland, and the flat terrain transitions into rolling hills and upland valleys. Further west, the land becomes yet more rugged and wild, until finally reaching the summit of Snow Mountain in the Snow Mountain Wilderness, 7,000 feet above the Valley floor (Colusa County 2012).

The total population of unincorporated areas in Colusa County was 22,098[9] at the beginning of 2018 (California Department of Finance 2018), and is projected to reach approximately 26,000 in 2030, an increase of 21% (Colusa County 2012). Assuming a consistent growth rate beyond 2030 (the last year from which Colusa County projections are available), the population of Colusa County will reach 31,450 in 2060, an increase of 46.8% compared with 2010 levels.

The number of housing units in unincorporated Colusa County totaled 4,114 in 2010. The number of housing units is projected to reach 5,400 in 2030, an increase of 31% (Colusa County 2012). Assuming a consistent growth rate beyond 2030 (the last year from which Colusa County projections are available), the number of housing units in Colusa County will reach 17,236 between 2080 and 2110, an increase of over 200% (Colusa County 2012).

General Plan

The Colusa County 2030 General Plan, adopted in 2012 (Colusa County 2012), is the overarching policy document that “identifies the County’s vision for the future and provides a framework that will guide decisions on growth, development, and conservation of open space and resources in a manner consistent with the quality of life desired by the County’s residents and businesses”

[9] http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/

throughout the unincorporated areas of Colusa County. The general plan includes the seven elements mandated by state law: circulation, conservation, housing, land use, noise, open space, and safety elements. The County's general plan also includes optional elements to address other topics of interest: agriculture, community character, economic development, and public services and facilities.

Colusa County has a rich agricultural heritage, and farming and related agricultural industries play a central role in the way of life of Colusa County residents (Colusa County 2012). As such, an important goal of the general plan is to take "appropriate measures to restrict the conversion of agricultural lands to non-agricultural uses" (Agriculture Element, Goal AG 1A). Many ongoing agricultural land uses in Colusa County provide ecosystem system services and important habitat for native fish and wildlife (Section 2.11, *Working Landscapes*). The general plan encourages the continued stewardship of agricultural lands to support fish and wildlife. For example (from the Agriculture Element):

Policy AG 2-16 Promote wildlife-friendly farm practices, such as tailwater ponds, native species/grasslands restoration in field margins, hedgerows, ditch management for riparian habitat, and restoration of riparian areas in a manner consistent with ongoing agricultural activities water delivery systems, reduction of pesticides, and other appropriate measures.

Policy AG 1-9 Encourage the conservation of agricultural lands using available programs that provide benefit to the County and/or farmers.

Policy AG 2-26 Promote wildlife-friendly farm practices, such as tailwater ponds, native species/grasslands restoration in field margins, hedgerows, ditch management for riparian habitat, and restoration of riparian areas in a manner consistent with ongoing agricultural activities, water delivery systems, reduction of pesticides, and other appropriate measures.

It is also Colusa County's vision to conserve and protect its ecosystems (Goal CON-1). The numerous objectives and policies of the Conservation Element guide this vision. For example,

Policy CON 1-1 Maintain areas of land designated Resource Conservation (RC).

Policy CON 1-2 Use conservation and open space easements, tax incentives, and other tools to:

a. Protect, restore, and enhance the County's significant natural resources.

b. Maintain established resource conservation lands around community areas.

c. Provide linkages between natural resource areas.

Policy CON 1-4 Encourage conservation, rather than preservation, through the active management of natural resources, including wildlife, water, air, minerals, forests, and land. Conservation and management techniques include replacing trees, crops, and other renewable resources at a pace that ensures they are not consumed more quickly than they can be replaced; use of non-renewable resources in a manner that ensures the resources are not depleted but available to future generations for use; strategic forest thinning and fuels management to prevent wildfires; making resources areas accessible to the public while protecting resources from being diminished to non-recoverable levels; reducing incompatible wildlife /agriculture interface; and increasing public understanding and responsible use of resource conservation areas.

Colusa County seeks to balance agricultural uses with the protection of its rich natural resources. Specifically, Goal CON-2 in the general plan's Conservation Element is to "[p]protect, restore, and enhance the County's significant natural resources." The general plan requires that lands actively managed or placed under a conservation easement for habitat, wetlands, species, or other natural resource or open space preservation or conservation be limited to lands with the General Plan designation of Resource Conservation (RC), unless specific conditions identified in Policy AG 1-14 are met. (Policy CON 1-3) (Figure 2-9). The general plan authorizes conservation easements on agricultural lands where agricultural activities occur on the majority of the site, the resource conservation activities are compatible with the agricultural activities on the site and in the vicinity, and that there would not be a concentration of resource conservation lands in the immediate area (Policy AG 1-14). Conservation easements and mitigation banks established primarily for habitat purposes (i.e., not typical working lands) in areas zoned for agriculture that do not meet these specific requirements may only be developed with a general plan amendment and rezoning application approval (Policy AG 1-14) (Colusa County 2012).

Because the RCIS area is dominated by farmland and grazing land (Table 2-2), and mostly zoned for agriculture (Figure 2-9 for Colusa County), the Mid-Sacramento Valley RCIS conservation strategy is primarily intended to be compatible with existing land uses on working lands (for example, see Chapter 3, Section 3.4, *Multi-Benefit Approach*, and Section 3.7.1, *Working Landscapes*). In certain cases, MCA sponsors or other entities implementing the Mid-Sacramento Valley RCIS conservation strategy will need to apply for and receive approval of a general plan and zoning amendment (see Chapter 4, Section 4.5.1.2, *Mitigation Credit Agreements in Colusa County*) for conservation actions such as habitat protection or restoration on a majority portion of a parcel zoned for agriculture. This RCIS's conservation actions and habitat enhancement actions, described in Chapter 3, *Conservation Strategy*, are mostly intended to be implemented in Colusa County within areas designated for resource conservation and agriculture, where the conservation actions and habitat enhancement actions would not preclude agricultural practices (though riverine actions to benefit fish can be implemented where feasible, anywhere suitable habitat occurs) (Figure 2-9), consistent with the general plan.

2.3.1.2 Sutter County

Sutter County is located in the central portion of the Sacramento Valley, with its southern boundary approximately 10 miles north of the city of Sacramento. Sutter County's jurisdictional boundaries are generally defined by Yolo and Colusa Counties to the west, with the Sacramento River and Butte Sink forming the western boundary; Butte County to the north; Yuba and Placer Counties to the east with the Feather and Bear Rivers forming a portion of the eastern boundary; and Sacramento County to the south, with the southern boundary south of Riego Road. The county comprises 607 square miles (378,875 acres).

The total population of Sutter County was 97,238 in 2018[10] (California Department of Finance 2018), of which approximately 22% (21,170, people) live in the unincorporated portion of the county.

The number of housing units in unincorporated Sutter County totaled 9,768 in 2010. According to the general plan, the number of housing units is projected to reach 16,000 in 2030, an increase of 63% (Sutter County 2011). However, the County no longer anticipates significant growth because

[10] http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/

subsequent to the 2011 general plan, most of Sutter County has been designated as either a Federal Emergency Management Agency or local floodplain. Areas were limited growth may occur include the Sutter Pointe Specific Plan area in the Natomas Basin, certain areas in and around the Rural Planned Community of Sutter, and south of Yuba City. The Sutter County General Plan (Sutter County 2011) generally guides development to occur within Yuba City's sphere of influence, or rural communities where compliance with floodplain requirements are feasible (D. Libby, pers. comm. 2018).

General Plan

The Sutter County General Plan, adopted in 2011 (Sutter County 2011), focuses on how the anticipated population and employment growth projected for the county can be accommodated to support a broad continuation of the current land use pattern, while affording new opportunities for growth and change in unincorporated Sutter County. The general plan balances the county's vision to maintain and enhance its high quality rural lifestyle, agricultural heritage, and natural resources, with a commitment to promoting a vibrant and sustainable economy that attracts diverse jobs and services. The general plan includes the seven elements mandated by state law, to the extent that they are relevant locally: circulation, conservation, housing, land use, noise, open space, and safety. Sutter County consolidated information required in some of the mandatory elements and included optional elements that address agricultural resources, economic development, infrastructure, and public services.

Agriculture is a defining feature of Sutter County's character, and the general plan reflects the County's resident's and business' vision for maintaining a thriving agricultural industry. It is a goal of the County (Goal AG-1, in Chapter 4: Agricultural Resources) to "[p]reserve and protect high-quality agricultural lands for long-term agricultural production." The general plan includes other goals and policies to sustain agricultural industries in the County. For example (from Chapter 4: Agricultural Resources):

Policy AG 1-1 **Agriculture Land Preservation.** Preserve and maintain agriculturally designated lands for agricultural use and direct urban/suburban and other nonagricultural related development to the cities, unincorporated rural communities, and other clearly defined and comprehensively planned development areas.

Sutter County General Plan policies also encourage the use of various tools to protect agricultural land, which could be used to implement this RCIS's conservation strategy. For example:

Policy AG 1.9 **Williamson Act**. Promote the use of the California Land Conservation Act (Williamson Act) on agricultural lands throughout the County provided the State continues to fund the subvention program to offset the loss of property taxes.

Policy AG 1.10 **Transfer of Development Rights.** Explore, and if determined feasible, implement programs to permanently preserve agricultural lands through the use of voluntary transfer of development rights to guide development to more suitable areas. (AG 1-B)

Policy AG 1.11 **Conservation Easements.** Explore, and if determined feasible, identify agricultural mitigation bank areas in which the County will encourage private landowners to voluntarily participate in agricultural conservation easements. (AG 1-B)

Policy AG 1.12 **Land Mitigation Program.** Explore, and if determined feasible, create an Agricultural Land Mitigation Program. (AG 1-B)

It is also Sutter County's vision to preserve its natural resources. The goals, policies, and implementation programs of the Environmental Resources Element guide this vision. For example:

Policy LU 2.1 **Long-term Conservation.** Promote the long-term conservation of agricultural and open space lands in accordance with the goals and policies of the Agricultural Resources and Environmental Resources elements.

And (from Chapter 9: Environmental Resources):

Goal ER-1 Support a comprehensive approach for the conservation, enhancement, and regulation of Sutter County's significant habitat and natural open space resources.

Policy ER 1.3 **Conservation Efforts.** Focus conservation efforts on areas identified as having very high and high habitat value as well as Sutter County's unique natural open space resources, including the Sutter Buttes, Sutter Bypass, Butte Sink, and the Sacramento, Feather, and Bear River corridors.

Policy ER 1.4 **Interconnected Habitat.** Emphasize the preservation, enhancement, and creation of sustainable, interconnected habitat and open space areas that highlight unique resources and integrate educational and recreational opportunities as appropriate.

The conservation goals and objectives of this Mid-Sacramento Valley RCIS (Chapter 3, *Conservation Strategy*) are generally consistent with, and will complement, the Sutter County General Plan's vision for maintaining and enhancing its agricultural heritage and natural resources. Lands in the unincorporated county fall within the following three broadly designated categories, each distinguished by the differing levels of conservation and growth: agriculture and open space, rural communities, and growth areas. The general plan (Sutter County 2011) defines agriculture and open space areas as those "to be set aside for the long-term conservation of agriculture, natural resources, and related uses." Policy AG 1-6, *Interrelationship with Habitat Conservation*, permits "agriculturally designated lands to be used for habitat conservation and/or mitigation with approval of a development agreement, provided such use does not interfere or adversely affect existing or planned agricultural uses or impact County flood control operations." As with Colusa County, working lands are a vital component of the RCIS area in Sutter County. Policy AG 3-8, *Habitat Protection*, emphasizes the role agricultural lands play in protecting habitat values in Sutter County by promoting "wildlife friendly agricultural practices." Policy AG 3-8 also encourages "habitat protection that is compatible with and does not preclude or restrict on-site agricultural production."

Because the RCIS area is dominated by farmland and grazing land (Table 2-2), and zoned mostly for agricultural uses (Figure 2-10), the Mid-Sacramento Valley RCIS conservation strategy is primarily intended to be compatible with existing land uses on working lands (for example, see Chapter 3, Section 3.4, *Multi-Benefit Approach*, and Section 3.7.1, *Working Landscapes*). This RCIS's conservation actions and habitat enhancement actions described in Chapter 3, *Conservation Strategy*, are intended to be implemented in Sutter County within areas designated agriculture and open space (though riverine actions to benefit fish can be implemented where feasible, anywhere suitable habitat occurs) (Figure 2-10), consistent with the general plan.

2.3.1.3 City of Colusa

The city of Colusa is a largely agricultural community located in the Colusa County portion of the Sacramento Valley, approximately 75 miles north of Sacramento. Located along the Sacramento River, Colusa is approximately 24 miles west of Yuba City and 10 miles east of Williams. Major roadways in Colusa include State Route (SR) 20 and SR 45. The city is approximately 5.95 square miles (3,805 acres). Most of the land surrounding the city is agricultural, but some riparian vegetation is located along the Sacramento River. The Colusa NWR is located southwest of the General Plan Area.

The population in Colusa was 5,971 in 2010. The city anticipates the population to increase to 26,750 at full buildout of its general plan, or by 2025, a yearly increase of 6.45%, and an overall increase of 348% (City of Colusa 2007). This increase in population would also increase the number of housing units from 3,486 in 2010 to 9,386 in 2025, an increase of 169%.

General Plan

The City of Colusa General Plan serves as a policy guide for the physical and economic growth and environmental sustainability of the city through 2025 (City of Colusa 2007). It is used to inform citizens, developers, agencies, interest groups and others of the ground rules that will guide development-related decisions in the community. The general plan provides the long-term vision for the community and indicates how that vision would be achieved over time through its goals, policies, and implementing actions.

2.3.1.4 City of Williams

The city of Williams is located along Interstate 5 (I-5) within the Colusa County portion of the Sacramento Valley region of California. It is a 1-hour drive from downtown Sacramento. The community is surrounded by open, agricultural lands. The incorporated area of Williams is a generally compact urban form.

An influx of new residents has led the city of Williams to represent an increasing population percentage of Colusa County. Williams is expected to grow from a population of 5,132 in 2010, to a population of around 9,822 by the Year 2030, an increase of 91% (City of Williams 2011). By 2030, the housing stock will nearly double to accommodate approximately 6,150 new residents (City of Williams 2011).

General Plan

The City of Williams General Plan, adopted in 2011, provides a strategic policy framework for both the incorporated city limits, as well as the surrounding area (City of Williams 2011). The objective of the plan is to provide guidance for decisions regarding the future use of land, community character and design, housing and neighborhoods, economic development, circulation and mobility, open space and recreation, resource conservation and management, and public facilities and services. The horizon year of the plan is 2030. It is the intent of the general plan that policies and associated goals and recommended implementation strategies serve as a framework for community decision-making. To ensure growth that is both wise and sustainable, decisions would be based on a formulation of sound policy and founded by a comprehensive and integrated approach to analyzing community issues and identifying realistic solutions, as set forth in the general plan.

2.3.1.5 Yuba City

Yuba City is situated in eastern Sutter County on the western bank of the Feather River. Marysville, Yuba City's sister city, is located opposite Yuba City on the eastern bank of the Feather River, and is in Yuba County. Primarily undeveloped agricultural land exists to the north, west, and south of Yuba City. The Sutter Buttes are located to the northwest of Yuba City and frame views in that direction.

The primary transportation corridors are SRs 99 and 20. SR 99 leads due south to Sacramento and north to Oroville and Chico beyond; SR 20 links Yuba City to Colusa and I-5 to the west and Grass Valley and the Sierra Nevada range to the east. SRs 70 and 65 lead south from Marysville, connecting the region to Sacramento and to Sacramento's northern suburbs, Roseville and Rockland.

General Plan

The Yuba City General Plan (Yuba City 2004), adopted in 2004, describes the vision for the future of Yuba City. At the time of preparation of the plan, regional projections estimated that the population will increase by upwards of 50,000 persons over the next 20 years—effectively doubling the 2002 population. The plan, based on input from Yuba City citizens, business owners, elected officials, and City staff, strives to maintain what is good and desirable about Yuba City as it grows into the future. The General Plan outlines a vision of long-range physical planning and land uses to address the economic development and resource conservation aspirations of the community and provides strategies and specific implementing actions that will allow this vision to be accomplished. It is also coordinated with and supports ideas in the Sutter County General Plan.

2.3.1.6 City of Live Oak

The city is situated between the Sutter Buttes to the west, the Feather River to the east, the Butte-Sutter County boundary to the north, and unincorporated areas of Sutter County to the south. SR 99 bisects the city into western and eastern portions. In addition to SR 99, Live Oak is also bisected by the Union Pacific railroad line, which is located just west of the highway. Agriculture is the predominant land use in Sutter County and near Live Oak. Agricultural lands in Live Oak can be divided into four categories: orchard, cropland, pasture, and irrigation channels. Orchards are the most prevalent agricultural lands and are planted with walnuts, peaches, and prunes. Croplands are found primarily in the western section of Live Oak and are dominated by rice fields, with some alfalfa being grown as well. Pastures account for the smallest portion of agricultural lands and are primarily located in the southernmost portion of the Live Oak. Irrigation channels are located throughout the agricultural lands.

General Plan

The 2030 General Plan addresses development and conservation within the new "growth" areas, as well as land use change and reinvestment into the existing area of development. Area of new growth are adjacent to the city limits and entirely within the City of Live Oak's sphere of influence. The 2030 General Plan provides decision makers, City staff, property owners, property developers, and the public with the City's policy direction for managing land use change (City of Live Oak 2009).

2.3.2 Land Use

Land use information was obtained from the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP) Land Use Data (Farmland Mapping and Monitoring Program 2014) to characterize the land use in the Mid-Sacramento Valley RCIS area. The data are based upon countywide land use surveys published in 2014. Land use categories are characterized by the following, as characterized in the Mid-Upper Sacramento River RFMP (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

- Urban and Built-Up Land

- Urban and built-up land is occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately six structures to a 10-acre parcel. Common examples include residential, industrial, commercial, institutional facilities, cemeteries, airports, golf courses, sanitary landfills, sewage treatment facilities, and water control structures.

- Grazing Land
  - Land on which the existing vegetation is suited to the grazing of livestock. Typical uses of grazing land can also include compatible low density rural development, or government land with restrictions on use but that allow grazing.
- Prime and Statewide Importance Farmland
  - Prime Farmland is irrigated land with the best combination of physical and chemical features able to sustain long term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the 4 years prior to the mapping date.
  - Farmland of Statewide Importance is irrigated land similar to Prime Farmland that has a good combination of physical and chemical characteristics for the production of agricultural crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops at some time during the 4 years prior to the mapping date.
- Local and Unique Farmland
  - Farmland of Local Importance includes all farmable lands that do not meet the definitions of Prime, Statewide, or Unique. This includes land that is or has been used for irrigated pasture, dry land farming, confined livestock, and dairy, poultry facilities, aquaculture and grazing land.
  - Unique Farmland consists of lesser-quality soils used for the production of the state's leading agricultural crops. Land must have been cropped at some time during the 4 years prior to the mapping date.
- Wetland and Other Land
  - FMMP mapped and categorized a large amount of freshwater emergent wetlands in the RCIS area as "other lands." For the purposes of the RCIS, the FMMP "other lands" category is identified here as wetland and other land. Other lands not classified as wetlands may include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and waterbodies smaller than 40 acres. Vacant and non-agricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

Land use in the RCIS area is primarily Prime and Statewide Importance Farmland with some large areas of Local and Unique Farmland and Native Vegetation and Grazing Land (Figure 2-11 and Table 2-2).

Table 2-2. Land Use in the RCIS Area

Land Use Category	Amount in RCIS Area (acres)	Percent of RCIS Area
Urban and Build-Up Land	17,840	2.8
Grazing Land	17,375	2.7
Prime and Statewide Importance Farmland	379,679	59.7
Local and Unique Farmland	140,325	22.1
Wetland and Other Land	80,407	12.7
Total	**635,626**	**100**

Source: California Department of Conservation Farmland Mapping and Monitoring Program Land Use Data (Farmland Mapping and Monitoring Program 2014)

2.3.3 Major Infrastructure

FGC 1852(c)(6) requires that an RCIS includes "consideration of major water, transportation and transmission infrastructure facilities . . . that accounts for reasonably foreseeable development of major infrastructure facilities, including, but not limited to, renewable energy . . . in the RCIS area." This section describes existing and reasonably foreseeable development of major infrastructure facilities in the RCIS area, including major water, transportation, transmission facilities, and renewable energy projects.

2.3.3.1 Flood Protection

The Mid- and Upper Sacramento and Feather River Regions lie within the Sacramento River Watershed, the state's largest watershed. At the core of this watershed is the Sacramento River, which collects water from over 27,000 square miles and discharges through the Sacramento-San Joaquin Delta into the San Francisco Bay. The state and federal governments, along with local stakeholders, have constructed and implemented a vast and complex system to manage and provide flood control for both urban and non-urban areas in the Mid- and Upper Sacramento and Feather River Regions. Within the Mid- and Upper Sacramento and Feather River Regions, the integrated structural system of flood protection includes reservoirs with active flood control space, hundreds of miles of levees, multiple weirs, an outfall structure, diversion channels, massive bypasses, and drainage facilities, which pump interior runoff and seepage from levee protected areas back into the flood control channels (Figure 2-12). DWR prepared the State Plan of Flood Control Descriptive Document Update, August 2017, which maps major flood protection infrastructure in the RCIS area.[11] These structural elements work together to contain high flows within the main river channel, and when necessary, divert water out of the main river channel into the bypass system.

The three main flood control protection plans for addressing major flood infrastructure in the RCIS area are the CVFPP (Section 2.2.4.1, *Central Valley Flood Protection Plan and Conservation Strategy*), the Mid-Upper Sacramento River RFMP (Section 2.2.4.2, *Mid- and Upper Sacramento River Regional Flood Management Plan*), and the Feather River RFMP (Section 2.2.4.3, *Feather River Regional Flood Management Plan*). These plans describe the process for identifying current flood protection infrastructure, as well as identifying the main flood control issues and the process of addressing

[11] For maps and descriptions of flood protection infrastructure in the RCIS area, the document can be located at, http://www.water.ca.gov/cvfmp/docs/2017/CVFPP-SPFC-DescriptiveDoc-Aug2017-compiled.pdf.

those needs. Summaries from the CVFPP, Mid- and Upper Sacramento River RFMP, and Feather River RFMP about infrastructure, projects, and operations and maintenance are provided below.

Central Valley Flood Protection Plan

The primary goals of the CVFPP are to improve flood risk management, reduce the chance of flooding and damages once flooding occurs, and improve public safety, preparedness, and emergency response. This is done through the following.

- Identifying, recommending, and implementing structural and non-structural projects and actions that benefit lands currently receiving protection from facilities of the State Plan of Flood Control.
- Formulating standards, criteria, and guidelines to facilitate implementation of structural and non-structural actions for protecting urban areas and other lands of the Sacramento and San Joaquin River basins and the Delta.

Implementation of recent flood improvements began in 2007, when bond funding provided a down payment toward State Plan of Flood Control improvements and extensive evaluations of State Plan of Flood Control facilities that were later included in the CVFPP. Since 2007, approximately 220 miles of urban and 100 miles of non-urban State Plan of Flood Control levees have been repaired, rehabilitated, or improved. From 2007 through 2012, on-the-ground construction began solving some critical levee problems, and management of the flood system began to improve. Since adoption of the CVFPP in June 2012, flood management planning has progressed at the federal, state, and regional/local levels, and the pace of implementation has been steady, enabled primarily by bond funding for capital projects and recent general fund allocations targeted at addressing deferred maintenance. The state has continued investing in projects that are consistent with the State Systemwide Investment Approach. This investment includes funding from Propositions 1E and 84 and from the general fund. Since passage of Propositions 1E and 84, significant progress has been made in implementing levee improvements and reducing flood risk, especially in urban areas, but much work remains to be done

The CVFPP plans for an integrated approach to flood protection that includes the following.

- Systemwide actions, including improved operations and maintenance, elimination of deferred maintenance backlogs, implementing larger-scale multi-benefit actions consistent with CVFPP plan goals of increased flood risk reduction and the CVFPP Conservation Strategy.
- Levee and other infrastructure improvements to provide 200-year level of protection for urban areas to preserve urban development opportunities within specific boundaries without inducing broader urban development in State Plan of Flood Control floodplains that increases aggregate economic and life safety risk.
- Levee and other infrastructure improvements to provide 100-year level of protection for small communities within specific boundaries to preserve small community development opportunities within specific boundaries without providing urban level of protection and encouraging broader urban development in State Plan of Flood Control floodplains.
- Other capital investment actions identified by the six RFMPs and DWR.
- Habitat restoration, habitat reconnection, and multi-benefit improvement actions (that include proposed systemwide improvements to the Yolo Bypass and Paradise Cut), groundwater recharge actions, and additional actions that may be included in the development of projects in

urban, rural, and small community areas of interest. The habitat restoration, habitat reconnection, and multi-benefit improvement actions were guided by the CVFPP Conservation Strategy.

Mid and Upper Sacramento River and Feather River Regional Flood Management Plans

As described in Sections 2.2.4.2, *Mid and Upper Sacramento River Regional Flood Management Plan* and Section 2.2.4.3, *Feather River Regional Flood Management Plan*, the Mid-Upper Sacramento River RFMP and the Feather River RFMP are locally driven assessments of regional flood management issues within their respective regions. These documents are a follow up to the 2012 CVFPP and has been used by DWR to inform the 2017 update to the CVFPP. Both RFMPs describe a number of projects and actions which are recommended to occur with the RCIS area.

Lower Feather River Corridor Management Plan

The DWR Division of Flood Management is preparing the Lower Feather River Corridor Management Plan to establish a long-term vision and strategy for managing the 20-mile-long, 12,000-acre river corridor between Yuba City and the city of Marysville at the north end, and the Sutter Bypass at the south end. The Lower Feather River Corridor Management Plan proposes implementing management actions to facilitate floodway management and maintenance of flood control facilities, enhance habitat and ecosystem functions, and support agricultural and recreational activities. The Lower Feather River Corridor Management Plan will describe a programmatic permitting approach that would efficiently link regulatory permitting and habitat restoration actions to more than offset habitat impacts in advance and thereby simplify obtaining permits for maintaining flood management facilities.

The purpose of the Lower Feather River Corridor Management Plan is to offer an approach and recommendations for management of the Lower Feather River corridor that would accomplish the following.

- Protect public safety by facilitating management of the flood protection system and maintenance of flood control facilities.
- Conserve, enhance, and restore habitat and ecosystem functions.
- Support agricultural productivity.
- Promote economic sustainability and land use compatibility.
- Improve compatible recreational opportunities.

DWR's Division of Flood Management is developing the Lower Feather River Corridor Management Plan in the context of the CVFPP (AECOM 2014). The Feather River Regional Permitting Program (which includes the Feather River HCP) is currently in development and is expanding the programmatic permitting approach described in the Lower Feather River Corridor Management Plan and the habitat restoration actions. Both of these components (the Lower Feather River Corridor Management Plan and the Feather River Regional Permitting Program) align with the Lower Feather River Corridor Management Plan.

Flood Control Projects and Operations and Maintenance

Detention Basins

The California State Legislature formed the Colusa Basin Drainage District (CBDD) in 1987 to address flooding and winter drainage, irrigation drainage and subsidence problems in the Colusa Basin Watershed. In September 2000, the U.S. Congress enacted the Colusa Basin Watershed Integrated Resources Management Act (PL 106-566, Title VI) authorizing federal participation in development of a flood control and environmental restoration program for the watershed.

CBDD was created to deal with flooding that occurs in the Colusa Basin watershed through ongoing and planned flood control and groundwater replenishment projects. It does not manage the Colusa Basin Drain, and the boundaries do not include foothill lands. The legislation that created the CBDD, by request and design, purposefully left the foothills within the Colusa Basin Watershed out of the district boundaries of the CBDD. The district encompasses an area from south of Orland (Glenn County) to Knights Landing (Yolo County) and from the west bank of the Sacramento River to the western boundary of the Tehama-Colusa Canal service area.

CBDD encompasses approximately 650,000 acres in Glenn, Colusa, and Yolo Counties, with the Colusa Basin Watershed being nearly 1,036,000 acres. CBDD works to reduce potential flood damages and improve the environment in the Colusa Basin. It has commissioned several site- and project-specific studies, in various phases of completion, to further address flooding and environmental issues. CBDD efforts to restore the environment primarily relate to soil erosion, sedimentation, habitat, and water supply.

Beginning in 1991, CBDD commissioned a series of studies and investigations culminating in reports that assessed methods to reduce the potential for flood damage while improving overall watershed health. CBDD has identified measures to accomplish these goals, including increasing populations of perennial vegetation in the foothills to create a “sponge effect,” allowing streams to reconnect to floodplains, and creating detention basins in or adjacent to streams. CBDD’s studies have determined that detention basins can be used to control the magnitude and timing of the peak runoff from the watershed to reduce flooding. Potential detention basin locations in the Upper Watershed (Wilson Creek and South Fork Willow Creek) were identified based on favorable topography, land use, and soils (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

Embankments would be constructed at locations along the creeks where topographic conditions allow for a maximum height and resulting storage. During storm events, water exceeding a threshold flow would be held back by the embankments, resulting in decreased downstream flooding. The water that is temporarily stored in the detention basins would then be released slowly after the flood event has subsided. Therefore, the lands in the detention basins would only be inundated for relatively short periods (up to several days) after major storm events. The design of the detention basins could include habitat creation. These practices would also afford multiple natural resource benefits such as groundwater recharge, enhanced habitat, reduced erosion and sedimentation and a reduction of residual chemicals coming out of the foothills during heavy rain events (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

Colusa Basin Drain

The Colusa Basin Drain extends from its junction with Willow Creek south to the vicinity of Colusa and then follows the alignment of the Colusa Basin Drain east levee, terminating at the Knights Landing Outfall Gates in Yolo County.

When water levels rise in the Yolo Bypass, the resulting hydraulic barrier prevents the Knights Landing Ridge Cut and other areas upstream from effectively draining. The water that runs off of the western foothills thus runs up against the Colusa Basin Drain levees and forms an unintentional lake, which threatens the City of Colusa, major commerce/evacuation routes (such as I-5 and SR 20), along with homes and agricultural infrastructure up and down the basin. Also, the Colusa Basin Drain can be a source of attracting and entraining salmonids from the Sacramento River (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

To reduce the flood risks within the Colusa Basin, construction of flood control reservoirs in the western foothills, in combination with other watershed management practices, such as the potential establishment of transitory storage agreements with existing stakeholders has been proposed (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

Flood Control Operations and Maintenance

In California, major flood management initiatives are generally undertaken by local, state, and federal agencies through cooperative relationships. Local levee districts, reclamation districts, and state maintenance areas, collectively known as Levee Maintenance Agencies, regularly patrol, maintain, and repair the levees within their jurisdictions, and fight floods when they occur. The Levee Maintenance Agencies in the RCIS area operate and maintain the levees that are part of the State Plan of Flood Control in perpetuity, in accordance with criteria established by U.S. Army Corps of Engineers (Corps) (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

DWR is responsible for state-level flood management in the RFMP planning areas (Figure 1-1), including cooperating with the Corps in project planning, design, and funding; cooperating with the and Atmospheric Administration in flood and water supply forecasting; operating the Flood Operations Center; providing flood fight assistance for local agencies; and maintaining portions of the flood management system.

DWR's levee maintenance responsibilities include portions of the system designated for state maintenance in the California Water Code (California Water Code §8361) and maintenance areas that may be formed (California Water Code §12878), including channel maintenance, weirs, and other flood control structures.

The CVFPB monitors levee maintenance agencies to ensure they are properly maintaining their facilities. If CVFPB determines that a local agency is not adequately maintaining its levee system, CVFPB has the power to establish a state maintenance area, to be operated by DWR, which will maintain the levee. Once the state invokes this power, it assumes the responsibility of the levee (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

The Corps is primarily responsible for planning, designing, and constructing federally authorized flood management facilities, including dams, levees, and other structures. The Corps regulates modifications to existing federal levees through Section 408 (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

There are several levee maintaining agencies that overlap with the RCIS area.

- Reclamation District 108.
- Reclamation District 0070.
- Reclamation District 1660.
- Reclamation District 1500.
- Sacramento River West Side Levee District.
- DWR Sutter Yard Maintenance Area 1.
- DWR Sutter Yard Statutory Area 3.
- DWR Sutter Yard Statutory Area 9.
- DWR Sutter Yard Maintenance Area 12.
- DWR Sutter Yard Maintenance Area 16.
- Levee District No. 1.
- Levee District No. 9.

See Appendix E of the Mid-Upper Sacramento RFMP for a summary of flood control improvement projects for the Mid- and Upper Sacramento River Regions, with identified Levee Maintaining Agencies as lead agencies (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014). See http://frrfmp.com/region-projects/ for Feather River Region Projects.

2.3.3.2 Water

Colusa County Water Resources Division

The Colusa County Water Resources Division is responsible for managing the county's water resources. The water resources division is involved in numerous water-related management activities, including the following.

- Planning and implementation of the Sustainable Groundwater Management Act.
- Northern Sacramento Valley-Integrated Regional Water Management Planning.
- California Statewide Groundwater Elevation Monitoring.
- Irrigated Lands Regulatory Program.
- Sites Reservoir Outreach.
- Other water-related activities.

The Colusa County Water Resources Division currently has no planned major infrastructure development projects in the RCIS area[12].

[12] https://www.countyofcolusa.org/index.aspx?nid=656

Sutter County Water Resources Division

The Sutter County Water Resources Division manages, protects, stores, and conserves water resources in Sutter County for beneficial and environmental use, while minimizing damage from flooding to create a safe and sustainable water supply for present and future generations. The Water Resources Division is responsible for the following programs.

- Floodplain management (e.g., supporting the Sutter-Butte Flood Control Agency, plan review for construction compliance).
- The Sutter County Water Agency (Master Drainage Plan, Drainage Zones of Benefit, Live Oak Canal repair/upgrades, plan review for drainage components).
- Water quality (National Pollutant Discharge Elimination System compliance).
- Sustainable Groundwater Management Act Compliance.
- Technical support for Northern Sacramento Valley-Integrated Regional Water Management Planning.
- Liaison for water-related permits (DWR, the Corps, Regional Water Quality Control Board, CDFW, CVFPB).
- Utility services for:
  - Rio Ramaza Community Services District (wastewater collection, treatment and disposal).
  - Sutter County Waterworks District No. 1 (water treatment and distribution, wastewater collection, treatment and disposal).

The Sutter County Water Resources Division currently has no planned major infrastructure development projects in the RCIS area.

Sites Reservoir Project

The Sites Project Authority was formed on August 26, 2010 to pursue the development and construction of the Sites Reservoir Project to provide additional off-stream water storage to benefit in-stream flows, the Delta ecosystem, and the state's water supply.

As described in the Mid-Upper Sacramento RFMP (2014), the site of the proposed Sites Reservoir is located in north-central Colusa County and south-central Glenn County, approximately 10 miles west of the community of Maxwell. The proposed Sites Reservoir would have a permanent facility footprint of approximately 15,300 acres, mostly in Colusa County. Water would be diverted from the Sacramento River to fill the reservoir from a new intake structure and pipeline. The proposed reservoir is in the Funks Creek and Stone Corral Creek watersheds, approximately 3 miles west of the RCIS area. The proposed reservoir would primarily inundate grassland and oak woodland currently used for cattle grazing.

The project contains substantial fisheries enhancements, such as increasing the Shasta Lake cold-water pool. The project also includes modifications to the Glenn-Colusa Irrigation District intake and a potential new diversion opposite Moulton Weir (which would require a fish screen). Although the proposed reservoir is outside of the RCIS area (Figure 2-13), some proposed facilities would occur within the northwestern portion of the RCIS area, including the following.

- New Terminal Regulating Reservoir along the Glenn-Colusa Irrigation District Canal.

- Expanded Holthouse Reservoir (renamed Funks Reservoir).
- New Delevan pipeline from the Sacramento River to the expanded Holthouse Reservoir.
- New pipeline connecting the Glenn-Colusa Irrigation District Canal and Tehama-Colusa Canal parallel to Funks Creek.
- New powerline between SR 45 and Sites Reservoir and parallel to SR 45.
- New access roads west of the Tehama-Colusa Canal.

Sites Reservoir is proposed in order to add flexibility to the state's water management system. This flexibility is intended to provide benefits including, but not limited to, the following.

- Enhanced water supply reliability for urban, agricultural, and environmental uses.
- Improved Delta water quality.
- Mitigation of snowpack storage losses due to climate change.
- Contribute to flood damage reduction in the Central Valley.
- Ecosystem restoration actions in the Sacramento River.
- Dedicated storage that can be adaptively managed to respond to Delta emergencies and help with restoration actions.

The Sites Project Authority released a Draft EIR/EIS in August 2017 (Sites Project Authority and Bureau of Reclamation 2017). The Final EIR/EIS is expected to be published in late 2019. Construction is planned to begin in 2022 and be completed in 2029.

2.3.3.3 Transportation

Figure 2-14 shows major transportation infrastructure in the RCIS area, including airports, state highways, county roads, and railways. Roads in the RCIS area are owned and maintained by Caltrans[13], Colusa County[14], Sutter County[15], and the cities within them (Loy, C. pers, comm.). State highways and Interstates operated and maintained by Caltrans consist of portions of:

- Interstate 5 (I-5).
- State Route 16 (SR 16).
- State Route 20 (SR 20).
- State Route 45 (SR 45).
- State Route 99 (SR 99).

[13] Caltrans District 3 completely encompasses the RCIS area. Caltrans District 3 is responsible for maintaining and operating 1,491 center-line miles and 4,385 lane miles in 11 Sacramento Valley and Northern Sierra counties. http://www.dot.ca.gov/d3/

[14] There are approximately 716 miles of maintained roads in Colusa County, 27 miles in the City of Colusa, 26 miles in the City of Williams, and 160 miles of Forest Service roads. A portion of these fall into the RCIS area. See page 1-5 and Figure 2-1 of http://countyofcolusa.org/DocumentCenter/View/4620.

[15] Sutter County is considered part of the Sacramento Metropolitan planning area. Sutter County's Road Maintenance Division is responsible for the inspection and maintenance of approximately 790 miles of roads and 98 bridges in the unincorporated area of the County. A portion of these fall into the RCIS area. https://www.suttercounty.org/doc/government/depts/ds/pw/roadmaintenance

- State Route 113 (SR 113).

County and city roads are too numerous to list.

In the RCIS area, transportation planning is coordinated via metropolitan planning organizations and regional transportation planning agencies, who also finance local transportation projects. Plans applicable to the RCIS area consist of the Colusa County Regional Transportation Plan (RTP) (Fehr & Peers 2014) and the Sacramento Region Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) (Sacramento Area Council of Governments 2016). These planning documents anticipate both primarily maintenance projects and one capacity increasing transportation project in the RCIS area.

Colusa County Regional Transportation Plan

The 2013 RTP (Fehr & Peers 2014) serves as the planning blueprint for transportation investments in Colusa County involving local, state, and federal funding over the next 26 years. In Colusa County, the state highway network services primarily intercity and intercounty regional travel, while the county's roadways serve local trips. Road projects include small roads in the area, bridge projects crossing waterways, and work on Highways 5, 99 and 20.

Sacramento Region Metropolitan Transportation Plan/Sustainable Communities Strategy

Sacramento Area Council of Governments (SACOG) is designated by the state and federal governments as the Metropolitan Planning Organization (MPO) and is responsible for developing a regional transportation plan every four years in coordination with El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba counties and the 22 cities within those counties (excluding the Tahoe Basin). The 2016 MTP/SCS (Sacramento Area Council of Governments 2016) covers the period from 2012 to 2036. The SACOG Board of Directors, in its policy role overseeing long-range transportation planning in the region, is ultimately responsible for this plan. Primary components of the Plan are to expand local roads to accommodate projected growth. More than 90 percent of new lane miles in this Plan will be on surface streets, not freeways. The state highway improvements will be implemented by Caltrans to add new carpool lanes, auxiliary lanes, and interchanges along the freeway system.

2.3.3.4 Transmission

Transmission facilities lines in the RCIS area include those supporting distribution of natural gas and electricity. Figure 2-15 shows transmission facilities in the RCIS area including transmission lines and natural gas pipelines.

Pacific Gas and Electric Company

Pacific Gas and Electric Company (PG&E) owns and operates all of the gas and electric transmission lines in the RCIS area. The company provides natural gas and electric service to approximately 16 million people throughout a 70,000-square-mile service area in northern and central California. Currently, PG&E has no major infrastructure development projects planned for the RCIS area[16].

[16] https://www.pge.com/en_US/safety/electrical-safety/safety-initiatives/transmission-project-overview.page

Western Area Power Administration

The Western Area Power Administration (WAPA) is one of four power marketing administrations within the U.S. Department of Energy whose role is to market and transmit wholesale electricity from multi-use water projects. WAPA's service area encompasses a 15-state region of the central and western United States where their transmission system carries electricity from 56 hydropower plants operated by Reclamation, the Corps, and the International Boundary and Water Commission. WAPA sells power to federal and state agencies, cities and towns, rural electric cooperatives, public utility districts, irrigation districts and Native American tribes. They, in turn, provide retail electric service to consumers.

The Colusa-Sutter Transmission Line, or CoSu Line Project,[17] is a proposed 500-kilovolt transmission line project currently being studied by WAPA and Sacramento Municipal Utility District. The CoSu Line Project would provide a new link between the California-Oregon Transmission Project and Sacramento Municipal Utility District and WAPA's facilities on the east side of the Sacramento Valley. The proposed project would enhance the reliability of the electrical grid in Northern California and increase Sacramento Municipal Utility District's ability to import power from the Pacific Northwest and export power from the Sacramento area. The project proponents are studying several corridors through the RCIS area (Figure 2-15). WAPA and Sacramento Municipal Utility District are preparing an EIR/EIS for the project.

2.3.3.5 Renewable Energy

Renewable energy projects are currently limited in the RCIS area. There are no large-scale (i.e., commercial scale) renewable energy projects planned in the RCIS area, though a mid-sized project is planned in Sutter County. Instead, renewable energy projects tend to be at the scale of individual residences (e.g., residential solar) or on properties of approximately 10 acres or less.

City of Live Oak Wastewater Treatment Plant Solar Project

The project proponent/sponsor, the City of Live Oak, proposes the development of a photovoltaic solar system and related infrastructure to be connected to the City's existing Wastewater Treatment Plant electrical distribution system[18]. The photovoltaic solar system will be used to provide supplemental electric power to the Wastewater Treatment Plant. The project site is in the southwestern portion of Live Oak on Treatment Plant Access Road on a City-owned 39-acre site (Figure 2-15).

The proposed project includes the installation of a photovoltaic solar system to serve the City of Live Oak's Wastewater Treatment Plant. The photovoltaic solar system will be in two areas within the 39-acre Wastewater Treatment Plant facility site: over the existing administration building and adjacent parking area and in an approximately 5-acre vacant field at the northeast corner of the site.

[17] https://www.cosuline.com/

[18] http://www.liveoakcity.org/~liveoak/images/Departments/City_Manager/Signed_NOI.pdf

2.4 Physical Environment

Climate, topography, hydrology, geology, and soils determine the conditions that support plant and wildlife species and the potential for protection, restoration, and enhancement of habitat for focal species.

2.4.1 Climate

The region is characterized by a Mediterranean climate with dry summers and rain during the winter months. Historically, the region has experienced extreme runoff that inundated large areas of the Central Valley floor, resulting in standing water and sediment deposition on the floodplain. This has produced a unique and productive agricultural landscape. The Central Valley floor has mild winters with less precipitation than the surrounding mountain ranges, and hot, dry summers. Overall, annual precipitation amounts generally increase from south to north and west to east across the Central Valley floor.

2.4.2 Geology and Topography

The majority of the RCIS area is located in the Great Valley geomorphic province (California Department of Conservation, California Geological Survey 2002). The Great Valley is a relatively flat alluvial plain, with thick sequences of sedimentary deposits of Jurassic through Holocene age. The elevation of the RCIS area ranges from approximately 850 feet above sea level in the southwest edge to approximately 15 feet above sea level along the Sacramento River in the southern portion of the RCIS area. The alluvial valley is about 430 miles long and about 75 miles wide, stretching from Redding to Bakersfield; the northern portion of the valley is known as the Sacramento Valley, where the RCIS area is located (Mid- and Upper Sacramento River Regional Flood Management Plan Partners 2014).

The valley originated as a deep structural trough created by the subduction of the ancient Farallon oceanic plate starting in the Mesozoic Era, about 200 million years ago, and ending in the Cenozoic Era, approximately 25 million years ago. Surrounding the Valley are the Klamath and Cascade mountain ranges on the north, the Sierra Nevada mountain range on the east, and the Coast Ranges on the west. The geologic history of the RCIS area includes a mixture of ancient marine and alluvial deposits. Up to 155 million years ago, periods of volcanic activity and uplifting were followed by periods of uplifting and folding, which formed the Coast Ranges. The Sacramento Valley floor, is a structural trough formed by the uplift of the mountains surrounding it. This trough has been filled in by sequences of marine and alluvial sediments ranging in age from 135 million years ago to the present.

2.4.3 Watersheds

Eighteen major watersheds[19] overlap with or occur completely within the RCIS area: Angel Slough, Lower Butte Creek, Middle Butte Creek, Gilsizer Slough-Snake River, Lower Feather River, Upper Feather River, Knights Landing Ridge Cut-Tule Canal, Colusa Basin Drainage Canal, Colusa Drain, Colusa Trough, Freshwater Creek, Logan Creek, Sacramento River, Stone Corral Creek, Sutter Basin,

[19] For the purpose of this Mid-Sacramento Valley RCIS, major watersheds are identified at the level of the U.S. Geological Survey's 10-digit HUC.

Sycamore Slough, Willow Creek, and Curry Creek-Sacramento River (Figure 2-16). These watersheds catch precipitation and runoff from storm drains and carry the water south to San Francisco Bay. Table 2-3 summarizes the amount of and major streams in each Hydrologic Unit Code (HUC)-10 watershed that overlaps with the RCIS area.

Table 2-3. HUC-10 Watersheds in RCIS Area

Watershed Name	Area of Entire Watershed (acres)	Area (acres) and Percent of Watershed in RCIS Area	Major Creeks in Watershed[a] (length in miles)
Angel Slough	58,968	663 (1.1%)	Little Chico Creek (33) Angel Slough (24) Comanche Creek (10) Dead Horse Slough (5)
Lower Butte Creek	259,834	56,668 (21.8%)	Dry Creek (14) Clear Creek (13) Cottonwood Creek (9) Drumheller Slough (6)
Middle Butte Creek	144,969	39 (0.2%)	Little Butte Creek (19) Butte Creek (17) Middle Butte Creek (4) Honey Run (3)
Gilsizer Slough-Snake River	173,051	128,331 (74.2%)	Snake River (26) Butte Slough (9) Live Oak Canal (9) Wadsworth Canal (5)
Lower Feather River	90,661	8,203 (9.0%)	Jack Slough (6) Simmerly Slough (5) Cordua Canal (5) Clark Slough (2)
Upper Feather River	47,259	44 (1.0%)	Feather River (1)
Knights Landing Ridge Cut-Tule Canal[b]	106,927	1 (<0.01%)	N/A
Colusa Basin Drainage Canal	155,099	29,081 (18.7%)	Colusa Basin Drainage Canal (24) Little Buckeye Creek (14) Tehama Colusa Canal (12) Mushoak Creek (11)
Colusa Drain	79,239	8,129 (10.3%)	River Branch Canal (8) Glen-Colusa Canal (8) Bounde Creek (7) Provident Main Canal (5)
Colusa Trough	254,163	167,532 (65.9%)	Cortina Creek (14) South Branch Sand Creek (11) Salt Creek (10) Glenn Valley Slough (9)

Watershed Name	Area of Entire Watershed (acres)	Area (acres) and Percent of Watershed in RCIS Area	Major Creeks in Watershed[a] (length in miles)
Freshwater Creek	72,564	22,402 (30.9%)	Freshwater Creek (33) Salt Creek (20) Spring Creek (12) Walters Creek (10)
Logan Creek	111,401	16,923 (15.2%)	North Fork Logan Creek (9) Hunters Creek (8) Minton Creek (7) Central Drain (6)
Sacramento River	61,446	10,488 (17.1%)	Sacramento River (106) Glenn-Colusa Canal (6) Stony Creek Irrigation Canal (5) Tehama Colusa Canal (3)
Stone Corral Creek	79,790	13,830 (17.3%)	Funks Creek (19) Stone Coral Creek (16) Grapevine Creek (15) Antelope Creek (9)
Sutter Basin	113,920	113,920 (100%)	Tisdale Bypass (4) Sacramento Slough (2) Purdue Lake (1) N/A
Sycamore Slough	86,332	56,210 (65.1%)	Main Drain (5) Wilkins Slough Main Irrigation Canal (4) N/A N/A
Willow Creek	54,192	3,165 (5.8%)	Wilson Creek (21) Willow Creek (19) Sheep Corral Creek (14) White Cabin Creek (12)
Curry Creek-Sacramento River[b]	66,395	3 (<0.01%)	Sacramento River (19) Curry Creek (15) East Drainage Canal (9) West Drainage Canal (7)

[a] Includes up to four of the longest creeks and canals, and other drainage systems in each watershed; this is not a comprehensive list of all creeks and drainage systems in each watershed.
[b] Because so little of the watershed appears within the RCIS area, the watershed is not represented on Figure 2-16.
RCIS = regional conservation investment strategy; N/A = not applicable

2.4.4 Hydrology

The Mid-Sacramento Valley region lies within the Sacramento River Watershed, California's largest watershed. At the core of this watershed is the Sacramento River, which collects water from over 27,000 square miles and discharges through the Sacramento-San Joaquin Delta into the San Francisco Bay. The RCIS area is dominated by the Sacramento River and its numerous tributaries, which originate from the foothills of the Coastal Range west of the RCIS area and the Sierra Nevada to the north and east. Some of the primary tributaries of the Sacramento River include Cottonwood Creek, Elder Creek, Deer Creek, Stony Creek, Mud Creek, Butte Creek, and the Feather River (Figure 2-16), with only Butte Creek running through the RCIS area, and the Feather River along the eastern edge of RCIS area. Nearly all of these tributaries have at least one State Plan of Flood Control levee system protecting existing development.

The Feather River, which is found in Sutter County along the eastern boundary of RCIS area, flows from the northern end of Sierra Valley in southeastern Plumas County, and consists of three branches. As the Sierra Nevada's largest and northernmost river, it flows 185 miles from its headwaters to the Sacramento River. The Lower Feather River extends from Oroville Dam south to the Sacramento River near Verona. The watershed drains approximately 803 square miles along the western slope of the Sierra Nevada and the eastern slope of the Sutter Buttes in Butte, Sutter, and Yuba Counties (AECOM 2014).

2.4.5 Soils

The Natural Resources Conservation Service, a division of the U.S. Department of Agriculture and formerly the Soil Conservation Service, completed a soil survey of Colusa County in 2006 (U. S. Department of Agriculture, Natural Resources Conservation Service 2006). Similarly, a soil survey of Sutter County was completed in 1998 (U. S. Department of Agriculture 1998, Soil Conservation Service). The soil surveys identified 16 soil types, with many subtypes, that comprise the primary soils found in the RCIS area (Figure 2-17).

- ***Cibo-Ayar-Altamont***: This soil type consists of moderately deep, well-drained soils that formed in material weathered from basic igneous rocks. These soils are on foothills and mountainous uplands and have slopes of 2 to 75%.
- ***Hillgate-Corning***: This soil type consists of very deep, well to moderately well-drained soils that formed in alluvium from mixed sources. They are on low terraces with slopes of 0 to 50%.
- ***Olashes***: The Olashes series consists of very deep well-drained soils that formed in alluvium weathered from mixed sources. Olashes soils are on alluvial fans and fan terraces and have slopes of 0 to 5%.
- ***Positas-Balcom***: This series consists of deep and very deep, moderately well-drained soils that formed in alluvial material from mixed rock sources. This soil type is found on stream terraces and have slopes of 2 to 75%.
- ***San Joaquin***: The San Joaquin series consists of moderately deep to a duripan, well- and moderately well-drained soils that formed in alluvium derived from mixed but dominantly granitic rock sources. They are on undulating low terraces with slopes of 0 to 9%.
- ***Sehorn-Rock Outcrop-Lodo***: This soil series consists of moderately deep, well-drained soil on foothills. These soils formed in residuum weathered from calcareous sandstone and shale. Slope ranges from 2 to 75%.
- ***Stockton-Clear Lake-Capay***: This soil series consists of deep to duripan, somewhat poorly drained soils that formed in alluvium from mixed rock sources. These soils are in basins and in swales of drainageways. Slope is 0 to 2%.

- ***Stohlman-Palls***: The Stohlman series consists of shallow, well-drained soils that formed in residuum from extrusive igneous rock. Stohlman soils are on hills and have slopes of 9 to 50%.
- ***Subaco-Oswald-Gridley***: The soil series consists of moderately deep, somewhat poorly drained soils that formed in alluvium from mixed sources. These soils are on basin rims and in basins and have slopes of 0 to 2%.
- ***Sycamore-Shanghai-Nueva-Columbia***: This soil series was a member of the fine-silty, mixed, non-acid, thermic family of Aeric Haplaquepts. Typically, these soils have grayish brown, slightly acid, slightly clay loam A horizons; grayish brown and light brownish gray, distinctly mottled, mildly to moderately alkaline, silt loam B horizons; and stratified light brownish gray and pale brown mottled loam, fine sandy loam and loamy fine sand calcareous C horizons.
- ***Tehama-Hillgate-Arbuckle***: The Tehama series consists of deep, well-drained soils formed in mixed alluvium. Tehama soils are on fans and terraces and have slopes of 0 to 15%.
- ***Tisdale-Kilaga-Conejo***: This series consists of moderately deep to very deep, well-drained soils that formed in alluvium from basic igneous or sedimentary rocks and is found on alluvial fans and stream terraces. Slopes range from 0 to 9%.
- ***Vina-Riverwash-Reiff-Columbia***: This series consists of very deep, well-drained soils on alluvial fans and flood plains. Slopes are 0 to 9%.
- ***Yolo-Sycamore-Brentwood-Artois***: These soils are on nearly level to moderately sloping alluvial fans. The soils formed in fine-loamy alluvium derived from sedimentary formations. They are at elevations of near sea level to 2400 feet.
- ***Yolo-Tehama-Rincon-Marvin***: This soil series are on nearly level flood plains at elevations of 10 to 100 feet under annual grasses and forbs. They formed in fine textured alluvium from mixed sources.
- ***Zamora-Willows-Marvin-Capay***-This soil series is found on nearly level to strongly sloping fans and terraces usually 0 to 9% slopes at elevations of 30 to 1,300 feet. The soils formed in alluvium from material weathered from mixed sedimentary rocks.

The soils on the floodplains along the Sacramento River within the RCIS area are very fertile and are among the best soils in the two counties. Several sloughs originally spread from the Sacramento River into the Butte Sink and Colusa Basins. These sloughs, particularly the Sycamore Slough, carried river sediments several miles from the river, creating the very productive Vina soils (Natural Resources Conservation Service 2006). West from the floodplains along the Sacramento River, the Colusa Basin runs the length of the county north and south. Overflows containing clayey sediments from the Sacramento River and foothill streams regularly filled the Colusa Basin. Because of the construction of levees on the Sacramento River, only sediments from the foothill streams now reach the basin. The basin is mostly leveled for rice production and has little relief. Salts in the clayey sediments from the foothill streams were deposited in the basin soils, particularly Willows soils, and reclamation of the soils has been ongoing since early in the 20th century (Natural Resources Conservation Service 2006). Most basin soils have been reclaimed to several feet.

The very deep clay deposits that are characterized by extremely slow permeability and a water table hamper further reclamation. Alluvial fans are along the west side of the Sacramento Valley. They originate at the base of the foothills, at elevations of 200 to 400 feet, and gently descend to the east for several miles to the Colusa Basin. Under natural conditions, streams from the foothills flooded these alluvial fans, depositing loamy soils high in fertility. Many of the streams have been diverted from their natural channels, and levees have been constructed in some areas to control flooding.

2.5 Land Cover Mapping

All RCISs are required to identify "important resource conservation elements within the RCIS area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements" (FGC 1852 (c)(4)). This Mid-Sacramento Valley RCIS uses a detailed geographic information system-(GIS) based map of land cover types within the RCIS area to spatially characterize the distribution of natural communities and habitat.

A land cover type is defined as the dominant character of the land surface discernible from aerial photographs or other remotely sensed imagery, as determined by vegetation, water, or human uses. Land cover types are the most widely used units in conservation planning to analyze a variety of landscape characteristics, including natural communities, wetlands and streams, species' habitat, ecosystem function, and biological diversity. Land cover is often a function of a variety of physical and biological factors such as plant and animal associations, soil type, topography, climate, and land uses.

The land cover dataset is an important tool for developing this Mid-Sacramento Valley RCIS's conservation strategy (Chapter 3, *Conservation Strategy*). Among its many uses, the land cover data were used to model focal species' habitat, identify gaps in conservation of habitat and other natural resources, set measurable conservation goals and objectives, and identify conservation priorities to achieve the goals and objectives.

This section describes the land cover classification system and methods used to map these land cover types in the RCIS area. The land cover dataset was generated at a scale and level of resolution appropriate for regional resources planning; it was not developed for use in project-level planning.

Land cover mapping was developed using the following data sources.

- Great Valley Ecoregion (California Department of Fish and Wildlife 2016a).
- Existing Vegetation Central Valley (U.S. Department of Agriculture Forest Service 2014).
- 2016 California Cropland Data Layer (U.S. Department of Agriculture, National Agricultural Statistics Service Cropland Data Layer 2017).
- Vernal Pool Distribution, California's Great Central Valley (Witham et al. 2014).

2.5.1 Natural Communities

Natural communities are an assemblage of species that co-occur in the same habitat or area and interact through trophic and spatial relationships. Natural communities are typically characterized by reference to one or more dominant species (Lincoln et al. 1998). Natural communities are defined by the vegetative communities, as identified by land cover types, for this Mid-Sacramento Valley RCIS. The RCIS area includes five natural communities (Table 2-4).

In addition to the natural communities and respective land cover types, the RCIS area also includes the following groupings of land cover types.

- Cultivated agriculture (working lands).
- Other agriculture (orchard and vineyard).
- Urban/developed.

Table 2-4 presents the amounts of natural communities, cultivated agriculture, other agriculture, and urban/developed, and the land cover types in the RCIS area. Figure 2-18 depicts the communities in the RCIS area, and Figure 2-19 depicts the land cover types in the RCIS area. The natural communities and the land cover types associated with each community, as well as cultivated agriculture, other agriculture, and urban/developed land cover types, are described in Section 2.8, *Natural Communities, Agricultural Lands, and Urban/Developed Land, and Land Cover Types*. These descriptions are based on the descriptions of land cover from the Yolo HCP/NCCP (ICF 2018b), the Santa Clara County HCP/NCCP (ICF International 2012), California Wildlife Habitat Relationships (Mayer and Laudenslayer 1998) and Manual of California Vegetation, 2nd Edition (Sawyer et al. 2009).

Table 2-4. Extent of Natural Communities, Cultivated Agriculture, Other Agriculture, and Urban/Developed Land Cover Types in the RCIS Area

Land Cover Type	Amount in RCIS Area (acres)	Percent (%) of RCIS Area
Grassland	**28,216**	**4.4**
Annual grassland	26,463	4.2
Vernal pool complex (includes vernal pool wetlands)^	1,753	0.3
Chaparral and Scrub	**266**	< 0.1
Mixed chaparral	199	< 0.1
Coastal scrub	67	< 0.1
Woodland	**2,221**	0.3
Blue oak woodland *	2,116	0.3
Montane hardwood	105	< 0.1
Riverine and Riparian	**23,651**	**3.7**
Valley foothill riparian*	14,666	2.3
Lacustrine/riverine*	7,983	1.3
Barren	1,001	0.2
Wetland	**43,676**	**7.0**
Freshwater emergent wetland*	43,676	7.0
Cultivated Agriculture**	**370,043**	**58.2**
Alfalfa	12,510	2.0
Fallow	52,187	8.2
Field crop	35,274	5.5
Grain and hay crop	16,452	2.6
Irrigated row crop	36,153	5.7
Pasture	1,844	0.3
Rice	216,622	33.9

Land Cover Type	Amount in RCIS Area (acres)	Percent (%) of RCIS Area
Other Agriculture	**125,356**	**19.7**
Orchard and vineyard	125,356	19.7
Urban/Developed	**42,198**	**6.6**
Eucalyptus	91	< 0.1
Urban	42,107	6.6
Total	**635,626**	**100**

RCIS = regional conservation investment strategy

^ = Identified as a sensitive habitat type in the Manual of California Vegetation (Sawyer et al. 2009).

* = Identified as a rare or sensitive habitat type by the Area of Conservation Emphasis (ACE) (California Department of Fish and Wildlife 2018a).

** = The amounts of cultivated agriculture land cover types in the RCIS area are a snapshot of cropping patterns in 2016 (U.S. Department of Agriculture, National Agricultural Statistics Service Cropland Data Layer 2017). Amounts and distribution of cultivated agriculture land cover types are expected to change over time.

The natural communities and corresponding land cover designations from other classification systems, including the Yolo HCP/NCCP and the Yolo RCIS/LCP (ICF 2018a), are presented in Table 2-5. The land cover classification system used for this Mid-Sacramento Valley RCIS is similar to the land cover classification system developed for the Yolo HCP/NCCP, and modified slightly for the Yolo RCIS/LCP. The similar land cover classification systems between the Mid-Sacramento Valley RCIS and the Yolo RCIS/LCP will help to ensure consistent description of the conservation strategy between this Mid-Sacramento Valley RCIS and the adjacent Yolo RCIS/LCP, as conservation goals, objectives, and actions in both RCISs are applied to natural communities and focal species and focal species' modeled habitat, that latter of which is based upon the land cover mapping.

Table 2-5. Comparison of Mid-Sacramento Valley RCIS Land Cover Types to other State and Local Land Cover Classification Systems

Mid-Sacramento Valley RCIS Land Cover Type	Manual of California Vegetation, 2nd Edition	California Department of Fish and Wildlife Natural Communities List	California Wildlife Habitat Relationships Habitat Type	California Department of Fish and Wildlife Great Valley Ecoregion	U.S. Forest Service Calveg Central Valley	U.S. Department of Agriculture California Cropland Data Layer	Yolo County HCP/NCCP (2017 Public Draft) and Yolo RCIS/LCP[a]
Grassland							
Annual grassland	Wild oat grasslands	Wild oat grasslands	Annual grassland	Annual Grassland, Annual Grassland-Alkali Desert Scrub	Annual Grassland	N/A[b]	Grassland (California Prairie)[a]
Vernal Pool Complex[c]	Fremont's Goldfields-Saltgrass Alkaline Vernal Pools, Fremont's Goldfields-Downingia Vernal Pools, Smooth Goldfields Vernal Pool Bottoms, Fremont's tidy tips-Blow Wives Vernal Pools	Fremont's Goldfields-Saltgrass Alkaline Vernal Pools, Fremont's Goldfields-Downingia Vernal Pools, Smooth Goldfields Vernal Pool Bottoms, Fremont's tidy tips-Blow Wives Vernal Pools	N/A	N/A	N/A	N/A	Vernal Pool Complex
Chaparral and Scrub							
Mixed chaparral	Chamise chaparral	Chamise chaparral	Mixed chaparral	Mixed Chaparral, Chamise-Redshank-Chaparral	Mixed Chaparral, Chamise-Redshank-Chaparral	N/A	Mixed Chaparral

Mid-Sacramento Valley RCIS Land Cover Type	Manual of California Vegetation, 2nd Edition	California Department of Fish and Wildlife Natural Communities List	California Wildlife Habitat Relationships Habitat Type	California Department of Fish and Wildlife Great Valley Ecoregion	U.S. Forest Service Calveg Central Valley	U.S. Department of Agriculture California Cropland Data Layer	Yolo County HCP/ NCCP (2017 Public Draft) and Yolo RCIS/LCP[a]
Coastal scrub	Coyote brush scrub, California buckwheat scrub, California sagebrush scrub	Coyote brush scrub, California buckwheat scrub, California sagebrush scrub	Coastal scrub	Coastal Scrub	N/A	Shrublands	N/A
Woodland							
Blue oak woodland	Blue oak woodland	Blue oak woodland	Blue oak woodland	Blue Oak-Foothill Pine, Blue Oak Foothill Pine, Blue Oak Woodland	Blue Oak Woodland, Blue Oak Foothill Pine	Blue Oak Woodland	Blue Oak Woodland
Montane hardwood	Canyon live oak forest, California black oak	Canyon live oak forest, California black oak	Montane hardwood-conifer	Montane Hardwood	Montane Hardwood	N/A	Montane Hardwood
Riverine and Riparian							
Valley foothill riparian	Black Willow Thickets, Red Willow Thickets, Shining Willow Thickets, Fremont Cottonwood Forest Alliance	Black Willow Thickets, Red Willow Thickets, Shining Willow Groves, Fremont Cottonwood Forest Alliance	Valley-foothill riparian	Valley Foothill Riparian, Coastal Scrub (Valley and Foothill Riparian)	Valley Foothill Riparian	N/A	Valley Foothill Riparian

Mid-Sacramento Valley RCIS Land Cover Type	Manual of California Vegetation, 2nd Edition	California Department of Fish and Wildlife Natural Communities List	California Wildlife Habitat Relationships Habitat Type	California Department of Fish and Wildlife Great Valley Ecoregion	U.S. Forest Service Calveg Central Valley	U.S. Department of Agriculture California Cropland Data Layer	Yolo County HCP/ NCCP (2017 Public Draft) and Yolo RCIS/LCP[a]
Lacustrine/Riverine	N/A	N/A	Riverine, Lacustrine	Lacustrine, Riverine Riverine	Lacustrine	N/A	N/A
Barren	N/A	N/A	Barren	Barren	Barren	Barren	Barren
Wetland							
Freshwater emergent wetland	Hardstem Bulrush, American Bulrush, California Bulrush	Hardstem Bulrush Marsh, American Bulrush Marsh, California Bulrush Marsh	Fresh Emergent Wetland	Freshwater Emergent Wetland, Freshwater Emergent Wetland Urban	N.A	Herbaceous Wetland	Fresh Emergent Wetland
Cultivated Agriculture							
Alfalfa	N/A	N/A	Irrigated Hayfield	N/A	N/A	Alfalfa	Alfalfa
Fallow	N/A	N/A	N/A	N/A	N/A	Fallow/Idle Cropland	N/A
Field Crop	N/A	N/A	Irrigated Gain Crops	N/A	N/A	Safflower, Corn, Dry Beans, Sunflower, Sweet Corn, Pop or Orn Corn	Field Crops, Other Agriculture

Mid-Sacramento Valley RCIS Land Cover Type	Manual of California Vegetation, 2nd Edition	California Department of Fish and Wildlife Natural Communities List	California Wildlife Habitat Relationships Habitat Type	California Department of Fish and Wildlife Great Valley Ecoregion	U.S. Forest Service Calveg Central Valley	U.S. Department of Agriculture California Cropland Data Layer	Yolo County HCP/ NCCP (2017 Public Draft) and Yolo RCIS/LCP[a]
Grain and hay crops	N/A	N/A	Dryland Grain Crops, Irrigated Hayfield	N/A	N/A	Barley, Oats, Winter Wheat, Other Hay/Non-Alfalfa, Canola, Dbl Crop Oats/Corn, Dbl Crop Winter Wheat/Corn, Rye, Sorghum, Spring Wheat, Triticale	Grain/Hay Crops, Other Agriculture
Irrigated row crops	N/A	N/A	Irrigated Row and Field Crops	N/A	N/A	Greens, Asparagus, Cantaloupes, Carrots, Cotton, Cucumbers, Garlic, Herbs, Honeydew Melons, Lettuce, Misc Vegs & Fruits, Onions, Other Crops, Peas, Peppers, Pumpkins, Squash, Tomatoes, Watermelons	Truck/Berry Crops, Other Agriculture, Other Agriculture
Pasture	N/A	N/A	Pasture	N/A	Pasture	Grass/Pasture, Clover/Wildflowers, Vetch	Pasture, Other Agriculture
Rice	N/A	N/A	Rice	N/A	N/A	Rice	Rice

Mid-Sacramento Valley RCIS Land Cover Type	Manual of California Vegetation, 2nd Edition	California Department of Fish and Wildlife Natural Communities List	California Wildlife Habitat Relationships Habitat Type	California Department of Fish and Wildlife Great Valley Ecoregion	U.S. Forest Service Calveg Central Valley	U.S. Department of Agriculture California Cropland Data Layer	Yolo County HCP/ NCCP (2017 Public Draft) and Yolo RCIS/LCP[a]
Other Agriculture							
Orchard and vineyard	N/A	N/A	Deciduous Orchard, Evergreen Orchard, Vineyard, Orchard/Vineyard	N/A	N/A	Almonds, Cherries Pistachios, Olives, Plums, Walnuts, Cherries, Peaches, Pears, Pecans, Pomegranates, Mixed Forest, Deciduous Forest, Other Tree Crops, Woody Wetland, Grapes	Other Agriculture
Urban/Developed							
Urban	N/A	N/A	Urban	Urban	Urban	Developed/Low Intensity, Developed/Med Intensity, Developed/Open Space	Developed
Eucalyptus	N/A	N/A	N/A	Eucalyptus	N/A	N/A	Eucalyptus

[a] The Yolo Habitat Conservancy developed a land cover classification and mapping system for the HCP/NCCP planning process. The Yolo RCIS/LCP uses this system, although slightly modified. The Yolo RCIS/LCP land cover type in parentheses is where the Yolo RCIS/LCP land cover type differs from the Yolo HCP/NCCP land cover type.

[b] N/A = The classification system does not have a land cover type similar to the RCIS type.

[c] Vernal pool complexes were cross-walked to data from Carol W. Witham, Robert F. Holland, and John Vollmar. 2014. Changes in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012. Sacramento, CA. Report prepared for the U.S. Fish and Wildlife Service and Bureau of Reclamation CVPIA Habitat Restoration Program under Grant Agreement No. F11AP00169 with the U.S. Fish and Wildlife Service. This includes Low Density Vernal Pool Matrix and Med Density Vernal Pool Matrix.

RCIS = regional conservation investment strategy; HCP = habitat conservation plan; NCCP = natural community conservation plan; LCP = local conservation plan

2.5.2 Mapping Methods

This section describes the methods used to develop the land cover dataset from existing datasets. These varying datasets were combined to develop a seamless land cover GIS data layer.

2.5.2.1 Land Cover

The CDFW Great Valley Ecoregion Vegetation land cover data provided the foundation for the Mid-Sacramento Valley RCIS land cover dataset, as this dataset covered almost of the RCIS area. A very small portion of the western edge of the RCIS area is not covered by the Great Valley Ecoregion Vegetation land cover data. Those slivers were filled in with the Existing Vegetation Central Valley land cover data (U.S. Department of Agriculture Forest Service 2014) (Figure 2-20). See Table 2-5 for the relationship between the Existing Vegetation Central Valley land cover types (in the U.S. Forest Service Calveg Central Valley column) and the Mid-Sacramento Valley RCIS land cover types.

The Program Guidelines (California Department of Fish and Wildlife 2018b) require that any vegetation data incorporated into an RCIS must be mapped to the Survey of California Vegetation Classification and Mapping Standards (California Department of Fish and Wildlife 2018c). The Great Valley Ecoregion Vegetation land cover data (Buck-Diaz et al. 2012) was evaluated against the Survey of California Vegetation Classification and Mapping Standards and found to be in compliance with this requirement. For example, the Great Valley Ecoregion Vegetation land cover dataset was developed using the California Native Plant Society–CDFW Combined Vegetation Rapid Assessment and Releve Field Form (California Native Plant Society and California Department of Fish and Wildlife 2010) and 10 samples were collected for all new vegetation types, both of which are requirements of the Survey of California Vegetation Classification and Mapping Standards. Additionally, CDFW's Vegetation Classification and Mapping Program vegetation ecologists confirmed that the Great Valley Ecoregion Vegetation land cover data is the most up-to-date source for natural vegetation in Colusa and Sutter Counties (Keeler-Wolf, Todd, personal communication, February 20, 2018).

Vernal pool complexes (the matrix of vernal pools, seasonal wetlands, seasonal swales and associated grasslands; Section 2.8.1.2, *Vernal Pool Complex*) occur in the RCIS area. However, vernal pool complexes and associated wetlands are not mapped by the CDFW, Great Valley Ecoregion Vegetation. To map vernal pool complexes in the RCIS area, California's Great Central Valley, Vernal Pool Distribution (Witham et al. 2014) data were incorporated into this RCIS's land cover dataset. This dataset maps vernal pool complexes, but does not map the location of vernal pools and associated seasonal wetlands and swales in the complexes. The extant vernal pools were added to the land cover by overwriting the other land cover types in the same location, and classified as having a land cover type of "Vernal Pool Complex."

The CDFW, Great Valley Ecoregion Vegetation dataset identifies agricultural lands, but generally does not distinguish the types of crops planted. Because agriculture is the primary land use in the RCIS area (Section 2.3.2, *Land Use*), and some focal species are selective in their use of agricultural crops as habitat (Section 2.9.2, *Focal Species Profiles*), U.S. Department of Agriculture, California Cropland Data (U.S. Department of Agriculture, National Agricultural Statistics Service Cropland Data Layer 2016) were incorporated into this RCIS's land cover dataset to represent crop types planted in the RCIS area. This dataset was used to characterize agricultural land in the RCIS area because it is updated regularly to reflect changing crop patterns in the RCIS area. The agricultural land cover data are intended to provide a “snapshot” of the agricultural composition representative of the RCIS area at the time this RCIS was developed. Because cropping patterns and type change over time due to market demand, climatic variables, and other factors, the extent and spatial distribution of each agriculture type mapped in this RCIS are expected to change. These cropland data were added to the dataset where these CDFW, Great Valley Ecoregion Vegetation land cover types where found (Figure 2-20).

- Cropland.
- Deciduous Orchard.
- Deciduous Orchard, Evergreen Orchard, Vineyard, Irrigated Row and Field Crops.
- Irrigated Row and Field Crops.
- Rice.

Once the two datasets were combined, a crosswalk was performed to standardize and simplify the land cover types represented. For example, multiple crop types (e.g., canola, corn, dry beans, safflower) were crosswalked into a single type, field crop. Table 2-6 shows the input land cover types (i.e., U.S. Department of Agriculture, California Cropland Data crop type) and the resulting Mid-Sacramento Valley RCIS land cover type.

Table 2-6. Crosswalk of U.S. Department of Agriculture, California Cropland Data Crop Types (Input Type) to Mid-Sacramento Valley Land Cover Type (RCIS Type)

Input Type	RCIS Type
Alfalfa	Alfalfa
Almonds	Orchard
Annual Grassland	Annual Grassland
Annual Grassland, Alkali Desert Scrub	Annual Grassland
Asparagus	Irrigated Row Crop
Barley	Grain and Hay Crop
Barren	Barren
Blue Oak Woodland	Blue Oak Woodland
Blue Oak-Foothill Pine	Blue Oak Woodland
Blue Oak-Foothill Pine, Blue Oak Woodland	Blue Oak Woodland
Canola	Field Crop
Cantaloupes	Irrigated Row Crop
Carrots	Irrigated Row Crop
Chamise-Redshank Chaparral	Mixed Chaparral
Cherries	Orchard
Clover/Wildflowers	Pasture
Coastal Scrub	Coastal Scrub
Coastal Scrub	Coastal Scrub
Coastal Scrub, Valley Foothill Riparian	Valley Foothill Riparian
Corn	Field Crop
Cotton	Irrigated Row Crop
Cucumbers	Irrigated Row Crop

Input Type	RCIS Type
Dbl Crop Oats/Corn	Grain and Hay Crop
Dbl Crop WinWht/Corn	Grain and Hay Crop
Deciduous Forest	Orchard
Developed/High Intensity	Urban
Developed/Low Intensity	Urban
Developed/Med Intensity	Urban
Developed/Open Space	Urban
Dry Beans	Field Crop
Eucalyptus	Eucalyptus
Fallow/Idle Cropland	Fallow
Fresh Emergent Wetland	Freshwater Emergent Wetland
Fresh Emergent Wetland, Urban	Freshwater Emergent Wetland
Garlic	Irrigated Row Crop
Grapes	Vineyard
Grass/Pasture	Pasture
Greens	Irrigated Row Crop
Herbaceous Wetlands	Freshwater Emergent Wetland
Herbs	Irrigated Row Crop
Honeydew Melons	Irrigated Row Crop
Lacustrine	Lacustrine/Riverine
Lacustrine/Riverine	Lacustrine/Riverine
Lettuce	Irrigated Row Crop
Low Density Vernal Pool Matrix	Vernal Pool Complex
Med Density Vernal Pool Matrix	Vernal Pool Complex
Misc Vegetables and Fruits	Irrigated Row Crop
Mixed Chaparral	Mixed Chaparral
Mixed Forest	Orchard
Montane Hardwood	Montane Hardwood
Oats	Grain and Hay Crop
Olives	Orchard
Onions	Irrigated Row Crop
Open Water	Lacustrine/Riverine
Oranges	Orchard
Other Crops	Irrigated Row Crop
Other Hay/Non-Alfalfa	Grain and Hay Crop
Other Tree Crops	Orchard
Pasture	Pasture
Peaches	Orchard
Pears	Orchard
Peas	Irrigated Row Crop
Pecans	Orchard
Peppers	Irrigated Row Crop

Input Type	RCIS Type
Perennial Grassland	Perennial Grassland
Pistachios	Orchard
Plums	Orchard
Pomegranates	Orchard
Pop or Corn	Field Crop
Pumpkins	Irrigated Row Crop
Rice	Rice
Riverine	Lacustrine/Riverine
Rye	Grain and Hay Crop
Safflower	Field Crop
Shrubland	Coastal Scrub
Sod/Grass Seed	Field Crop
Sorghum	Grain and Hay Crop
Spring Wheat	Grain and Hay Crop
Squash	Irrigated Row Crop
Sunflower	Field Crop
Sweet Corn	Field Crop
Tomatoes	Irrigated Row Crop
Triticale	Grain and Hay Crop
Urban	Urban
Valley Foothill Riparian	Valley Foothill Riparian
Valley Foothill Riparian, Desert Riparian	Valley Foothill Riparian
Valley Foothill Riparian, Montane Riparian	Valley Foothill Riparian
Valley Oak Woodland	Blue Oak Woodland
Vetch	Pasture
Walnuts	Orchard
Watermelons	Irrigated Row Crop
Winter Wheat	Grain and Hay Crop
Woody Wetlands	Orchard

2.5.2.2 Stream Layer

Although rivers and creeks in the RCIS area are represented as lacustrine/riverine in the areal land cover dataset, this RCIS also maps streams using a linear, stream layer dataset. While not included in the land cover dataset, rivers, streams, and canals are mapped using high resolution flowlines from the National Hydrography Dataset (U.S. Geological Survey 2016). The stream layer was developed to provide a comprehensive spatial dataset of the rivers, streams, and canals in the RCIS area. Furthermore, the stream layer is a linear dataset, so the extent of rivers, creeks, and canals can be reported in commonly-used linear units such as miles. All records that fell within the RCIS area were used. Figure 2-16 shows the streams in the RCIS area.

2.6 Protected Areas

The RCIS area includes existing *protected areas*, which are public or private lands protected through legal or other effective means, where the primary intent of land management is to manage the land for open space use or agricultural production. Protected areas include large parks and open space areas that are managed primarily for their ecological functions and values. Protected areas may also include semi-developed areas such as recreational parks that maintain some ecological value.

A GIS dataset of protected areas was compiled for this RCIS to inform the development of the Conservation Strategy (Chapter 3, *Conservation Strategy*). This dataset is used to identify gaps in protection (e.g., of focal species populations, habitat, movement corridors, or other natural resources), develop conservation goals and objectives, and prioritize conservation opportunities. This section identifies the datasets used to compile the protected areas dataset, and methods used to curate these data for this Mid-Sacramento Valley RCIS.

Data from the following sources were used to compile a protected areas database for RCIS.

- California Protected Areas Database (California Protected Areas Database 2016).
- California Conservation Easement Database (California Conservation Easement Database 2018).
- Protected Areas Database of the United States (U. S. Geological Survey, Gap Analysis Program 2016).
- CDFW-owned/managed lands (California Department of Fish and Wildlife 2016b).
- USFWS National Cadastral Data (U.S. Fish and Wildlife 2017d).
- Colusa County parcel data (Colusa County 2017) for Williamson Act contracts.
- Sutter County Williamson Act parcel data (Sutter County 2018).

Mitigation and conservation banks located in the RCIS area and/or with service areas that overlap the RCIS area were identified from the USFWS, CDFW, and the Corps) bank websites.[20]

2.6.1 Types of Protected Areas

Protected areas in the RCIS area vary according to the mechanisms by which the land is protected (e.g., fee title, conservation easement, agricultural easement); the degree to which land is protected for its ecological values (e.g., land protected primarily for the conservation of natural resources; land protected for multiple uses, including conservation and recreation; or land protected primarily for recreation.); and the duration of the commitment to protect land (permanent or temporary). All

[20] Up-to-date information on approved conservation and mitigation banks can be found at the following USFWS, CDFW, and the Corps websites: https://www.fws.gov/sacramento/es/Conservation-Banking/Banks/In-Area/es_conse-bank-in-area.htm

https://www.wildlife.ca.gov/Conservation/Planning/Banking/Approved-Banks

https://www.fws.gov/gis/data/CadastralDB/links_cadastral.html

http://www.spn.usace.army.mil/Missions/Regulatory/Mitigation-Banks/Approved-Banks-for-the-San-Francisco-Regulatory-Di/Amy types of protected areas were included in the dataset. The types of protected areas in the RCIS area include the following.

- Mitigation/conservation banks.
- Land with conservation and agricultural easements.
- Land under Williamson Act contracts.
- State or federal wildlife areas.
- State parks.

The distribution of protected areas in the RCIS area is shown in Figure 2-21. There are 216,083 acres of protected lands in the RCIS area (34% of the RCIS area) comprising land protected in fee[21] only (25,851 acres; 4% of the RCIS area); through conservation easement only (22,818 acres; 3% of the RCIS area); or both (55 acres; <1% of the RCIS area). Most of the land protected through easement is permanently protected (21,684 acres; 95%). Approximately 402 acres and 3 acres (< 1% of the RCIS area) are in conservation bank and mitigation banks, respectively.

Williamson Act contracts protect a significant amount of agricultural land and open space and other land cover types in the RCIS area (166,704 acres [26% of the RCIS area)]). Lands under Williamson Act contracts are protected under voluntary contracts between landowners and local governments to restrict development on parcels used for agriculture and related open space functions for a minimum of 10 years[22].

See Tables 3-2 and 3-3, Chapter 3, *Conservation Strategy* for more information about the amounts of land cover types and habitats protected in the RCIS area.

GIS Wildlife refuges, management areas, and recreation areas are an important component of the conservation landscape in the RCIS area, protecting and managing natural communities and native biodiversity. Major wildlife refuges, management areas, and recreation areas are listed in Table 2-7. Collectively, these protected areas provide important habitat for focal species and public recreational opportunities.

[21] The California Protected Areas Database (2016) classifies land in "fee" as lands that are owned outright and protected for open spaces purposes.

[22] http://www.conservation.ca.gov/dlrp/lca

Table 2-7. Major Wildlife and Recreation Management Areas in RCIS Area

Protected Area Name	Ownership	Area in RCIS Area (acres)
Bobelaine Sanctuary	National Audubon Society	354
Butte Sink Wildlife Management Area	USFWS	717
Butte Sink Wildlife Management Area Easements	Private	7,062
Collins Eddy Wildlife Area	CDFW	12
Colusa Bypass Wildlife Area	CDFW	1,525
Colusa National Wildlife Refuge	USFWS	4,082
Colusa-Sacramento River State Recreation Area	State Parks	364
Delevan National Wildlife Refuge	USFWS	5,795
Feather River Wildlife Area	CDFW	1,773
Fremont Weir Wildlife Area	CDFW	38
Gray Lodge Wildlife Area	CDFW	421
North Central Valley Wildlife Management Area	USFWS	1,018
Sacramento National Wildlife Refuge	USFWS	2,229
Sacramento River National Wildlife Refuge	USFWS	9
Sacramento River Wildlife Area	CDFW	1,005
Sutter National Wildlife Refuge	USFWS	2,713
Sutter Bypass Wildlife Area	CDFW	3,449
Upper Butte Basin Wildlife Area	CDFW	1
Willow Creek/Lurline Wildlife Management Area Easements	Private	5,852

RCIS = regional conservation investment strategy; USFWS = U.S. Fish and Wildlife Service; CDFW = California Department of Fish and Wildlife

2.6.2 Conservation and Mitigation Banks

FGC 1852(b)(12) requires that an RCIS provide, "a summary of mitigation banks and conservation banks approved by the department or the United States Fish and Wildlife Service that are located within the RCIS area or whose service area overlaps with the RCIS area." The Program Guidelines (California Department of Fish and Wildlife 2018b) further specify that the summary include banks approved by the Corps, as well as information on the types of credits available and where information can be found on the number of available credits.

Conservation and mitigation banks are areas of preserved, restored, enhanced, or constructed habitats (for example, wetlands) that are set aside for the express purpose of providing mitigation for project impacts on wetlands, threatened and endangered species, and other sensitive resources. FGC 1797.5 defines terms associated with mitigation banking in California. In summary, a conservation or mitigation bank is privately or publicly owned land that is managed for its natural resource values, with an emphasis on the targeted resource (species or aquatic resources, respectively). Overseeing agencies typically require that the establishment of a mitigation bank include the restoration or creation of aquatic resources. Conservation banks may include restoration or creation projects, but they are more heavily focused on the protection and management of existing occupied habitats of the target species. In exchange for permanently protecting and managing the land—and in the case of mitigation banks, restoring or creating aquatic resources—the bank operator is allowed to sell credits to project proponents who need to satisfy legal requirements for compensating environmental impacts of development projects.[23]

There are 30 conservation and mitigation banks found within the RCIS area or whose service area overlaps the RCIS area (Table 2-8). Up-to-date information on approved conservation and mitigation banks, including available credits, can be found at the following USFWS, CDFW, Corps, and other websites:

- https://www.fws.gov/sacramento/es/Conservation-Banking/Banks/In-Area/es_conse-bank-in-area.htm
- https://www.wildlife.ca.gov/Conservation/Planning/Banking/Approved-Banks
- http://www.spn.usace.army.mil/Missions/Regulatory/Mitigation-Banks/Approved-Banks-for-the-San-Francisco-Regulatory-Di/
- https://www.wesmitigation.com/available-credits/search-our-banks-map/

Table 2-8. Conservation and Mitigation Banks with Available Credits and Service Areas in RCIS Area

Conservation/Mitigation Bank	Location (County)	Available Credits and Service Territory
Blackburn Vernal Pool Conservation Bank	Tehama	A 621-acre bank offering vernal pool preservation credits with service territory overlapping portions of the RCIS area.
Big Gun Conservation Bank	Placer	The 52.4-acre site has a service territory that overlaps with the RCIS area in Sutter County has credits available for California red-legged frog (*Rana draytonii*).
Burke Ranch Conservation Bank	Solano	A 960-acres bank that with a service territory that overlaps with the RCIS area, has vernal pool preservation credits available. In addition to offering vernal pool preservation credits, the bank also offers credits for California tiger salamander and Swainson's hawk.
Bullock Bend Mitigation Bank	Yolo	A 120-acre bank located along the Sacramento River has a service territory that overlaps with the RCIS area[24]. The bank has credits available for salmonids, Swainson's hawk nesting habitat, riparian habitat, and 404 other waters of the United States.

[23] For additional information on banks and available credits see the following websites:
https://www.wildlife.ca.gov/Conservation/Planning/Banking
https://www.fws.gov/sacramento/es/Conservation-Banking/Banks/In-Area/

[24] https://www.wesmitigation.com/cabanks/bullock-bend-mitigation-bank/

Conservation/Mitigation Bank	Location (County)	Available Credits and Service Territory
Campbell Ranch Conservation Bank	Solano	This bank offers credits for vernal pool preservation, with a service territory that overlaps with the RCIS area. In addition to credits for vernal pool preservation, the bank also offer credits for vernal pool tadpole shrimp and vernal pool fairy shrimp.
Colusa Basin Mitigation Bank	Colusa	A 160-acre site, and is a subset of a 215-acre property **located within the RCIS area**. The bank provides mitigation credits to offset impacts on the giant garter snake and 404 seasonal wetlands, with a service area that overlaps the RCIS area.
Daley Ranch Vernal Pool Conservation Bank	Butte	A 665-acre bank that offers credits for vernal pool preservation within its service territory, which overlaps with the RCIS area.
Dolan Ranch Conservation Bank	Colusa	A 252-acre site **located in the RCIS area**. The bank has alkaline vernal pool preservation credits available. The bank's service area overlaps the RCIS area. The bank was also approved to sell giant garter snake credits but these are sold out.
Elsie Gridley Mitigation Bank	Solano	The 1,837-acre bank has credits available for vernal pools, perennial, seasonal, and riparian wetlands as well as western burrowing owl, Swainson's hawk, tricolored blackbird, northern harrier (*Circus cyaneus*), and valley elderberry longhorn beetle.
Fremont Landing Conservation Bank	Yolo	A 100-acre mitigation site includes a service territory overlapping with the RCIS area. The bank provides habitat and mitigation credits for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead. The bank also offer credits for riparian floodplain forest habitat, shaded riverine aquatic habitat, and green sturgeon.
French Camp Conservation Bank	San Joaquin	The 84-acre French Camp Conservation Bank, with a service territory that overlaps with the RCIS area, has valley elderberry longhorn beetle credits available.
Gilsizer Slough South Giant Garter Snake Conservation Bank	Sutter	The 565-acre property is **located in the RCIS area.** The conservation bank is currently sold out of credits for the giant garter snake.
Goldfields Conservation Bank	Solano	A 152-acre bank with a service territory that overlaps with the RCIS area. The bank offers credits for Contra Costa goldfields (*Lasthenia conjugens*) and vernal pool tadpole shrimp.

Conservation/Mitigation Bank	Location (County)	Available Credits and Service Territory
Laguna Creek Conservation Bank	Sacramento	The 780-acre bank has service territory that overlaps with the RCIS area. The bank offered credits for vernal pool creation and preservation but credits are sold out.
Laguna Terrace East Conservation Bank	Sacramento	This 200-acre conservation bank has service territory for vernal pool preservation that overlaps with the RCIS area. However, the bank is currently sold out of available credits. The bank also offer credits for Swainson's hawk on a case-by-case basis.
Locust Road Mitigation Bank (Pending)	Placer	This 75-acre bank, which has service territory that overlaps with the RCIS area. The bank offers credits for wetlands, Swainson's hawk, and vernal pools. The bank is sold out of available credits for Swainson's hawk.
Meridian Ranch Conservation Bank	Butte	A 530-acre bank with a service territory that overlaps with the RCIS area. The bank offers credits for vernal pool creation and preservation. The bank also offers credits for Swainson's hawk.
Mountain House Conservation Bank	Alameda	This 147-acre conservation bank has a service territory that overlaps with the RCIS area. The bank, which offered credits for burrowing owl, California tiger salamander, San Joaquin kit fox (*Vulpes macrotis mutica*), California red-legged frog, vernal pool fairy shrimp, and Swainson's haw, is currently sold out of all available credits.
Muzzy Ranch Conservation Bank (Pending)	Solano	The 1,289-acre conservation bank has a service territory that overlaps with the RCIS area. The bank offers credits for vernal pool species, California tiger salamander, San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*), western burrowing owl nesting and foraging habitat, Swainson's hawk and other raptor foraging habitat, and Delta green ground beetle (*Elaphrus viridis*).
Nicolaus Ranch VELB Conservation Bank	Sacramento	A 42-acre bank, which has a service territory that overlaps with the RCIS area, has valley elderberry longhorn beetle credits available. The bank also offers the opportunity to accept valley elderberry longhorn beetle transplants.
Noonan Ranch Conservation Bank	Solano	The 189-acres bank, whose service territory overlaps with the RCIS area, provides credits for impacts to vernal pool species, California tiger salamander, and Contra Costa goldfields.

Conservation/Mitigation Bank	Location (County)	Available Credits and Service Territory
North Bay Highlands Conservation Bank	Marin	This 450-acre bank, with a service territory that overlaps the RCIS area, offers credits for California red-legged frog. The bank also offers credits for Central California coast steelhead (*Oncorhynchus mykiss*) and Marin western flax (*Hesperolinon congestum*).
North Suisun Mitigation Bank	Solano	A 612-acre bank with a service territory that overlaps with the RCIS area, provides mitigation and conservation credits for agency-approved impacts on wetlands. In addition to credits for vernal pool preservation, the bank also offer credits for California tiger salamander and Contra Costa goldfields. The bank is sold out of vernal pool creation credits.
Ohlone West Conservation Bank	Alameda	A 640-acres bank with a service territory that overlaps with the RCIS area, offering credits for California red-legged frog. The bank also offers credits for Alameda whipsnake (*Masticophis lateralis euryxanthus*), California tiger salamander, and Callippe silverspot butterfly (*Speyeria callippe callippe*).
Ridge Cut Giant Garter Snake Conservation Bank	Yolo	The 186-acre bank has a service territory that overlaps the RCIS area and offers conservation credits available for giant garter snake habitat.
Ridge Top Ranch Wildlife Conservation Bank	Solano	This 745-acre bank with a service territory that overlaps with the RCIS area, will begin accepting reservations for credits for California red-legged frog. The bank will also offer credits for Callippe silverspot butterfly.
River Ranch Valley Elderberry Longhorn Beetle Conservation Bank	Yolo	This bank, with a service territory that overlaps with the RCIS area, provides 211 acres of riparian habitat and credits for the valley elderberry longhorn beetle.
Sutter Basin Conservation Bank	Sutter	A 429-acre site **located within the RCIS area**. The bank has giant garter snake credits available and a service territory that overlaps the RCIS area.
Toad Hill Mitigation Bank	Placer	The 1,630-acre mitigation bank has service territory that overlaps with the RCIS area offering credits for vernal pool creation and preservation. The bank is also approved to sell Corps of Engineers wetlands mitigation credits.
Van Vleck Ranch Mitigation Bank	Sacramento	The 775-acre mitigation bank has service territory that overlaps with the RCIS area offering credits for vernal pool creation and preservation. The bank is also offers credits for Swainson's hawk.

RCIS = regional conservation investment strategy; NWR = national wildlife refuge

2.6.3 Protected Areas Adjacent to the RCIS Area

There are protected areas north, east, and south of the RCIS that are connected to, but are just outside of, the RCIS area. These areas provide landscape connectivity between the RCIS area and other portions of the low-lying lands of the Sacramento Valley region (Figure 2-21). The north side of the RCIS area includes portions of the Sacramento NWR, the Sacramento River Wildlife Area, and portions of Willow Creek/Lurline Wildlife Management Area Easements. These refuges and the wildlife management area easements extend outside of the RCIS area north into adjacent Glenn County, providing connectivity between seasonal and permanent wetland habitats, as well as native grassland and riparian natural communities. Along the northeastern boarder of the RCIS areas are the approximately 9,600-acre Upper Butte Basin Wildlife Area, the North Central Valley Wildlife Management Area Easement, and Butte Sink Wildlife Management Area surrounding the Butte Creek drainage. These wildlife management areas primarily comprise managed wetlands with some grasslands and valley foothill riparian woodland, with the primary purpose of supporting wetland habitat for migrating waterfowl. These wildlife areas provide riparian and wetland habitat connectivity to mid- and upper-Butte Creek into Butte County. The Gray Lodge Wildlife Area is located just outside of the northeastern portion of the RCIS area and provides connectivity from the surrounding working lands to perennial ponds, natural grasslands, and wooded riparian habitat south to the Butte Sink Wildlife Management Area Easements within the RCIS area. Along the eastern boarder of the RCIS area, within Yuba City, are Feather River Parkway and Riverfront Park Complex; these parks are situated within the confluence of the Feather and Yuba River and provide willow riparian connectivity to South Yuba River east of the RCIS area. Additionally, along the eastern border of the RCIS area is the Feather River Wildlife Area, straddling the Feather River in Sutter County and Yuba County. This 2,800-acre protected area consists of dense overstory of riparian valley oak and cottonwood forest and an understory of wild grape, pipevine, and California rose. This natural community extends north of the RCIS area and provides connectivity to riparian habitat along the Feather River. The approximately 1,500-acre Fremont Weir Wildlife Area and 2,962-acre River Ranch Agricultural Conservation Easement are just outside of the southernmost portion of the RCIS area in eastern Yolo County, along the Sacramento River, Feather River, and Cross Canal. These protected agricultural floodplains areas extend into the Yolo Bypass south of the RCIS area and include valley oak woodlands, willow and cottonwood riparian habitat along the Sacramento River, and annual California grasses. Outside of the southwestern portion of the RCIS area along the Colusa Basin Drainage Canal, in Yolo County, is the Wetlands Reserve Program Conservation Easements; this protected area provides enhanced and restored wetlands and wetland-associated grasslands extending northwest along portions of the Colusa Basin Drainage Canal into Colusa County.

2.7 Ecoregions

FGC 1852(c)(2) states that an RCIS shall include ". . . a description of the surrounding ecoregions…. that provide relevant context for the development of the strategy." Furthermore, FGC 1852(c)(14) states that an RCIS shall include "incorporation and reliance on, and citation of, the best available scientific information regarding the RCIS area and the surrounding ecoregion, including a brief description of gaps in relevant scientific information, and use of standard or prevalent vegetation classifications and standard ecoregional classifications for terrestrial and aquatic data to enable and promote consistency among regional conservation investment strategies throughout California."

This section provides a description of the ecoregions that overlap and surround the RCIS area, according to the U.S. Department of Agriculture classification (McNab et al. 2007), as required by the Program Guidelines (California Department of Fish and Wildlife 2018b).

Ecoregions are areas of general similarity in ecosystems based on major terrain features such as a desert, plateau, valley, mountain range, or a combination thereof as defined by the U.S. Department of Agriculture. They provide a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions can be effective units for setting regional conservation goals, as well as developing biological criteria and water quality standards.

Ecoregions are hierarchical, and are identified based on patterns of biotic and abiotic phenomena, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. North America is divided into different ecological units from coarsest to finest (ecoregions [i.e., provinces], subregions [i.e., sections], landscapes, and land units).

The RCIS area overlaps two ecoregion provinces. Almost all of the RCIS area overlaps the California Dry Steppe Province, with a small amount (615 acres) of the western edge of the strategy area extending into the Sierran Steppe-Mixed Forest-Coniferous Forest-Alpine Meadow Province. The California Dry Steppe Province extends beyond the RCIS area throughout the Central Valley to the north, south, and east of the RCIS area. The Sierran Steppe-Mixed Forest-Coniferous Forest-Alpine Meadow Province is adjacent to the entire western boundary of the RCIS area. Within each of the two ecoregion provinces is one ecoregion subsection. The two ecoregion provinces and two ecoregion subsections that overlap the RCIS area are described below based on the descriptions provided by the U.S. Department of Agriculture (McNab et al. 2007) (Figure 2-22).

2.7.1 California Dry Steppe Province

The California Dry Steppe ecoregion province lies within the Central Valley of California, a flat alluvial plain between the Sierra Nevada and the Coast Ranges. Elevations range from sea level to 500 feet. The province has broad, nearly level valleys bordered by sloping alluvial fans, slightly dissected terraces, and the lower foothills of the surrounding uplands. The Central Valley of California was once dominated by natural grasses that have mostly been eliminated by agriculture, fire, and grazing except in a few remaining stands. These stands suggest that the dominants were bunch grasses on lands similar in appearance to mixed prairie. Needlegrass was the principal species except near the coast. Today, introduced annual grasses, including various species of avens, brome, fescue, and barley, occupy most of the remaining grassland areas. The rivers flow through alkaline flats where pickleweed (*Salicornia* spp.), salt grass (*Distichlis spicata*), and shadscale (*Atriplex* spp.) provide the chief cover. Tule (*Schoenoplectus* spp.) marshes border the lower reaches of the Sacramento River.

2.7.1.1 Great Valley

The Great Valley ecoregion subsection of the California Dry Steppe province is a low fluviatile plain with elevation ranges from sea level to 800 feet. Primary vegetation includes California prairie, riparian forest, tule marsh, San Joaquin saltbush, and valley oak savanna. Predominant potential natural communities are valley oak, valley needlegrass, and saltbush series. Many slow-moving rivers flow to the Delta east of San Francisco Bay via the Sacramento River system. Flows to this levied, alluvial channel river system are regulated throughout the year by the many dams in adjacent areas. Many rivers and perennial streams flow west from the Sierra Nevada foothills to the

Sacramento River. The many alluvial channels that flow eastward from the Coast Ranges to the Sacramento River are mostly dry during summer months; only a few are perennial streams.

2.7.2 Sierran Steppe-Mixed Forest-Coniferous Forest-Alpine Meadow Province

This ecoregion province covers the southernmost portion of the Cascade Mountains, northern Coast Range, Klamath Mountains, and Sierra Nevada. The province overlaps a very small portion of the RCIS area along the western boundary, where the interior coast range meets the Central Valley. Most of the province is covered with steeply sloping to precipitous mountains crossed by many valleys with steep gradients. The long west slope of the Sierra Nevada rises gradually from 2,000 feet to more than 14,000 feet; the east slope drops abruptly to the floor of the Great Basin, about 4,000 feet. Much of this region has been glaciated. The lower slopes and foothills, from about 1,500 to 4,000 feet, are covered by coniferous and shrub associations. On higher slopes, digger pine and blue oak (*Quercus douglasii*) dominate, forming typical open or woodland stands. Most of the low hills are covered by close-growing evergreen scrub, or chaparral. Several oaks are common associates. Temperatures average 35 to 52 degrees Fahrenheit (°F), but fall with rising elevation. The base of the west slope receives only about 10 to 15 inches of rainfall per year and has a long, unbroken dry summer season. At higher elevations, the dry summer season shortens and precipitation rises to as much as 70 inches, with a larger portion falling as snow. Prevailing west winds influence climatic conditions for the whole region.

2.7.2.1 Northern California Interior Coast Ranges

The Northern California Interior Coast Ranges ecoregion subsection is characterized by parallel ranges and folded, faulted, and metamorphosed strata. Elevation ranges from 200 to 2,500 feet. Predominant potential natural communities are blue oak, mixed chaparral and valley needlegrass series. Precipitation ranges from 20 to 40 inches and temperature averages 55° to 64°F. Many rapid perennial or intermittent streams are in deeply incised canyons with weak bedrock channels; they flow easterly to the Sacramento River. Reservoirs for irrigation water and flood control are common.

2.8 Natural Communities, Agricultural Lands, and Urban/Developed Lands

This section describes the natural communities, cultivated agriculture, other agriculture, urban/developed land, and associated land cover types in the RCIS area (Figures 2-18 and 2-19). The natural communities are grouped into five categories: grassland, chaparral and scrub, woodland, riverine and riparian, and wetland. Cultivated agriculture consists of a number of cropland types, including fallow land, and other agriculture includes the orchard and vineyard land cover type. Urban/developed land consists of the urban and eucalyptus land cover types. These categories provide a system for describing the biological communities, working lands, and urban/developed land cover in this RCIS. The amount of each natural community, agriculture type, urban/developed, and land cover type in the RCIS area is presented in Table 2-4.

2.8.1 Grassland

The grassland[25] natural community consists of herbaceous vegetation dominated by grasses and forbs. In the RCIS area, grasslands are found in upland topographic locations, generally irrespective of landscape position, slope, and aspect. Vernal pool complexes, which consist of small, scattered, seasonally connected pools with the larger grassland matrix, are also included in this natural community. There are 28,216 acres of the grassland natural community in the RCIS area, which provide many ecosystem services such as carbon sequestration, nutrient cycling, and agricultural benefits (Jones and Donnelly 2004).

Grassland in the RCIS area is classified into two land cover types (Figure 2-23).

- Annual grassland.
- Vernal pool complex.

2.8.1.1 Annual Grassland

The annual grassland land cover type is an herbaceous plant community dominated by non-native annual grasses (Holland 1986, Sawyer and Keeler-Wolf 1995). Annual grassland is defined as areas where grasses and forbs occur as extensive stands without an overstory. The dominant grasses generally consist of introduced annual grasses, including, foxtail chess (*Bromus madritensis*), harding grass (*Phalaris aquatica*), hare barley (*Hordeum murinum* ssp. *leporinum*), nit grass (*Gastridium phleoides*), oats (*Avena barbata* and *A. fatua*), rattail sixweeks grass (*Festuca myuros*), ripgut grass (*Bromus diandrus*), rye grass (*Festuca perennis*), silver hair grass (*Aira caryophyllea*), small fescus (*Festuca microstachys*), soft chess (*Bromus hordeaceus*), and barbed goat grass (*Aegilops triuncialis*). The associated herbaceous cover includes native and non-native forbs. Common herbaceous species in the RCIS area include black mustard (*Brassica nigra*), California poppy (*Eschscholzia californica*), clover species (*Trifolium* spp.), common fiddleneck (*Amsinckia menziesii*), common yarrow (*Achillea millefolium*), filaree species (*Erodium* spp.), Ithuriel's spear (*Triteleia laxa*), knapweed species (*Centaurea* spp.), lupine species (*Lupinus* spp.), yellow star thistle (*Centaurea solstitialis*) and owl's-clover species (*Castilleja* spp.).

Native grasslands are patchily distributed within the larger annual grassland land cover type. These patches of native grasslands include an abundance of non-native annual grasses, interspersed with perennial grasses and forbs. Thus, native grassland cannot be distinguished from California annual grassland at the mapping scale used for this RCIS. Consequently, native grass patches are included in the annual grassland land cover type.

Annual grassland occupies an estimated 26,463 acres, or approximately 4%, of the RCIS area. This land cover type is scattered throughout the RCIS area but is most concentrated around the southwestern boundary of the RCIS area and around the lower perimeter of the Sutter Buttes (Figure 2-23).

[25] The Mid-Sacramento Valley RCIS refers to this community as grassland to reflect its current composition dominated by non-native, annual grasses. Areas dominated by grasslands, however, have historically been more dominated by forbs than by grasses, and are also referred to as California prairie (Holstein 2011).

2.8.1.2 Vernal Pool Complex

The vernal pool complex land cover type consists of an interconnected network of vernal pools and seasonal swales within an upland, grassland matrix. Within the RCIS area, vernal pools form in shallow depressions that hold water due to the slow infiltration rate of the underlying clay alluvium soil. The Sacramento NWR supports a large amount of vernal pools in the RCIS area. Vernal pools on the refuge complex occur on an alkaline soils, resulting in unique alkali vernal pool vegetation. In this landscape, vernal pools are characterized by button-celery (*Eryngium vaseyi*), smooth-stemmed popcornflower (*Plagiobothrys leptocladus*), stipitate popcornflower (*P. stipitatus*), white-flowered navarretia (*Navarretia leucocephala*), dwarf woolly-heads (*Psilocarphus brevissimus*), Oregon woolly-heads (*Psilocarphus oregonus*), Fremont's goldfields (*Lasthenia fremontii*), and several species of *Downingia* (Silveira 2000). The vernal pool complex land cover type accounts for 1,753 acres, or approximately 0.3%, of the RCIS area. The vernal pool complexes are mainly located near the city of Colusa and just northeast of the Sutter Buttes (Table 2-4, Figure 2-23).

2.8.2 Chaparral and Scrub

The chaparral and scrub natural community consists of two distinct vegetation types: chaparral and coastal scrub land cover types. What little (266 acres) chaparral and scrub there is, is located primarily in the southwest corner of the RCIS area. Chaparral occurs on rocky, porous, nutrient-deficient soils on steep slopes up to 6,561 feet in elevation (Keeley 2002). These communities are dominated by densely packed and nearly impenetrable drought-adapted evergreen woody shrubs with small, thick, leathery sclerophyllous leaves (Hanes 1988, Keeley 2002). In comparison, the coastal scrub land cover types generally consist of low "soft" shrubs in open to dense shrublands, interspersed with grassy openings or little to no herbaceous layer. Chaparral and scrublands provide many ecosystem services such as carbon sequestration, nutrient cycling, forage for wildlife, and passive open space values (Garnache et al. 2018).

Chaparral and coastal scrub in the RCIS area is classified into two land cover types (Figure 2-24).

- Mixed chaparral.
- Coastal scrub.

2.8.2.1 Mixed Chaparral

Mixed chaparral includes a variety of shrubs with thick, stiff, sclerophyll leaves where no one species is clearly dominant. Mixed chaparral occurs on moist, shaded slopes and is dominated by a great variety of shrubs including chamise (*Adenostoma fasciculatum*), scrub oak (*Quercus berberidifolia*), buckbrush (*Ceanothus cuneatus*), and birch-leaf mountain-mahogany (*Cercocarpus betuloides*). At maturity, this community can be dense and nearly impenetrable. Mixed chaparral tends to occur on rocky slopes with little soil development, but soils are typically somewhat more developed on mixed, than on monotypic, stands of chaparral (i.e., chamise chaparral). An estimated 199 acres, or less than 1%, of mixed chaparral are present in the RCIS area (Table 2-4, Figure 2-24).

2.8.2.2 Coastal Scrub

The coastal scrub land cover type (Figure 2-24) consists primarily of evergreen shrubs with an herbaceous understory in openings. This land cover type is usually found at elevations below approximately 1,640 feet (Holland and Keil 1995). Coastal scrub can range from a patchy shrubs to nearly prostrate subshrubs surrounded by grassland to a dense and continuous cover of two layers. Coastal scrub in the RCIS area typically occurs on less-exposed sites and is dominated by coyote brush (*Baccharis pilularis*), California coffeeberry, blackberry (*Rubus* spp.), poison oak (*Toxicodendron diversilobum*), and sticky monkey flower (*Mimulus aurantiacus*), as well as different species of ferns and non-native grasses (Mayer and Laudenslayer 1998). An estimated 67 acres, or less than 1%, of coastal scrub are present in the RCIS area (Table 2-4, Figure 2-24).

2.8.3 Woodland

The woodland natural community is an upland vegetation community dominated by hardwood tree species, characterized by a prevalence of various species of oaks (*Quercus* sp.). There is little woodland in the RCIS area (2,221 acres), and it is located in the southwest corner of the RCIS area. The composition of this natural community can range from open savannas with grassy understories to dense woodlands with persistent leaf litter that precludes much herbaceous understory or shrubby understories. The canopy can vary from pure stands of oak trees to stands intermixed with other broadleaf and coniferous trees. Woodlands provide many ecosystem services such as carbon sequestration, nutrient cycling, erosion control, forage for wildlife, and passive open space values (U.S. Department of Agriculture 2018).

Woodland in the RCIS area is classified into two land cover types (Figure 2-25).

- Blue oak woodland.
- Montane hardwood.

2.8.3.1 Blue Oak Woodland

Blue oak woodland consists of a variably spaced overstory of blue oak with a largely herbaceous understory of moderately shade-tolerant grasses and forbs. Native species like the grasses blue wild-rye (*Elymus glaucus*), California melic (*Melica californica*), and the forb Ithuriel's spear are common in the understory, but it is also frequently dominated by non-native species like wild oat (*Avena sativa*) and ripgut grass and the forb yellow star thistle. Large shrubs of common manzanita occur occasionally in blue oak woodland, but are never dominant. Blue oak woodland occurs on sites with much greater soil development but often considerably less relief than other oak woodland types. Sometimes, blue oak woodland is separated into "woodland" and "savanna" types, which differ largely in terms of percent canopy closure. Generally, these woodlands have an overstory of scattered trees, although the canopy can be nearly closed on some sites (Pillsbury and De Lasaux 1983). Other occasionally associated shrub species include poison oak, California coffeeberry (*Frangula californica*), and buckbrush. An estimated 2,116 acres of blue oak woodland are present in the RCIS area (approximately 0.3%) (Table 2-4; Figure 2-25), located within the southwestern corner of the RCIS area and on the northeastern edge of Sutter Buttes.

2.8.3.2 Montane Hardwood

The montane hardwood land cover type typically consists of a dominant hardwood tree component with a shrub understory and little herbaceous vegetation. Tree spacing ranges from 10 to more than 30 feet apart. Soil depth may be shallow or deep. In the RCIS area, small patches of these woodlands are generally found along dry washes and intermittent streams and undeveloped areas within the cultivated agriculture landscape in the southwestern corner of the RCIS area, and northeast of the Sutter Buttes. Montane hardwood also integrates with the blue oak woodland land cover type.

Montane hardwood covers an estimated 105 acres, or less than 1%, of the RCIS area (Table 2-4; Figure 2-25).

2.8.4 Riverine and Riparian

The riverine and riparian natural community encompasses the riverine systems, including associated riparian vegetation. Riverine consists of the channel itself, while riparian areas are the areas of woody vegetation associated with riverine water sources. Riparian woodlands are dominated by trees and contain an understory of shrubs and forbs. In the RCIS area, riparian woodland land cover types thrive along stream banks and floodplains. There are 23,651 acres of the riverine and riparian natural community in the RCIS area, which provide many ecosystem services such as improved water quality, erosion control, flood management, forage for wildlife, and passive open space values (U.S. Department of Agriculture 2018).

Riverine and riparian in the RCIS area is classified into three land cover types (Figure 2-26).

- Valley foothill riparian.
- Lacustrine/riverine.
- Barren.

2.8.4.1 Valley Foothill Riparian

Riparian areas are ecological transitions between aquatic areas and terrestrial areas (National Research Council 2002, California Department of Water Resources 2012[26]). Riparian areas in the RCIS area include the aquatic/terrestrial ecotones associated with rivers, streams, ponds, and wetlands that have prolonged aquatic stages. Because riparian areas affect ecological process for all aquatic areas, features such as altered stream courses that provide drainage functions, constructed wetlands that connect to surface watercourses, and other seminatural aquatic features incorporate riparian areas. However, some conservation planning efforts for the Central Valley limit the application of “riparian” to the terrestrial portion of riparian ecotones (e.g., California Department of Water Resources 2016).

The valley foothill riparian land cover type is found in and along the margins of the active channel on intermittent and perennial streams. The valley foothill riparian land cover mapped in this RCIS is based on existing information about the distribution of woody vegetation associated with stream courses and rivers in RCIS area (Figure 2-26); that is, while riparian areas exist for all aquatic/terrestrial transitions, the application of “riparian” is often limited to areas dominated by woody vegetation. This approach reflects the association between woody riparian vegetation and the high habitat values provided by riparian areas for wildlife. Generally, no single species dominates the canopy, and composition varies with elevation, aspect, hydrology, and channel type. Some areas may be more sparsely vegetated (usually farther from the active channel), while areas directly adjacent to the channel may be very densely vegetated. Thus, riparian vegetation is highly diverse, reflecting the diversity of riparian conditions in the RCIS area.

Older stands of valley foothill riparian consist of gallery forests dominated by Fremont cottonwood (*Populus fremontii*), valley oak, Oregon ash (*Fraxinus latifolia*), box elder (*Acer negundo*), red willow (*Salix laevigata*), black willow (*Salix gooddingii*), and arroyo willow (*Salix lasiolepis*). A dense

[26] This is the CVFPP. Attachment 4 (Glossary) repeats the National Research Council (2002) definition.

understory of shrubs like California wild rose (*Rosa californica*) is also typically present and the trees are often festooned with California wild grape (*Vitus californica*) lianas. Since these gallery forests can utilize summer streamflow, their primary productivity (as well as that of fresh emergent wetlands) is much higher than that of more widespread upland vegetation, and they resultantly provide habitat services to many wildlife species disproportionate to their relatively small area, Many streams have such low seasonal or intermittent flow, however, that their riparian vegetation is much less developed and their productivity and wildlife values are significantly lower than those of the gallery forests. Vegetation of such streams is typically a riparian scrub dominated by sandbar willow (*Salix exigua* var. *hindsiana*), a shrubby species also found on early successional sandbars adjacent to gallery forests. Valley foothill riparian covers an estimated 14,666 acres, or approximately 2%, of the RCIS area (Table 2-4; Figure 2-26).

2.8.4.2 Lacustrine/Riverine

The lacustrine/riverine natural community consist of both natural and human-made waterways. Rivers and streams in the RCIS area include perennial, intermittent, and ephemeral watercourses characterized by a defined bed and bank. Perennial streams support flowing water year-round in normal rainfall years. These streams are often marked on U.S. Geological Survey quadrangle maps with a blue line, known as blue-line streams. Intermittent (seasonal) streams carry water through most or all of the dry season (May through October) in a normal rainfall year. More specifically, in the wet season, intermittent streamflow occurs when the water table is raised, or rejuvenated, following early season rains that fill shallow subsurface aquifers. Ephemeral streams carry water only during or immediately following a rainfall event. The principal watercourses in the RCIS area are the Sacramento River and the Feather River, which are large, perennial rivers that provide habitat for the focal fish species. Butte Creek is a perennial stream that also provides habitat for focal fish species except for green sturgeon and Sacramento River winter-run Chinook salmon.

In addition to natural rivers and streams, this land cover type also includes human-made irrigation canals, sloughs, and leveed channels, including the Sutter Bypass and Tisdale Bypass. These human-made water conveyance systems generally transport water for irrigation and excess floodwater from the upper Sacramento River to the confluence of the Feather and Sacramento Rivers. The Tisdale Bypass releases overflow waters of the Sacramento River into the Sutter Bypass.

The lacustrine/riverine natural community is associated with riparian plants described in the riparian woodland community. The riparian plant composition and width of the riparian corridor varies depending on channel slope, magnitude and frequency of channel and overbank flows, and the frequency and duration of flooding flows that inundate the broader floodplain.

Lacustrine and riverine are combined into one land cover type to mirror the classification used in CDFW's Great Valley Ecoregion Vegetation data layer. Although lacustrine is typically used to describe lakes and ponds, the CDFW's Great Valley Ecoregion Vegetation data layer used lacustrine-riverine to map rivers and stream systems, and associated ponds. The lacustrine U.S. Department of Agriculture Forest Service, Existing Vegetation Central Valley data layer, which includes more off-stream ponds, is included in this land cover type for consistency. As such, some ponds not associated with river and streams are included in this land cover type. Finally, this land cover types also includes open water habitat from U.S. Department of Agriculture California Cropland data layer, which was mapped along river and streams in the RCIS area (Table 2-6). An estimated 7,983 acres, or approximately 1%, of lacustrine/riverine land cover type are present in the RCIS area (Table 2-4; Figure 2-26).

2.8.4.3 Barren

Barren areas, by definition, lack vegetation. Any habitat with less than 2% herbaceous vegetation cover and 10% cover by tree or shrub species is defined as barren. Barren areas include the narrow, unvegetated streams that run through the western portion of the RCIS area. Barren areas may be intermixed with other vegetated natural community types; for example, valley foothill riparian may grade into steep, barren riverbanks (Mayer and Laudenslaer 1998). Barren land accounts for 1,001 acres, or approximately 0.2%, of the RCIS area (Table 2-4; Figure 2-26).

2.8.5 Wetland

The wetland natural community includes aquatic habitats that have hydrophytic, herbaceous vegetation. The wetland natural community includes one land cover type, freshwater emergent wetland (Figure 2-27), which provides ecosystem services such as improved water quality, flood management, and forage for wildlife (Mitsch et al. 2015).

Individual vernal pools and associated wetlands (e.g., seasonal wetlands and swales) are not mapped; rather, these wetlands are included in the vernal pool complex land cover type (Section 2.8.1.2, *Vernal Pool Complex*) within the grassland natural community.

2.8.5.1 Freshwater Emergent Wetland

Freshwater emergent wetland is dominated by emergent herbaceous plants (e.g., reeds, sedges, grasses) with either intermittently flooded or perennially saturated soils. The plants that grow in these areas have hydrological and substrate conditions that require specialized adaptations by plant species rooted in these wetlands for living in their biochemically altered conditions. A freshwater emergent wetland usually features shallow water that is often clogged with dense masses of tall vegetation, resulting in deep peaty soils. Plant species common to freshwater emergent wetlands predominantly consists of species such as cattails (*Typha* spp.), bulrushes (*Schoenoplectus* and *Bolboschoenus* spp.), sedges (*Carex* spp.), and rushes (*Juncus* spp.).

Freshwater emergent wetlands were once widespread in the Colusa Basin, and despite their extensive drainage and conversion to cropland, some still exist there. The extant locations are mostly in areas that have been preserved as wildlife refuges, including the Colusa NWR, Delevan NWR, Sacramento NWR, and Sutter NWR. Although CDFW's Great Valley Ecoregion land cover dataset (California Department of Fish and Wildlife 2016a) maps these wildlife refuges as freshwater emergent wetland, large amounts of these wildlife refuges are managed as seasonal flooded marshes, permanent ponds, annual and perennial grasslands, riparian, and vernal pool/alkali meadow complexes (U. S. Fish and Wildlife Service 2009). Because of their managed nature, the water depth and flooding duration of freshwater emergent wetlands on state and federal lands may be highly variable and dependent on water availability and management goals. There is also a large area of freshwater emergent wetland located in the northeastern corner of the RCIS area within the Butte Sink Wildlife Management Area Easements. Freshwater emergent wetland covers an estimated 43,676 acres, or approximately 7%, of the RCIS area, and is the most common natural land cover type in the RCIS area concentrated almost entirely on protected land (Table 2-4; Figure 2-27).

2.8.6 Cultivated Agriculture

This Mid-Sacramento Valley RCIS also refers to cultivated land that supports wildlife (e.g., foraging habitat) as *working lands* to distinguish it from other agriculture types such as orchard and vineyard, that provides lower quality habitat, and urban/developed land that is heavily disturbed by human use. There are 370,043 acres of the cultivated agriculture working lands in the RCIS area, which provide agricultural values as an ecosystem service to the region (U.S. Department of Agriculture 2018). As noted in Section 2.5.2.1, *Land Cover*, the agricultural land cover types represent a snapshot of the amount of crop types in the RCIS area at the time this RCIS was developed. Because cropping patterns and type change over time, the extent and spatial distribution of each agriculture land cover type described below are expected to change.

Cultivated agriculture in the RCIS area is classified into seven land cover types (Figure 2-28).

- Alfalfa.
- Fallow.
- Field crops.
- Grain and hay crops.
- Irrigated row crops.
- Pasture.
- Rice.

2.8.6.1 Alfalfa

Alfalfa is a relatively low-growing perennial herbaceous legume species that is periodically irrigated and cut for hay. Alfalfa fixes nitrogen, is often used as a “green manure” fertilizer, and is incorporated into the soil as part of many crop rotations. Alfalfa accounts for 12,510 acres, or approximately 2% of the RCIS area (Table 2-4; Figure 2-28).

The high protein content of its leaves makes alfalfa highly palatable for rodents such as ground squirrels, gophers, and voles, which are often present in high numbers in the fields. As a result of the large rodent populations, alfalfa fields support particularly high-value foraging habitat for raptors and other predators. Due to its low stature and high productivity and protein content, alfalfa may actually provide better foraging habitat for Swainson’s hawk than the beardless wild rye (*Elymus triticoides*) fields of valley oak woodland they historically used for foraging.

2.8.6.2 Fallow

Fallow areas are lands used for cultivated agriculture that are currently idle. The land may deliberately not be used to raise a crop during a stage of crop rotation or it may ultimately be designated for development in the future. Fallow areas can provide habitat for some ground nesting birds, and foraging habitat for raptors and other species. Fallow areas cover an estimated 52,187 acres, or approximately 8%, scattered throughout the RCIS area (Table 2-4; Figure 2-28). The location of fallow areas change regularly as fields are rotated in and out of production. The amount present in the RCIS area reflects a snapshot of the fallow agricultural land mapped in the California Cropland Data Layer in 2016 (U.S. Department of Agriculture, National Agricultural Statistics Service Cropland Data Layer 2017) (Section 2.5, *Land Cover Mapping*) and can change annually.

2.8.6.3 Field Crops

Diverse irrigated herbaceous crops like safflower, corn, and sunflower are extremely important elements of agricultural economy in the RCIS area and some also provide important habitat for focal species as well as other local species of concern. Field crops cover an estimated 35,274 acres, or approximately 6%, of the RCIS area (Table 2-4; Figure 2-28). The location of field crops change regularly as fields are rotated.

2.8.6.4 Grain and Hay Crops

These crops differ from the field crops because many, but not all, are not irrigated and they can somewhat resemble California prairie in general structure. Grain and hay crops consist of species such as barley, oats, and wheat. Triticale grain is important for nesting by the focal species tricolor blackbird elsewhere in California, though tricolored blackbird have not been reported to nest in triticale in the RCIS area (University of California, Davis 2017) (Section 2.9.2.10, *Tricolored Blackbird*). Grain and hay crops cover an estimated 16,452 acres, or 3%, in the RCIS area (Table 2-4; Figure 2-28).

2.8.6.5 Irrigated Row Crops

Irrigated row crops involve intensive agricultural operations to produce food and landscaping plants. Irrigated row crops are fruits or vegetables that can be planted in rows to grow on a relatively large scale for transport to distant markets. Irrigated row crops include tomatoes, asparagus, melons, squash, cucumbers, onions, strawberries, and peppers. These crop types provide foraging habitat for wildlife species such as the red-winged blackbirds and small mammals. Irrigated row crops account for 36,153 acres, or approximately 6% of the RCIS area (Table 2-4; Figure 2-28).

2.8.6.6 Pasture

Pasture is typically irrigated but is most often used to feed cattle rather than to produce a plant crop. It is typically vegetated with a variety of non-native perennial grasses and forbs and shares ecological features with both prairie and freshwater emergent wetland natural communities but is distinctly different from either. In the RCIS area, pasture may consist of vetch, clovers/wildflower fields, and grasses. This community's productivity attracts native wildlife but most are common species. There is 1,844 acres of pasture land cover in the RCIS area, or approximately 0.3% of the RCIS area. It is most extensive along the Colusa-Sutter County line southwest of Sutter Buttes in the RCIS area (Table 2-4; Figure 2-28).

2.8.6.7 Rice

Rice is unique among the other major crops in the RCIS area because it is grown in flooded fields that resemble and provide some of the same ecological services as the freshwater emergent wetland natural community. Serving as surrogate wetland habitat, rice fields provide breeding and wintering habitat for waterfowl, shorebirds, and other wildlife (Elphick and Oring 1998). Rice habitat also provides food resources and habitat cover for some reptiles, amphibians, and mammals. Each year, fields are prepared in March and flooded to a depth of 5 inches and seeded in April. From April through August, when most seasonal wetlands in the Central Valley are dry, rice fields continue to hold water, as the rice grows to a height of about 3 feet. In September, the fields are drained and the crop is harvested; although, some fields are also flooded following harvest in an effort to decompose rice straw (Brouder and Hill 1995). Additionally, the water released from rice fields is reused to flood nearby wetlands (Ducks Unlimited 2017). In total, the rice fields can be flooded for up to 8 months of the year, during which time the fields become temporary wetlands. Consequently, rice fields provide extremely important habitat for several focal species such as giant garter snake, which was formerly entirely confined to freshwater emergent wetlands. Because of this species' association with permanent water in canals, however, only rice grown where this community formerly occurred in the Colusa Basin provides habitat for giant garter snake (Section 2.9.2.7, *Giant Garter Snake*). Rice is the major cultivated agriculture type in the RCIS area, covering 216,622 acres, or approximately 34%, of the RCIS area (Table 2-4; Figure 2-28).

2.8.7 Other Agriculture

The following agricultural land cover type generally provides lower quality habitat for focal and many native species, and is not included in the cultivated agriculture (i.e., working lands) category for the purpose of this RCIS. However, these lands can provide habitat values for some species and provide buffers between natural communities and nearby development. Furthermore, these lands have the potential to be rotated into crop types that have greater value for focal species. There are 125,356 acres of other agriculture in the RCIS area (approximately 20% of the RCIS area).

Other agriculture includes one land cover type, orchard and vineyard.

2.8.7.1 Orchard and Vineyard

Orchards involve planting rows of fruit- and nut-bearing trees for food production. Orchards in the RCIS area are mostly deciduous small trees producing fruit or nut crops, usually planted in rows with or without irrigation channels. Deciduous fruit and nut orchards are typically planted with a single-tree species. In the RCIS area, orchards include crops such as almonds, cherries, pears, pistachios, pecans, prunes, olives, and walnuts. Orchards are distinguished on the basis of their tree cover, canopy characteristics, and distinctive production rows.

Grapes for wine, a vine typically grown as a shrub in vineyards, are an increasingly important crop in the RCIS area but provide much less habitat for its native wildlife than many others. They are primarily located in the southwest corner of the RCIS area. Orchards and vineyards cover an estimated 125,356 acres, or approximately 20%, of the RCIS area, concentrated on the western and eastern sides of the RCIS area (Table 2-4; Figure 2-28).

2.8.8 Urban/Developed

Urban/developed land consists of areas where native vegetation has been replaced with residential, commercial, industrial, transportation development or infrastructure, or with structures, paved and impermeable surfaces, horticultural plantings, turf, and lawn. Vegetation found in the urban land cover types is typically cultivated vegetation associated with landscaped residences, non-native planted street trees (e.g., elm, ash, liquidambar, pine, palm), and parklands. There are approximately 42,198 acres (or approximately 7 %) of urban/developed land in the RCIS area.

Urban/developed land in the RCIS area is classified into two land cover types (Figure 2-29).

- Eucalyptus.
- Urban.

2.8.8.1 Eucalyptus

Eucalyptus consists of monotypic eucalyptus stands that have been generally planted for wood production or as wind breaks for fields and buildings. This land cover type has a dense canopy and groundcover that consists of a thick layer of leaf litter and bark. Tree spacing and species composition influence the size of mature eucalyptus groves. In the RCIS area, Eucalyptus groves are mostly found on cultivated agriculture land, where they have been planted as wind breaks along roads or near houses or parking areas. Eucalyptus species (primarily blue gum [*Eucalyptus globulus*]) can invade the riparian natural community, but eucalyptus is still a more localized threat than some other invasive species (e.g., tamarisk [*Tamarix ramossissima*] and giant reed [*Arundo donax*]). Eucalyptus stands account for 91 acres, or less than 1% of the RCIS area (Table 2-4; Figure 2-29).

2.8.8.2 Urban

Urban areas are dominated by residential, commercial, industrial, transportation, recreational structures, or other developed land use elements such as highways, city parks, and cemeteries. Vegetation found in the urban land cover type is similar to that of the rural residential land cover type, with the exception that these areas are more expansive landscaped residences, planted street trees (i.e., elm, ash, liquidambar, pine, palm), and parklands, as well as large areas of turf and lawn. Urban land in the RCIS area accounts for 42,107 acres, or 6%, of the RCIS area (Table 2-4; Figure 2-29). Yuba City is the largest urban area in the RCIS area.

2.9 Focal Species

Focal species are species whose conservation needs are addressed throughout this Mid-Sacramento Valley RCIS. Discussions in this RCIS about conservation priorities, including land protection, enhancement, and restoration (Chapter 3, *Conservation Strategy*) are described within the context of the conservation needs for focal species (Chapter 1, Section 1.6.3, *Focal Species*, provides a description of the focal species selection process for this RCIS). This section describes the methods used to model habitat distribution for focal species, and profiles of the focal species.

2.9.1 Habitat Distribution Models

Habitat distribution models were developed for all focal species to predict where they could occur, based on known habitat requirements and previously documented occurrences. Habitat distribution models were developed on a regional scale using regional data. The models are intended for use in regional planning and do not necessarily provide accurate site-specific species information. For project planning, model results must always be field-verified. Habitat distribution models for the focal species are described in detail in the respective focal species profiles in Section 2.9.2, *Focal Species Profiles*. Methods used for all the models are described below. Habitat distribution models were developed for each of the focal wildlife species.

2.9.1.1 Model Structure and Development Methods

The habitat distribution models were designed to estimate the extent and location of key habitat characteristics of each species and to be repeatable and scientifically defensible, while remaining as simple as possible. The models are spatially explicit, GIS-based “expert opinion models” based on identification of suitable land cover types in the RCIS area and location of known species occurrences. Land cover types are the basic unit of evaluation for habitat modeling and developing conservation strategies for the focal species. See Section 2.5.2, *Mapping Methods* for a description of the methods and data sources used to compile the land cover data used in this RCIS. Land cover types were identified as suitable habitat based on the known or presumed habitat requirements and use patterns of each species. In some cases, perimeter zones that were used to designate habitat are defined by a certain distance from a suitable land cover type (e.g., area of upland habitat use, limited by a certain distance of aquatic habitat for giant garter snake).

Habitats were designated according to type of habitat use, such as breeding, foraging, aestivation, and movement habitat. Determination of suitable land cover types and additional characteristics of habitat use were based on available data from peer-reviewed scientific literature. Overall, the habitat distribution models likely overestimate the actual extent of suitable habitat for most focal species because some important habitat features cannot be spatially mapped at the scale of the RCIS area, or such mapping was beyond the scope of this Mid-Sacramento Valley RCIS, and because species do not occupy all of their suitable habitat.

Consistency with the Yolo RCIS/LCP

The habitat models for this RCIS were designed to be consistent with the habitat models developed for the adjacent Yolo HCP/NCCP (ICF 2018b) and Yolo RCIS/LCP (ICF 2018a) (all Mid-Sacramento Valley RCIS focal species are also Yolo RCIS focal species)[27]. This RCIS generally classifies the same, or similar, types of habitat for focal species as the Yolo RCIS/LCP, using the same, or similar, land cover type associations and modifiers, such as distance of upland habitat from aquatic habitat for giant garter snake.

Because a large part of the Yolo RCIS/LCP area overlaps the same ecoregion province as the Mid-Sacramento Valley RCIS area (the Great Valley Ecoregion) and addresses many of the same focal species and habitats, this Mid-Sacramento Valley RCIS anticipates that projects in the Yolo RCIS/LCP area may have mitigation needs that can be met within the Mid-Sacramento Valley RCIS area, and vice versa. As described in Chapter 4, Section 4.5.1, *Mitigation Credit Agreements*, mitigation credits through an MCA can be established for a conservation action or habitat enhancement action that contributes to the achievement of an RCIS's conservation goals and objectives. To ensure that MCAs in the Mid-Sacramento Valley RCIS area can be used in the Yolo RCIS/LCP area and vice versa, the Mid-Sacramento Valley RCIS development team coordinated closely with the Yolo RCIS/LCP development team to create consistent and compatible conservation goals and objectives for focal species, habitats, and other natural resources addressed in both RCISs (see Chapter 4, Section 4.5.1, *Mitigation Credit Agreements,* for details on how an MCA can be used for projects in an adjacent RCIS area). Ensuring that the habitat models used in this RCIS are consistent with the models developed for the Yolo RCIS/LCP will facilitate consistent and compatible conservation goals and objectives.

[27] The Yolo RCIS/LCP uses the same habitat models as the Yolo HCP/NCCP. The Yolo RCIS/LCP and Yolo HCP/NCCP habitat distribution models were developed by consultant biologists in coordination with CDFW and USFWS biologists as part of the HCP/NCCP development process. See the Yolo HCP/NCCP, Chapter 2, *Existing Ecological Conditions*, Section 2.6.3, *Covered Species Habitat Models*, for more details on the methods used to develop the habitat models for HCP/NCCP.

2.9.1.2 Focal Species Locations

Documented occurrences of focal species within the RCIS area were used to visually evaluate and refine the habitat distribution models. The data used to identify locations of occurrence of focal species are primarily from the California Natural Diversity Database (CNDDB) (California Department of Fish and Wildlife, California Natural Diversity Database 2018) and associated Biogeographic Information and Observation System data viewer version 5.56.24, with some additional data from the University of California, Davis Tricolored Blackbird Portal (University of California, Davis 2017). Occurrence data from eBird (2017) were used for western yellow-billed cuckoo to identify use of habitat along the Sutter Bypass. Yellow-billed cuckoo are strongly associated with riparian woodland in the RCIS area, and eBird occurrences for yellow-billed cuckoo in the RCIS area are limited primarily to areas adjacent to rivers. eBird data were not used to identify habitat use for the other focal bird species because eBird occurrence points were abundant for these species and not regularly associated with the habitat types classified for these species in the habitat distribution models (e.g., nesting vs. foraging; occurrence points can be of birds flying overhead). Occurrence records (e.g., from CNDDB, eBird, etc.) are also displayed in each species' habitat distribution map.

For CNDDB records, only occurrences documented after 1990 and presumed extant were used. Any occurrence record documented before 1990 is considered a historical location and is not shown on the habitat model. Data that are reported to the CNDDB are done so with varied precision. Some occurrences are very well documented with explicit locations (e.g., GPS coordinates) while other data are reported with more general location information. Precise occurrences are those that have sufficient information to be located on a standard U.S. Geological Survey 7.5 minute quadrangle map, either at specific location or with an accuracy of 262 feet. General occurrences are those that have been documented in very general terms and include non-specific records (such as the boundary of a park where an occurrence is known to occur) or records with an accuracy of 0.1, 0.2, 0.4, 0.6, 0.8, or 1.0 mile. Precise occurrences were assumed to be extant unless they were on sites that have obviously been converted to other land uses and were used to verify habitat distribution models.

Occurrences that fell outside of a model's predicted habitat distribution were evaluated to determine whether they indicated flaws in the model or were an anomalous or erroneous location point. Erroneous points were deleted; anomalous points (e.g., those that occur in unsuitable habitat, or beyond the expected range of the species), were retained but were not used to adjust the model results. Aerial photographs were examined to assess the significance of extreme outliers.

2.9.1.3 Occurrence Data Limitations

CNDDB records represent the best available statewide data but are limited in their use for conservation planning. CNDDB data document presence only; the absence of an occurrence data point does not indicate that the species is not present. CNDDB records rely on field biologist to voluntarily submit information on the results of surveys and monitoring. As a result, the database is biased geographically toward areas where surveys have been conducted or survey efforts are greater (many areas have not been surveyed at all and this is not reflected in the database). The database may also be biased toward species that receive more survey effort.

2.9.1.4 Model Uses and Limitations

The precision of the habitat distribution models is limited by several factors, including minimum mapping units of the underlying land cover datasets. Areas of suitable habitat smaller than the mapping thresholds were not mapped and, therefore, could not be incorporated into the models. This constraint limited the degree of resolution of some habitat features potentially important to some species. This presented challenges for focal plant species, which are often associated with unmapped microhabitats such as swales, ditches, or rock outcrops smaller than the minimum mapping unit.

The habitat distribution models were limited to distinguishing habitat uses based on key life history requirements such as breeding, foraging, or dispersal that are tied to land cover types. The land cover data do not allow further distinctions of habitat quality on a regional scale. To account for these limitations, conservative estimates of habitat parameters were used. This approach tends to overestimate the actual extent of suitable or required habitat for this species, but is consistent with current conservation planning practices when data are limited (Noss et al. 1997).

The habitat distribution models are intended to be used only for planning purposes at the scale of the RCIS area. The use of these models by project proponents is voluntary; the models impose no regulatory requirements. If used for site planning, the models should be only used as a guide. All species' habitat and occurrences should be verified in the field. Occurrence data are incomplete and limited by where field surveys have been conducted. Some occurrence points may also be geographically general or inaccurate.

2.9.2 Focal Species Profiles

The following species profiles summarize the regulatory status, distribution in the RCIS area, and habitat requirements for the focal species. The information provided in the species profiles is intended to be sufficient to develop effective and practical conservation goals, objectives, and actions for this Mid-Sacramento Valley RCIS. The profiles are not intended to provide a comprehensive summary of the biology and ecology of each focal species (for many focal species, such comprehensive summaries are available in state or federal listing decisions or recovery plans cited in the accounts below). A summary of the historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, on the focal species, is provided in Section 2.13, *Pressures and Stressors on Focal Species and other Conservation Elements*.

2.9.2.1 Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Regulatory Status

- **State:** None
- **Federal:** Threatened
- **Critical Habitat:** Final designated by USFWS on August 8, 1980 (FR 45:52803). Two zones have been designated and both critical habitat zones are located in Sacramento County.
- **Recovery Planning:** Final Recovery Plan for Valley Elderberry Longhorn Beetle approved in 1984 but is now outdated.

Life History

The valley elderberry longhorn beetle is endemic to the Central Valley of California and all phases of its life are completely dependent on its host plant, the elderberry (*Sambucus mexicana*, *S. caerulea, S. racemosa, S. glauca*) (Linsley and Chemsak 1972, 1997, Eng 1984, Barr 1991, Collinge et al. 2001). As elderberry trees or shrubs begin flowering in spring, adult beetles begin to emerge from tunnels (or pupal chambers) bored in the tree's pith (Barr 1991).

The adults readily fly from shrub to shrub, eating foliage and possibly flowers until they mate (Linsley and Chemsak 1972, Barr 1991, Talley et al. 2006). Valley elderberry longhorn beetle is most often seen on, in, or immediately under the host plant's flowers; however, copulation occurs on the lower parts of the stems (Barr 1991). The adults are active from March to early June. After mating, female valley elderberry longhorn beetles will lay between 8 and 20 eggs in bark crevices on the host plant and produce only one generation per year (Burke 1921, Barr 1991). The egg is attached to the plant by a thin secretion, and the larva encloses within 30 to 40 days (Burke 1921). After approximately 10 days, the newly emerged larvae bore into the wood of the host plant (Linsley and Chemsak 1972, Barr 1991). Burke (1921) and Eya (1976) reported that the larvae take 2 years to mature while inside the host plant; however, Halstead (1991) believes that 1 year is the norm. The larva typically bores into the central pith of stems and feeds there; however, on large trunks, the larvae feed on the wood (Burke 1921). The larvae create an elongated longitudinal gallery through the heart of the stems, filling it with debris and shredded wood (Barr 1991). When the larva is ready to pupate, it chews a circular to slightly oval exit hole to the outside, which it plugs with frass. Then the larva backs up into the gallery and constructs a pupal chamber out of shredded wood and frass (Barr 1991). Pupae can be found between January and April, and the pupal stage lasts about 1 month. After pupation, the adult remains in the pupal cell for several weeks prior to emergence (Burke 1921). The adult eventually emerges from the pupal chamber through the exit hole (Barr 1991) and the life cycle repeats.

Ecological Requirements

The elderberry shrub is a component of riparian forests throughout the Central Valley. Although this shrub occasionally occurs outside riparian areas, shrubs supporting the greatest beetle densities are located in areas where the shrubs are abundant and interspersed among dense riparian forest, including Fremont cottonwood, box elder (*Acer negundo*), California sycamore (*Platanus racemosa*), California walnut (*Juglans californica*), white alder (*Alnus rhombifolia*), willow (*Salix* spp.), button willow (*Cephalanthus occidentalis*), Oregon ash, California wild grape, California hibiscus (*Hibiscus californica*), and poison oak (Barr 1991, U.S. Fish and Wildlife Service 1999a, Collinge et al. 2001). There is also a strong association between blue elderberries and valley oaks which historically extended beyond riparian zones. Isolated elderberry shrubs separated from contiguous habitat by extensive development are not typically considered to provide viable habitat for valley elderberry longhorn beetle (U.S. Fish and Wildlife Service 1998, Collinge et al. 2001).

Valley elderberry longhorn beetle was likely common in elderberry savannah, which was historically more extensive in the California Central Valley, but now is limited to the confluence area of the American River, which is outside the RCIS Area (Jones & Stokes 1985, 1986, 1987, Barr 1991, U.S. Fish and Wildlife Service 1984, 1999a). In the RCIS area, valley elderberry longhorn beetle habitat can occur as stands of elderberry shrubs adjacent to, or contiguous with, riparian forest, floodplains, or relict elderberry savannah, and within riparian areas. Habitat occupied by valley elderberry longhorn beetle tends to form and exist in riparian corridors and on the level, open ground of periodically flooded river and stream terraces and floodplains.

Distribution

General

Desmocerus californicus is one of three species of *Desmocerus* in North America. Valley elderberry longhorn beetle is one of two subspecies of *D. californicus*. One subspecies is widespread in coastal California, ranging from Mendocino County southward to western Riverside and northern San Diego Counties, and into the southern Sierra Nevada range (Kern and Tulare Counties).

The valley elderberry longhorn beetle subspecies is a narrowly defined, endemic taxon, limited to portions of the Central Valley (U.S. Fish and Wildlife Service 1999a, 2006) from Shasta to Kern Counties (California Department of Fish and Wildlife, California Natural Diversity Database 2018). This subspecies is endemic to California, occurring below 2,953 feet elevation (U.S. Fish and Wildlife Service 1999a).

In the RCIS Area

Of the 271 CNDDB records for valley elderberry longhorn beetle, 18 are in the RCIS area, specifically in riparian corridors along the Sacramento River and Feather River (see Figure E-1, Appendix E, *Focal Species Habitat Models*). The majority of occurrences in the RCIS area are located in the protected areas of the Sacramento River NWR and within the Feather River Wildlife Area. There are five occurrences that are not located in protected areas along SR 99 south of Sullivan and on private lands east of Live Oak. Recent occurrences have also been recorded near Moulton Weir and the town of Meridian.

There are also occurrences of valley elderberry longhorn beetle south of the RCIS area along the Sacramento River riparian corridor and Putah Creek in Yolo County; and additional occurrences north of the RCIS area along the Sacramento River NWR in Glenn and Butte counties.

There is no designated critical habitat for the species in the RCIS area, and the RCIS area is not located within the three known sites (i.e., American River [Sacramento County], Putah Creek [Yolo and Solano Counties], and the Merced River [Merced County]), as described in the USFWS Final Recovery Plan (U.S. Fish and Wildlife Service1984) that are considered essential or important habitat.

Suitable habitat occurs along riparian corridors in the RCIS area. Because the spatial distribution of beetle is often minimal (Barr 1991, Collinge et al. 2001), the beetle is assumed to be a poor disperser (Collinge et al. 2001), or the dispersal ability of the species range is fairly limited (U.S. Fish and Wildlife Service 2014a). The lack of dispersal capabilities may contribute to the species' vulnerability to impacts from habitat fragmentation. Dispersal corridors throughout the species' range may be necessary to maintain long-term gene flow and population persistence.

Maintenance of dispersal corridors in the RCIS area is important to the conservation of valley elderberry longhorn beetle in the RCIS area, because of the habitat fragmentation along existing waterways. Restoring habitat connectivity between beetle populations along the Sacramento River in the RCIS area and beyond would help to restore connectivity between populations of the beetle north of Colusa to core populations south of the RCIS area, such as populations on the American River.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for valley elderberry longhorn beetle were developed to characterize riparian habitat and non-riparian habitat. Valley elderberry longhorn beetle rely on host elderberry trees primarily found in riparian areas. Riparian habitat was modeled by selecting all mapped valley foothill riparian land cover vegetation types. The beetle may also occur in elderberry shrubs that are adjacent to riparian habitat and these areas are characterized as non-riparian habitat in the model. Non-riparian habitat includes all potentially suitable areas immediately adjacent to riparian habitat that are likely to also contain elderberry shrubs. This habitat was modeled by selecting a 250-foot buffer zone from modeled riparian habitat into annual grassland, blue oak woodland and montane hardwood vegetation types (ICF 2018b).

Model Results

There are 14,667 acres of riparian and 6,773 acres of non-riparian modeled habitat for valley elderberry longhorn beetle in the RCIS area (see Figure E-1, Appendix E, *Focal Species Habitat Models*).

The majority of modeled habitat for valley elderberry longhorn beetle is restricted to the riparian corridors of the Sacramento River, Butte Creek, Sutter Bypass, Feather River, and in associated in protected areas north of the Colusa Basin Drainage Canal. The known valley elderberry longhorn beetle occurrences are shown in the modeled habitat and occurrences are generally concentrated along the Sacramento River riparian corridor, with a few occurrences in mapped habitat along the Feather River. There are three occurrences that are not located with mapped habitat, adjacent to SR 99 and SR 45; this is likely due to relatively small inaccuracies in the location of mapped occurrences. The habitat model mapped small patches of habitat in the western portion of the RCIS area and on the eastern and southeastern side of Sutter Buttes, however there are no known occurrences of valley elderberry longhorn beetle associated with these mapped areas. Site-specific conditions (i.e., the presence/absence of suitable elderberry shrubs) will dictate whether valley elderberry longhorn beetle could be present and should be assessed on-the-ground to determine whether the habitat on the site could support the species.

2.9.2.2 Green Sturgeon – Southern Distinct Population Segment (*Acipenser medirostris*)

Regulatory Status

- **State:** None
- **Federal:** Threatened
- **Critical Habitat:** NMFS made a final critical habitat designation for the Southern DPS on October 9, 2009 (74 FR 52300). Designated areas in California include the Sacramento River, Lower Feather River, and Lower Yuba River; the Delta; and Suisun, San Pablo, and San Francisco Bays. Critical habitat in the RCIS area includes the Sacramento River and lower Feather River.
- **Recovery Planning:** A Draft Recovery Plan was written by NMFS (2018), and is currently under public review.

Life History

There is relatively little known about the North American green sturgeon, particularly for those that spawn in the Sacramento River (The Nature Conservancy et al. 2008). Adult North American green sturgeon are believed to spawn every 3 to 5 years, but can spawn as frequently as every 2 years (National Marine Fisheries Service 2005b) and reach sexual maturity at an age of 15 to 20 years, with males maturing earlier than females. Adult green sturgeon begin their upstream spawning migrations into the San Francisco Bay in March, reach Knights Landing during April, and spawn between March and July (Heublein et al. 2009). Based on the distribution of sturgeon eggs, larvae, and juveniles in the Sacramento River, CDFW concluded that green sturgeon spawn in late spring and early summer upstream of Hamilton City, and possibly to Keswick Dam (Moyle et al. 2015). Peak spawning is believed to occur between April and June. Adult female green sturgeon produce between 59,000 and 242,000 eggs, depending on body size (Moyle et al. 1992, Van Eenennaam et al. 2006, Moyle et al. 2015). Water temperatures in spawning and egg incubation areas are critical; temperatures greater than 66.2°F are lethal to green sturgeon embryos (Mayfield and Cech 2004, Van Eenennaam et al. 2005, Allen et al. 2006). Acoustic tagging studies by Erickson et al. (2002) indicate that adult green sturgeon hold for as long as 6 months in deep (greater than 16 feet), low-gradient reaches or off-channel sloughs or coves of the river during summer months when water temperatures were between 59°F and 73.5°F). When ambient temperatures in rivers drop in fall and early winter (less than 50°F), and flows increase, fish move downstream and into the ocean (Moyle et al. 2015).

Juveniles spend 1 to 4 years in freshwater and estuarine habitats before they enter the ocean (Nakamoto et al. 1995). According to Heublein (2006), all adults leave the Sacramento River prior to September. Lindley et al. (2008) found frequent large-scale migrations of green sturgeon along the Pacific Coast. Kelly et al. (2007) reported that green sturgeon enter the San Francisco Estuary during the spring and remain until fall. Juvenile and adult green sturgeon enter coastal marine waters after making significant long-distance migrations with distinct directionality thought to be related to resource availability.

Ecological Requirements

As anadromous fish, North American green sturgeon rely on riverine, estuarine, and marine habitats during their long life. Freshwater habitat of green sturgeon of the Southern DPS varies in function, depending on location in the Sacramento River watershed. Spawning areas currently are limited to accessible reaches of the Sacramento River upstream of Hamilton City and downstream of Keswick Dam (Moyle et al. 2015). Preferred spawning habitats are thought to contain large cobble in deep and cool pools with turbulent water (California Department of Fish and Game 2002, Moyle 2002, Adams et al. 2002, Moyle et al. 2015). Sufficient flows are needed to oxygenate and limit disease and fungal infection of recently laid eggs (Deng et al. 2002, Parsley et al. 2002). Nearshore marine habitats must provide adequate food resources, suitable water quality, and natural cover for juvenile green sturgeon to successfully forage and grow to adulthood. Offshore marine habitats are also important for supporting growth and maturation of subadult green sturgeon.

Distribution

General

Green sturgeon ranges from Ensenada, Mexico to the Bering Sea, Alaska (Colway and Stevenson 2007, Moyle et al. 2015). Green sturgeon spawn in two California basins: the Sacramento and Klamath Rivers. These reproducing populations are genetically distinct and occupy the Southern and Northern DPS, respectively (Adams et al. 2002, Israel et al. 2004). The Southern DPS is the only population occurring in the RCIS Area. Within the Sacramento River basin, the Southern DPS ranges upstream in the Sacramento River to Keswick Dam, upstream in the Feather River to Fish Barrier Dam, and upstream in the Yuba River to the Daguerre Point Dam.

In the RCIS Area

Green sturgeon have been recorded in the Feather River as larvae caught in screw traps (Beamesderfer et al. 2004). Spawning upstream of the RCIS area in the Feather River has recently been recorded with eggs from three different sturgeon females (Van Eenenaam 2011). In spring 2011, many sturgeon adults were spotted during Dual Frequency Identification Sonar surveys (Seesholtz 2011). Most occurrences of green sturgeon are in the Sacramento River, and both the Sacramento and Feather Rivers are important migratory corridors to upstream spawning habitat. The Sacramento and Feather Rivers in the RCIS area are used as migratory and rearing habitat by green sturgeon. (Figure E-2, Appendix E, *Focal Species Habitat Models*). Adult green sturgeon have been found in the Sutter Bypass when flows are high in the Sacramento River and flood into the Bypass. However, they become stranded behind the weirs when flood waters recede. CDFW has gone into Sutter Bypass and rescued green sturgeon, returning them to the Sacramento River (California Department of Fish and Wildlife 2011). Relocation efforts help green sturgeon, but cannot prevent all mortality associated with stranding. The loss of even a few adult fish is detrimental to the population. It is important to construct structures at the Sutter Bypass weirs that allows passage of upstream migrating green sturgeon (National Marine Fisheries Service 2018). Critical habitat is designated in the Sacramento River, Feather River and Sutter Bypass in the RCIS area (Figure 2-7).

Green sturgeon are long-lived (up to 60 to 70 years) (Van Eenennaam et al. 2006). They have a low fecundity rate (59,000 to 242,000 eggs per female) due to a larger egg size and smaller adult size relative to white sturgeon (180,000 to 590,000 eggs per female). These characteristics make green sturgeon particularly susceptible to habitat degradation and overharvest (Musick 1999). With only one population in the Central Valley, a lack of spatial and geographic diversity make the viability of the Southern DPS vulnerable to changes in the environment and catastrophic events. As a result of low abundance, the population has limited genetic diversity, which decreases the ability of individuals in the green sturgeon population to withstand environmental variation.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

This RCIS mapped the distribution of green sturgeon in the RCIS area as mapped by the draft Recovery Plan, Green Sturgeon Southern DPS (National Marine Fisheries Service 2018) which also coincides with designated critical habitat. All habitat in the RCIS area is modeled as rearing and migration habitat, as green sturgeon does not spawn in the RCIS area.

Model Results

There are 172 miles of green sturgeon Southern DPS rearing and migration habitat in the RCIS area. Green sturgeon Southern DPS habitat is limited to the entire length of the Sacramento River and Feather River in the RCIS area, and Sutter Bypass. Figure E-2, Appendix E, *Focal Species Habitat Models*, displays the results of the modeled habitat for the green sturgeon Southern DPS within the RCIS area.

2.9.2.3 Central Valley Steelhead – Distinct Population Segment (*Oncorhynchus mykiss*)

Regulatory Status

- **State:** Species of Concern
- **Federal:** Threatened
- **Critical Habitat:** Critical habitat for the Central Valley steelhead DPS was designated by NMFS on September 2, 2005 (70 FR 52488) and includes 2,308 miles of stream habitat in the Central Valley and an additional 254 square miles of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex. Critical habitat in the RCIS area includes the Sacramento River, Feather River, and Butte Creek.
- **Recovery Planning:** Recovery Plan for the ESUs of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014).

Life History

Steelhead have a complex life history and may follow a variety of life-history patterns, including some that may exhibit anadromy (i.e., migrate to the ocean to mature as adults) or freshwater residency (i.e., are not migratory and reside their entire life in fresh water). The relationship between these two life-history forms when they occur together is poorly understood. Intermediate life-history patterns also exist and include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to nearshore ocean areas. These life-history patterns do not appear to be genetically distinct, and individuals exhibiting different life-history patterns have been observed interbreeding (Shapovalov and Taft 1954).

Adult steelhead in this DPS leave the ocean and enter fresh water to spawn when winter rains occur and water temperatures drop. Increased streamflow during runoff events appears to provide adults with cues that stimulate migration and allows improved conditions for fish to pass obstructions and shallow areas on their way upstream. Optimal migration temperatures are from 46° to 52°F (California Department of Fish and Game 1991). The season for upstream migration of Central Valley steelhead adults lasts from late October through the end of May, but typically the bulk of migration occurs between mid-December and mid-April. The preferred water temperature range for steelhead spawning is 30° to 52°F (California Department of Fish and Game 2000). Freshwater steelhead rearing sites contain suitable in-stream flows, water quantity, and quality (e.g., water temperatures 39° to 73°F [Moyle 2002]). The exact timing and rate of migration depend on several factors, including stream discharge, water temperature, the maturity of the fish, the behavior of the population, and possibly other factors.

Central Valley steelhead typically mature after 1 or 2 years in the ocean, with males commonly maturing in 1 year and females in 2 years. Steelhead fecundity is relatively high. A 22-inch female produces around 4,800 eggs, and a 30-inch fish produces an average of 9,000 to 10,000 eggs (Shapovalov and Taft 1954). By comparison, a 12-inch non-anadromous rainbow trout may produce closer to 1,000 eggs. Steelhead may survive spawning, return to the ocean, and return to spawn again. Repeat spawners may make up as much as 30% of the run, but typically only a relatively low percentage survive to spawn more than twice.

Ecological Requirements

Central Valley steelhead require conditions that support spawning habitat, freshwater rearing habitat, freshwater migration corridors, and ocean habitat in order to complete their life cycle.

Spawning habitat for Central Valley steelhead primarily occurs in mid to upper elevation reaches or immediately downstream of dams located throughout the Central Valley that contain suitable environmental conditions (e.g., seasonal water temperatures, substrate, and dissolved oxygen) for spawning and egg incubation and floodplain connectivity to form and maintain physical habitat conditions that support juvenile growth and mobility, provide forage species, and include cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Spawning areas and migratory corridors may also function as rearing habitat for juveniles, which feed and grow before and during their outmigration.

Optimal freshwater steelhead migration corridors (including river channels, channels through the Delta, and the Bay-Delta estuary) support mobility, survival, and food supply for juveniles and adults. Migration corridors should be free from obstructions (passage barriers and impediments to migration), provide favorable water quantity (in-stream flows) and quality conditions (seasonal water temperatures), and contain natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

Most juvenile steelhead rear in coastal marine waters for approximately 1 to 2 years, returning to the Central Valley rivers as adults to spawn. During their marine residence, steelhead forage on krill and other marine organisms. Offshore marine areas with water quality conditions and food, including squid, crustaceans, and fish (fish become a larger component in the steelhead diet later in life [Moyle 2002]) that support growth and maturation are important habitat elements.

Distribution

General

Central Valley steelhead were widely distributed historically throughout the Sacramento and San Joaquin Rivers (Busby et al. 1996, McEwan 2001). Steelhead inhabited waterways from the upper Sacramento and Pit River systems (now inaccessible because of Shasta and Keswick Dams) south to the Kings River and possibly the Kern River systems, and in both east- and west-side Sacramento River tributaries (Yoshiyama et al. 1996). Lindley et al. (2006) estimated that there were historically at least 81 independent Central Valley steelhead populations distributed primarily throughout the eastern tributaries of the Sacramento and San Joaquin Rivers.

In the RCIS Area

Existing wild steelhead stocks in the Central Valley inhabit the upper Sacramento River and its tributaries. Populations may exist in Butte Creek, and a few wild steelhead are produced in the Feather River (McEwan and Jackson 1996). The Sacramento River, Feather River, Sutter Bypass, Tisdale Bypass, and Butte Creek in the RCIS area are used as a migratory corridor and rearing habitat. The Sacramento and Feather rivers and Butte Creek in the RCIS area are migratory routes to upstream spawning habitat, and are also used as rearing areas. The most northeastern section of the Feather River in the RCIS area provides some spawning habitat for Central Valley steelhead (Figure E-3, Appendix E, *Focal Species Habitat Models*). Sutter and Tisdale bypasses provide migratory and rearing habitat for juvenile steelhead emigrating downstream towards the ocean. Critical habitat is designated in all the waterways in the RCIS area (Figure 2-4).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

This RCIS mapped the distribution and habitat of Central Valley steelhead in the RCIS area as mapped in Figures 2-9 and 2-10 in the Recovery Plan for the ESUs of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014) and also coincides with designated critical habitat. All habitat in the RCIS area is modeled as rearing and migration habitat, as Central Valley steelhead does not spawn in the RCIS area.

Model Results

There are 189 miles of Central Valley steelhead rearing and migration habitat in the RCIS area. Modeled habitat is in the entire length of the Sacramento River and Feather River within the RCIS area, and Sutter Bypass, Tisdale Bypass, and Butte Creek. Figure E-3, Appendix E, *Focal Species Habitat Models*, displays modeled habitat for Central Valley steelhead in the RCIS area.

2.9.2.4 Sacramento River Winter-Run Chinook Salmon – Evolutionarily Significant Unit (*Oncorhynchus tshawytscha*)

Regulatory Status

- **State:** Endangered
- **Federal:** Endangered
- **Critical Habitat:** Critical habitat for the Sacramento River winter-run Chinook ESU was designated under the ESA on June 16, 1993 (58 FR 33212). Designated critical habitat includes the Sacramento River from Keswick Dam (river mile 302) to Chipps Island (river mile 0) at the westward margin of the Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker, Grizzly, and Suisun bays, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge (59 FR 440, January 4, 1994). The Sacramento River in the RCIS area is designated as critical habitat for Sacramento River winter-run Chinook salmon.

- **Recovery Planning:** Recovery Plan for the ESUs of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014a).

Life History

Chinook salmon exhibit two generalized freshwater life history types (Healey 1991). Stream-type adults enter fresh water months before spawning and juveniles reside in fresh water for a year or more following emergence, whereas ocean-type adults spawn soon after entering fresh water and juveniles migrate to the ocean as fry or parr in their first year. Winter-run Chinook salmon are somewhat anomalous in that they have characteristics of both stream- and ocean-type races (Healey 1991). Adults enter fresh water in winter or early spring, and delay spawning until spring or early summer (stream-type). The maximum suitable water temperature for holding is 59 to 60°F (National Marine Fisheries Service 1997). However, juvenile winter-run Chinook salmon migrate to sea after only 4 to 7 months of river life (ocean-type). Adequate in-stream flows and cool water temperatures are more critical for the survival of Chinook salmon exhibiting a stream-type life history due to over-summering by adults and/or juveniles.

Sacramento River winter-run Chinook salmon spawn during the summer months (late April through mid-August, peaking in June and July) between Keswick Dam and Red Bluff Diversion Dam (Vogel and Marine 1991). Spawning sites include those stream reaches with clean loose gravel, in swift, relatively shallow riffles, or along margins of deeper river reaches (National Marine Fisheries Service 2014). Water temperatures range from 50 to 59°F (National Marine Fisheries Service 2014). Water velocity and substrate conditions are more critical to the viability of spawning habitat than depth. Incubating eggs and embryos buried in gravel require sufficient water flow through the gravel to supply oxygen and remove metabolic wastes (California Department of Fish and Game 1998). Water velocity in Chinook salmon spawning areas typically ranges from 1.0 to 3.5 feet per second and optimum velocity is 1.5 feet per second (California Department of Fish and Game 1998). Spawning occurs at depths between 1 to 5 feet with a maximum observed depth of 20 feet. A depth of less than 6 inches can be restrictive to Chinook salmon movement.

Sacramento River winter-run Chinook salmon fry begin to emerge from the gravel in late June to early July and continue through October (Fisher 1994). Fry then seek lower velocity nearshore habitats with riparian vegetation and associated substrates important for providing aquatic and terrestrial invertebrates, predator avoidance, and slower velocities for resting (National Marine Fisheries Service 1996a). This edge habitat also provides slower water velocities for resting (National Marine Fisheries Service 1996a). As they grow larger, they will move into deeper water with higher velocities, but still need velocity refugia (Healey 1991). Emigrating juvenile Sacramento River winter-run Chinook salmon pass the Red Bluff Diversion Dam beginning as early as mid-July, typically peaking in September, and can continue through March in dry years (Vogel and Marine 1991, National Marine Fisheries Service 1997). Many juveniles apparently rear in the Sacramento River below Red Bluff Diversion Dam for several months before they reach the Delta (Williams 2006). From 1995 to 1999, all Sacramento River winter-run Chinook salmon outmigrating as fry passed the Red Bluff Diversion Dam by October, and all outmigrating presmolts and smolts passed the Red Bluff Diversion Dam by March (Martin et al. 2001). Both spawning areas and migratory corridors also function as rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing.

The majority of Sacramento River winter-run Chinook salmon spawners are 3 years old. Adult winter-run Chinook salmon tend to enter fresh water as sexually immature fish, migrate far upriver, and delay spawning for weeks or months. The female digs a nest, called a redd, in which she buries her eggs after they are fertilized by the male (National Marine Fisheries Service 2014a).

Juvenile Chinook salmon inhabit nearshore coastal marine waters for typically 2 to 4 years before adults return to Central Valley rivers to spawn. During their marine residence, Chinook salmon forage on krill, squid, and other marine invertebrates and a variety of fish such as northern anchovy, sardines, and Pacific herring.

Ecological Requirements

Sacramento River winter-run Chinook salmon require conditions that support spawning habitat, freshwater rearing habitat, freshwater migration corridors, estuarine, and ocean habitat to complete their life cycle.

Freshwater migration corridors should be free from obstructions (passage barriers and impediments to migration), provide favorable water quantity (in-stream flows) and quality conditions (National Marine Fisheries Service 1997), and contain natural cover such as submerged and overhanging large wood, native aquatic vegetation, large woody debris, rocks and boulders, side channels, and undercut banks. Migratory corridor conditions are strongly affected by the presence of passage barriers, which can include dams, unscreened or poorly screened diversions, and degraded water quality. Adults hold in pools for several months before spawning.

Estuarine migration and juvenile rearing habitats should be free of obstructions (i.e., dams and other barriers) and provide suitable water quality, water quantity (river and tidal flows), and salinity conditions to support juvenile and adult physiological transitions between fresh and salt water. Natural cover, such as submerged and overhanging large wood, native aquatic vegetation, and side channels, provide juvenile foraging habitat and cover from predators. Tidal wetlands and seasonally inundated floodplains have also been identified as high-value foraging and rearing habitats for juvenile salmon migrating downstream through the estuary.

Distribution

General

The distribution of winter-run Chinook salmon spawning and rearing was limited historically to the upper Sacramento River and tributaries, where cool spring-fed streams supported successful adult holding, spawning, egg incubation, and juvenile rearing (Slater 1963, Yoshiyama et al. 1998).

Primary spawning and rearing habitats for Sacramento River winter-run Chinook salmon are now confined to the cold-water areas between Keswick Dam and Red Bluff Diversion Dam. The lower reaches of the Sacramento River, Sacramento–San Joaquin River Delta and San Francisco Bay serve as migration corridors for the upstream migration of adult and downstream migration of juvenile winter-run Chinook salmon.

In the RCIS Area

Sacramento River winter-run Chinook salmon use the Sacramento River, Feather River, Sutter Bypass and Tisdale Bypass in the RCIS area as a migratory corridor and rearing habitat. The Sacramento River is used by adults to migrate upstream to spawn between Keswick Dam and Red

Bluff Diversion Dam and as a rearing area for juveniles. The Feather River, Sutter Bypass and Tisdale Bypass may be used by emigrating juvenile Chinook salmon for rearing (Figure E-4, Appendix E, *Focal Species Habitat Models*). Critical habitat is designated in the Sacramento River and Sutter Bypass and Tisdale Bypass in the RCIS area (Figure 2-6).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

This RCIS mapped the distribution and habitat of Sacramento winter-run Chinook salmon in the RCIS area as mapped in Figures 2-1 and 2-3 in the Recovery Plan for the ESUs of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014) and also coincides with designated critical habitat. All habitat in the RCIS area is modeled as rearing and migration habitat, as Sacramento River winter-run Chinook salmon do not spawn in the RCIS area.

Model Results

There are 144 miles of Sacramento winter-run Chinook salmon in the RCIS area. Modeled habitat is in the entire length of the Sacramento River and Feather River in the RCIS area, and Sutter and Tisdale bypasses. Figure E-4, Appendix E, *Focal Species Habitat Models*, displays modeled habitat for Sacramento winter-run Chinook salmon in the RCIS area.

2.9.2.5 Central Valley Spring-Run Chinook Salmon – Evolutionarily Significant Unit (*Oncorhynchus tshawytscha*)

Regulatory Status

- **State:** Threatened
- **Federal:** Threatened
- **Critical Habitat:** Critical habitat for Central Valley spring run Chinook salmon ESU was updated on September 2, 2005 (70 FR 52488). Designated critical habitat includes 1,158 miles of stream habitat in the Sacramento River basin and 254 square miles of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex (70 FR 52488). Critical habitat in the RCIS area includes the Feather and Sacramento Rivers and Butte Creek.
- **Recovery Planning:** Recovery Plan for the ESUs of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014).

Life History

Chinook salmon typically mature between 2 and 6 years of age, although more commonly from 2 to 4 years (Myers et al. 1998). Timing of freshwater entry and spawning are generally thought to be related to local water temperature and flow regimes. Runs are designated based on adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime, and flow characteristics of their spawning site, and the actual time of spawning (Myers et al. 1998). Spring-run Chinook salmon tend to enter fresh water as immature fish, migrate far upriver, hold in cool-water pools for a period of months during the spring and summer, and delay spawning until the early fall.

Adult Central Valley spring-run Chinook salmon begin their upstream migration in late January and early February (California Department of Fish and Game 1998) and enter the Sacramento River between February and September, primarily in May and June (Yoshiyama et al. 1998, Moyle 2002). Lindley et al. (2006) reported that adult Central Valley spring-run Chinook salmon enter native tributaries from the Sacramento River primarily between mid-April and mid-June. Typically, spring-run Chinook salmon use mid- to high-elevation streams that provide appropriate seasonal water temperatures and sufficient flow, cover, and pool depth to allow over-summering while conserving energy and allowing their gonadal tissue to mature (Yoshiyama et al. 1998). For maximum embryo survival, water temperatures must be between 41° and 55.4°F and dissolved oxygen close to saturation level (Moyle 2002).

Spring-run Chinook salmon fry emerge from the gravel from September to April (Moyle 2002, Harvey 1995, Bilski and Kindopp 2009). The timing of timing is highly variable, as they may migrate downstream as young-of-the-year or as juveniles or yearlings. Fry may continue downstream to the estuary and rear, or may take up residence in the stream for a period from weeks to a year (Healey 1991). Fry seek streamside habitats with beneficial characteristics such as riparian vegetation and associated substrates that provide aquatic and terrestrial invertebrates, cover that provides areas for predator avoidance, and slower water velocities for resting (National Marine Fisheries Service 1996b). Studies found that the majority of Central Valley spring-run Chinook salmon migrants are fry occurring primarily during December, January, and February, and that fry movements appeared to be influenced by flow (Ward et al. 2002 and 2003, McReynolds et al. 2005). Small numbers of Central Valley spring-run Chinook salmon remained in Butte Creek to rear and migrated as yearlings later in the spring (Lindley et al. 2006).

Once juveniles emerge from the gravel they initially seek areas of shallow water and low velocities while they finish absorbing the yolk sac (Moyle 2002). Many also disperse downstream during high-flow events. As is the case with other salmonids, there is a shift in microhabitat use by juveniles to deeper, faster water as they grow, but still seek shelter and velocity refugia to minimize energy expenditures (Healey 1991). Microhabitat use can be influenced by the presence of predators, which can force juvenile salmon to select areas of heavy cover and suppress foraging in open areas (Moyle 2002). Peak movement of yearling Central Valley spring-run Chinook salmon in the Sacramento River at Knights Landing occurs in December, and young-of-the-year juveniles occur in March and April; however, juveniles were also observed between November and the end of May (Snider and Titus 2000).

Ecological Requirements

Central Valley spring-run Chinook salmon require conditions that support spawning habitat, freshwater rearing habitat, freshwater migration corridors, estuarine, and ocean habitat to complete their life cycle. Their ecological requirements are the same as winter-run Chinook salmon.

Chinook salmon spawn in clean, loose gravel in swift, relatively shallow riffles or along the margins of deeper reaches where suitable water temperature, depth, and velocity favor redd construction and adequate oxygenation of incubating eggs. Chinook salmon spawning typically occurs in gravel beds located at the tails of holding pools (U.S. Fish and Wildlife Service 1995). Most spawning habitat in the Central Valley for spring-run Chinook salmon is located in areas directly downstream of dams containing suitable environmental conditions for spawning and incubation. Currently, Central Valley spring-run Chinook salmon spawn on the mainstem Sacramento River between the Red Bluff Diversion Dam and Keswick Dam, and in tributaries such as the Feather River, Mill, Deer, Clear, Battle, and Butte Creeks.

Freshwater rearing sites have sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; suitable water quality; availability of suitable prey and forage to support juvenile growth and development; and natural cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large woody debris, rocks and boulders, side channels, and undercut banks. Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their outmigration.

Freshwater migration corridors for spring-run Chinook salmon, including river channels, channels through the Delta, and the Bay-Delta estuary support mobility, survival, and food supplies for juveniles and adults. Migration corridors should be free from obstructions (passage barriers and impediments to migration), have favorable water quantity (in-stream flows) and quality conditions (seasonal water temperatures), and contain natural cover such as submerged and overhanging large wood, native aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Migratory corridors for Central Valley spring-run Chinook salmon are located downstream of the spawning areas and include the lower Sacramento River, lower Feather River, tributaries providing suitable adult holding and spawning habitat, the Delta, and the San Francisco Bay complex extending to coastal marine waters. Central Valley spring-run Chinook salmon tend to enter fresh water as immature fish, migrate far upriver, hold in cool-water pools for a period of months during the spring and summer, and delay spawning until the early fall.

Estuarine migration and juvenile rearing habitats should be free of obstructions (i.e., dams and other barriers) and provide suitable water quality, water quantity (river and tidal flows), and salinity conditions to support juvenile and adult physiological transitions between fresh and salt water. Within the Delta, juvenile Chinook salmon forage in shallow areas with protective cover, such as tidally influenced sandy beaches and shallow water areas with emergent aquatic vegetation (Meyer 1979, Healey 1980). Natural cover, such as submerged and overhanging large wood, native aquatic vegetation, and side channels provide juvenile foraging habitat and cover from predators. Tidal wetlands and seasonally inundated floodplains are identified as high-value foraging and rearing habitats for juvenile salmon migrating downstream through the estuary.

Biologically productive coastal waters are an important habitat component for the ESU. Juvenile Chinook salmon typically inhabit nearshore coastal marine waters for 2 to 4 years before adults return to Central Valley rivers to spawn. During their marine residence, Chinook salmon forage on krill, squid, and other marine invertebrates, as well as a variety of fish such as northern anchovy and Pacific herring.

Distribution

General

Historically, spring-run Chinook salmon were predominant throughout the Central Valley, occupying the upper and middle reaches (1,000 to 6,000 feet) of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud and Pit Rivers, with smaller populations in most tributaries with sufficient habitat for adult salmon holding over the summer months (Stone 1874, Rutter 1904, Clark 1929). Naturally spawning populations of Central Valley spring-run Chinook salmon with consistent spawning returns are currently restricted to Butte Creek, Deer Creek, and Mill Creek (Good et al. 2005). The Feather River Hatchery produces spring-run Chinook salmon on the Feather River.

In the RCIS Area

Central Valley spring-run Chinook salmon are present in the Sacramento River and Feather River in the RCIS area, and the Sutter Bypass, Tisdale Bypass and Butte Creek. All of these waterways provide migratory and rearing habitat. The Sacramento and Feather rivers and Butte Creek in the RCIS area are migratory routes to upstream spawning habitat and are rearing habitat for juveniles. The northeastern-most section of the Feather River in the RCIS area provides some spawning habitat for spring-run Chinook salmon. Sutter and Tisdale bypasses provide rearing habitat for juvenile Chinook salmon emigrating downstream towards the ocean (Figure E-5, Appendix E, *Focal Species Habitat Models*). Critical habitat is designated in all waterways in the RCIS area (Figure 2-5).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

This RCIS mapped the distribution and habitat of Central Valley spring-run Chinook salmon in the RCIS area as mapped in Figure 2-4 in the Recovery Plan for the ESUs of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014) and also coincides with designated critical habitat. All habitat in the RCIS area is modeled as rearing and migration habitat, as Central Valley spring-run Chinook salmon does not spawn in the RCIS area.

Model Results

There are 188 miles of Central Valley spring-run Chinook salmon in the RCIS area. Modeled habitat is in the entire length of the Sacramento River and Feather River within the RCIS area, and the Sutter Bypass, Tisdale Bypass, and Butte Creek. Figure E-5, Appendix E, *Focal Species Habitat Models*, displays modeled Central Valley spring-run Chinook salmon in the RCIS area.

2.9.2.6 Central Valley Fall/Late Fall-Run Chinook Salmon (*Oncorhynchus tshawytscha*)

Regulatory Status

- **State:** Species of Special Concern
- **Federal:** Species of Concern
- **Critical Habitat:** None
- **Recovery Planning:** None

Life History

Chinook salmon exhibit two characteristic freshwater life history types (Healey 1991). Stream-type adult Chinook salmon enter fresh water months before spawning, and their offspring reside in fresh water 1 or more years following emergence. In contrast, ocean-type Chinook salmon spend significantly less time in fresh water, spawning soon after entering fresh water as adults and migrating to the ocean as juvenile fry or parr in their first year. Adequate stream flows and cool water temperatures are more critical for the survival of Chinook salmon exhibiting the stream-type life history behaviors because of their residence in fresh water both as adults and juveniles over the warmer summer months (Moyle et al. 2015).

Central Valley fall-run Chinook salmon exhibit an ocean-type life history. Chinook salmon typically mature between 2 and 6 years of age (Myers et al. 1998). The majority of Central Valley fall-run Chinook salmon spawn at age 3.

Adult fall-run Chinook salmon migrate through the Delta and into Central Valley rivers from June through December and spawn from September through December. Adult late fall–run Chinook salmon migrate through the Delta and into the Sacramento River from October through April and may wait 1 to 3 months before spawning from December through April (U.S. Fish and Wildlife Service 2001). Peak spawning activity for fall-run fish usually occurs in October and November. Late-fall run Chinook salmon's peak spawning activity occurs in February and March (U.S. Fish and Wildlife Service 2001).

Ecological Requirements

Central Valley fall/late fall-run Chinook salmon require conditions that support spawning habitat, freshwater rearing habitat, freshwater migration corridors, estuarine, and ocean habitat to complete their life cycle. Their ecological requirements are the same as winter-run and spring-run Chinook salmon.

Chinook salmon spawning sites include those stream reaches with in-stream flows, water quality, and substrate conditions suitable to support spawning, egg incubation, and larval development. Late fall–run Chinook salmon spawning is limited to the mainstem and tributaries of the Sacramento River. They also require cool water temperatures for migration, spawning, and rearing, the same as winter-run and spring-run Chinook salmon (Moyle et al. 2015).

Fall- and late fall–run Chinook salmon rear in streams and rivers with sufficient water flow and floodplain connectivity. They rear in these areas to form and maintain physical habitat conditions that support growth and mobility and provide suitable water quality (e.g., seasonal water temperatures) and forage species that support juvenile salmon growth and cover such as shade, submerged and overhanging large wood, logjams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks (Moyle et al. 2015). Both spawning areas and migratory corridors might also function as rearing habitat for juveniles, which feed and grow before and during their outmigration.

Freshwater migration corridors for fall- and late fall–run Chinook salmon, including river channels, channels through the Delta, and the Bay-Delta estuary, support mobility, survival, and food supply for juveniles and adults. Migration corridors should be free from obstructions (passage barriers and impediments to migration), have favorable water quantity (in-stream flows) and quality conditions (seasonal water temperatures), and contain natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks (Moyle et al. 2015).

Estuarine migration and juvenile rearing habitats should be free of obstructions (i.e., dams and other barriers) and provide suitable water quality, water quantity (river and tidal flows), and salinity conditions to support juvenile and adult physiological transitions between fresh- and saltwater.

Natural cover, such as submerged and overhanging large wood, aquatic vegetation, and side channels, provides juvenile and adult foraging.

Biologically productive coastal waters are an important habitat component for Central Valley fall- and late fall–run Chinook salmon. Juvenile fall-run and late fall–run Chinook salmon inhabit near-shore coastal marine waters for typically 2 to 4 years before adults return to Central Valley rivers to spawn (Moyle et al. 2015). During their marine residence Chinook salmon forage on krill, squid, and other marine invertebrates, as well as a variety of fish such as northern anchovy and Pacific herring.

Distribution

General

Central Valley fall-run Chinook salmon historically spawned in all major tributaries, as well as the mainstem of the Sacramento and San Joaquin Rivers. The historical geographic distribution of Central Valley late fall–run Chinook salmon is not well understood, but is thought to be less extensive than that of fall-run. The late fall–run fish most likely spawned in the upper Sacramento and McCloud Rivers in reaches now blocked by Shasta Dam, as well as in sections of major tributaries where there was adequate cold water in summer. There is also some evidence they once spawned in the San Joaquin River in the Friant region and in other large San Joaquin tributaries (Yoshiyama et al. 1998). Currently, fall-run Chinook salmon still occur in major tributaries of the mainstem Sacramento River (Moyle et al. 2015).

In the RCIS Area

Fall and late-fall run Chinook salmon occur in the Sacramento River, Feather River, Butte Creek, Sutter Bypass, and Tisdale Bypass. All of these waterways are migratory and rearing habitat. The Sacramento and Feather rivers and Butte Creek in the RCIS area are migratory routes to upstream spawning habitat, and rearing habitat for juveniles. The northeastern-most section of the Feather River in the RCIS area provides some spawning habitat for fall and late-fall-run Chinook salmon. Sutter and Tisdale bypasses provide rearing habitat for juvenile Chinook salmon emigrating downstream towards the ocean (Figure E-6, Appendix E, *Focal Species Habitat Models*). No critical habitat has been designated for fall/late fall-run Chinook salmon since they are not federally listed as threatened or endangered.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Central Valley fall/late fall-run Chinook salmon's ecological requirements are the same as winter-run and spring-run Chinook salmon. This RCIS mapped the distribution and habitat of Sacramento winter-run Chinook salmon in the RCIS area as mapped in Figures 2-1 and 2-3 in the Recovery Plan for the ESUs of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the DPS of California Central Valley Steelhead (National Marine Fisheries Service 2014). All habitat in the RCIS area is modeled as rearing and migration habitat, as Central Valley fall/late fall-run Chinook salmon does not spawn in the RCIS area.

Model Results

There is 188 miles of Central Valley fall/late fall-run Chinook salmon habitat in the RCIS. Modeled habitat includes the entire length of the Sacramento River and Feather River within the RCIS area, and Butte Creek, Sutter Bypass, and Tisdale Bypass. Figure E-6, Appendix E, *Focal Species Habitat Models*, displays modeled Central Valley fall/late fall-run Chinook salmon habitat in the RCIS area.

2.9.2.7 Giant Garter Snake (*Thamnophis gigas*)

Regulatory Status

- **State:** Threatened
- **Federal:** Threatened
- **Critical Habitat:** None designated

Recovery Planning: Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*) (U.S. Fish and Wildlife Service 2017a).

Life History

The giant garter snake is an aquatic snake endemic to the Central Valley of California. Described as among California's most aquatic garter snakes (Fitch 1940), giant garter snakes are associated with low-gradient streams and Central Valley floor wetlands and marshes. Giant garter snake are also able to thrive in regions of rice agriculture.

After spending cool winter months in dormancy or periods of reduced activity, giant garter snakes typically emerge from underground overwintering sites in late March to early April and remain active through October, although the specific timing of annual activity is subject to varying seasonal weather conditions. Daily activity consists of emerging from burrows after sunrise, basking to warm bodies to active temperatures, and foraging or courting for the remainder of the day (Hansen and Brode 1993). Upon emerging from underground overwintering sites, male giant garter snakes immediately disperse in search of mates, and breeding takes place from March into early May. Female giant garter snakes brood young internally, giving birth to live young from late July through early September (Hansen and Hansen 1990). Young immediately disperse and seek shelter to absorb their yolk sacs, after which they molt and begin feeding on their own. Brood size ranges from 10 to 46 young (Hansen and Hansen 1990). Giant garter snake activity generally peaks during spring emergence and courtship from April into June, whereupon observations of giant garter snakes diminish until a second peak is observed after females give birth (Hansen and Brode 1993, Wylie et al. 1997, U.S. Fish and Wildlife Service 1999b, Hansen 2004b). Giant garter snakes continue to actively forage and occasionally court until the onset of cooler fall temperatures.

The giant garter snake typically overwinters in burrows and crevices near active season foraging habitat (Hansen 2004a). Although the snakes tend to overwinter near aquatic habitat, individuals have been noted using burrows as far as 164 feet from marsh edges during the active season, and retreating as far as 820 feet from the edge of wetland habitats while overwintering, presumably to reach hibernacula above the annual high water mark (Wylie et al. 1997, U.S. Fish and Wildlife Service 1999b).

Giant garter snakes feed on small fishes, tadpoles, and small frogs (Hansen 1980, U.S. Fish and Wildlife Service 1999b), while juveniles probably consume insects and other small invertebrates.

Giant garter snakes are not known to consume larger terrestrial prey such as small mammals or birds.

Ecological Requirements

Habitats occupied by giant garter snakes typically contain permanent or seasonal water, mud bottoms, and vegetated dirt banks (Fitch 1940, Hansen and Brode 1980). This species appears to be mostly absent from permanent waters that support established populations of predatory game fishes; from streams and wetlands with sand, gravel, or rock substrates; and from riparian woodlands lacking suitable basking sites, prey populations, and cover vegetation (Hansen and Brode 1980, Rossman and Stewart 1987, Brode 1988, U.S. Fish and Wildlife Service 1999b). The species may also avoid natural or artificial waterways that undergo routine dredging, mechanical or chemical weed control, or compaction of bank soils (Hansen and Brode 1993).

Giant garter snakes are associated with aquatic habitats characterized by the following features: 1) sufficient water during the snake's active season (typically early spring through mid-fall) to supply cover and food such as small fish and amphibians; 2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, accompanied by vegetated banks to provide basking and foraging habitat and escape cover during the active season; 3) upland habitat (e.g., bankside burrows, holes, and crevices) to provide short-term refuge areas during the active season; and 4) high ground or upland habitat above the annual high water mark to provide cover and refuge from flood waters during the dormant winter period (Hansen and Brode 1980, Hansen 1980).

Distribution

General

The current known distribution of giant garter snakes extends from near Chico in Butte County south to the Mendota Wildlife Area in Fresno County. Occurrences of giant garter snakes are not known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (Hansen and Brode 1980, U.S. Fish and Wildlife Service 1993). Recent occurrence records indicate that, within this range, garter snakes are distributed in 13 unique population clusters coinciding with historical flood basins, marshes, wetlands, and tributary streams of the Central Valley (Hansen and Brode 1980, Brode and Hansen 1992, U.S. Fish and Wildlife Service 1999b). These populations are isolated, without protected dispersal corridors to other adjacent populations, and are threatened by land use practices and other human activities, including development of wetland and suitable agricultural habitats.

In the RCIS Area

There are 98 CNDDB occurrences located within the RCIS area. Giant garter snakes generally occur in agricultural rice and freshwater emergent wetland habitat throughout the RCIS area (Figure E-7, Appendix E, *Focal Species Habitat Models*). In the northern region of the RCIS area, there are a number of occurrences of giant garter snake in the agricultural rice lands in the vicinity of Williams and Maxwell, west of I-5, and in protected wetlands of the Delvan NWR. In the middle region of the RCIS area, occurrences are predominately located in agricultural lands south of the town of Colusa, and within wetlands of Colusa NWR. In the south and southeastern region of the RCIS area, giant garter snake occurrences are concentrated in agricultural lands north of Robbins and in portions of the Sutter Bypass, particularly along the Sutter NWR. There are occurrences of the species west of the Feather River and east of Sutter Buttes in cultivated lands.

Just outside of the RCIS area there are multiple occurrence records along the Colusa Basin Drainage Canal, Tule Canal, and Knights Landing Ridge Cut Canal south of the RCIS area in Yolo County. Giant garter snake occurrences are also recorded at Cross Canal and North Drainage Canal just outside and southeast of the RCIS area in Sutter County. There are also occurrences within the Sacramento NWR and Sacramento River NWR north of the RCIS area in Glenn County.

Due to the loss of natural wetland habitat, the giant garter snake relies heavily on rice fields in the Sacramento Valley for suitable habitat. The species also utilizes managed marsh habitat in Federal NWRs and state wildlife areas (U.S. Fish and Wildlife Service 2017a). Rice habitat and wildlife refuges located within the RCIS area provide suitable habitat for the species, and based on occurrence records, a sizeable population of giant garter snakes is present within the RCIS area. Portions of the RCIS area corresponds with the "most suitable" categories in an analysis of the potential habitat distribution in the Sacramento Valley (Halstead et al. 2010). The giant garter snake recovery plan (U.S. Fish and Wildlife Service 2017a) identifies recovery units critical for the conservation of the species. The RCIS area overlaps with portions the Butte Basin, Colusa Basin and Sutter Basin recovery units (Section 2.2.5.5, *Giant Garter Snake*).

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for giant garter snake were developed to characterize wetland habitat, rice habitat, upland movement habitat, and overwintering habitat (Hansen 1980, Hansen and Brode 1980, ICF 2018b). Giant garter snake is associated with low-gradient streams, and Central Valley floor freshwater wetlands and marshes. Wetland habitat is generally seasonal or managed freshwater wetlands that may support inclusions of perennial wetland. This habitat was modeled by selecting all mapped freshwater emergent wetland vegetation types, open water, and other aquatic habitat types (i.e., lacustrine and riverine) located adjacent to suitable agricultural canals and ditches shown in the U.S. Geological Survey National Hydrology Dataset. Larger water features with rapidly moving water including the Sacramento River and Feather River were excluded along with water features surrounded by development without surrounding upland habitat (U.S. Fish and Wildlife Service 1999b, 2015). Due to the loss of the snake's natural habitat, rice agriculture has become a major habitat component for giant garter snake in the Central Valley (Hansen and Brode 1993). The primary habitat within rice land are the conveyance channels and irrigations canals, which provide foraging and movement habitat. Mapped rice habitat includes associated water conveyance infrastructure consisting of a matrix of channels, levees, and ditches. Upland movement habitat includes all potentially suitable active season upland movement areas adjacent to modeled rice, open water, and wetland land cover types with the potential to provide thermoregulation (i.e., basking) and short-term refuge (i.e., summer shelter in burrows) for giant garter snake (U.S. Fish and Wildlife Service 2015). This habitat was modeled by selecting all natural vegetation types that occur within 200 feet of modeled rice and wetland land cover types (U.S. Fish and Wildlife Service 2017a). Note that if habitat in this category remains outside the winter flood zone it may also be used for overwintering. Higher elevation uplands are used for cover and refuge from flood waters and required during the snake's inactive season in the winter. Overwintering habitat includes all potentially suitable upland refugia habitat (i.e., small mammal burrows and soil crevices above flood elevations) outside of the active season upland movement habitat that may provide long-term refuge or hibernacula during the winter. This habitat was modeled by selecting all natural vegetation types that occur between 200 and 820 feet from modeled rice and wetland land cover types (U.S. Fish and Wildlife Service 2015).

Model Results

There are 51,677 acres of wetland, 215,622 acres of rice, 16,508 acres of upland movement, and 11,867 acres of overwinter giant garter snake modeled habitat in the RCIS area. Figure E-7, Appendix E, *Focal Species Habitat Models*, displays modeled wetland, rice, overwintering, and upland movement habitats for giant garter snake in the RCIS area. Modeled rice habitat is spread widely throughout the RCIS area; whereas, wetland habitat is mapped in association with the NWRs and protected areas (e.g., conservation easements) surrounding the Lower Butte Creek Complex, Sutter Bypass, Feather River, and the Colusa Basin Drainage Canal. The amount of suitable wetland habitat on the NWRs is likely an overestimate, as not all of the area on the NWRs mapped by CDFW's Great Valley Ecoregion land cover dataset (California Department of Fish and Wildlife 2016a) is managed as wetland habitat suitable for giant garter snake (U. S. Fish and Wildlife Service 2009).

Mapped overwintering and upland movement habitat is located adjacent to aquatic habitat and concentrated around the Sacramento River, adjacent to aquatic habitat surrounding Sutter Butte, and Lower Feather River. Narrow and small patches of mapped upland movement and overwintering habitat found close to rice habitat may not be readily visible in Figure E-7, due to the scale of the map.

The majority of known occurrences are shown in the modeled habitat types. In the northern portion of the RCIS area, occurrences are clustered in and around mapped wetland habitat in Delevan NWR and Colusa NWR, with a few occurrences mapped in rice habitat north of Stone Corral Creek. There are also numerous occurrences within modeled rice habitat in the southern portion of the RCIS area. The habitat model mapped potentially suitable rice and wetland habitat in the northeastern portion of the RCIS area, east and southeast of Sutter Buttes, however, there are limited occurrence records in this area; the occurrences that are recorded there are within mapped rice habitat. In the northwestern and southeastern portion of the RCIS area, occurrences are closely associated with mapped rice habitat.

2.9.2.8 Western Pond Turtle (*Actinemys marmorata*)

Regulatory Status

- **State:** Species of Special Concern
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** None

Life History

The western pond turtle is a medium-sized aquatic turtle that may be found throughout California, west of the Sierra-Cascade and absent from desert regions, except along the Mojave River and its tributaries. The species is found at elevations ranging from sea level to 6,696 feet (Stebbins 2003). Western pond turtles are associated with permanent or nearly permanent water in a wide variety of habitats. The turtles are active year-round where warm climates persist, but overwinter during cold periods (California Department of Fish and Wildlife 2017a).

Breeding typically occurs in spring, and field observations have reported egg laying in May, June, and as late as early August (as cited in Jennings and Hayes 1994). Females emigrate from aquatic habitat to upland locations to dig a nest on sandy banks near water or in fields with sunny spots up to a few hundred feet from water (Thomson et al. 2016), where they deposit eggs. Oviposition (egg-laying) may occur as early as late April in central California (Rathbun et al. 1993) to late July, with most occurring in June and July (Holland 1994). Incubation time ranges from 80 to more than 100 days in California (Holland 1994). In Northern California, hatchling western pond turtles (which are about the size of a quarter) overwinter inside the nest chamber and emerge the following spring (Holland 1994). The terrestrial movements of post-emergent hatchlings are poorly understood (Holland 1994), although it is known that at least some move quickly to aquatic habitats.

Western pond turtles are generalist feeders, with most food being obtained by opportunistic foraging or scavenging (Ernst et al. 1994, Thomson et al. 2016). The species will consume aquatic plant material, as well as aquatic invertebrates, fish, and frogs. Western pond turtle exclusively forages in water (Bury 1986), so when overland movements are made, the turtles are fasting and on land do not drink (Purcell, McGregor, Calderala 2017). The home range of western pond turtles is generally restricted, except for seasonal movements during spring or early summer when females move overland to find suitable sites for egg-laying and or movements in response to environmental stress such as drying of local aquatic habitat (California Department of Fish and Wildlife 2017a, Purcell et al. 2017). Over-wintering sites appear to be variable. Studies have shown that western pond turtle can be found overwintering more than 1,500 feet from aquatic habitat, as well as migrating over a half mile to find suitable habitat (Resse and Welsh 1997, Rathbun et al. 1993, Jennings and Hayes 1994, Holland 1994, Thomson et al. 2016).

Ecological Requirements

The western pond turtle, although primarily found in slow-moving natural aquatic habitats (permanent or nearly permanent), also inhabits impoundments, irrigation ditches and canals servicing rice agriculture in the Central Valley, and other artificial and natural waterbodies (Ernst et al. 1994, Jennings and Hayes 1994) and is found at elevations ranging from sea level to 6,696 feet (Stebbins 2003). The species is usually found in fresh water, but brackish habitats are also utilized (Ernst et al. 1994). The aquatic habitat may comprise either mud or rocky substrates and usually contains some vegetation (Ernst et al. 1994). Basking sites may be rocks, logs, vegetation, terrestrial islands within the aquatic habitat, and human-made debris (Holland 1994). Western pond turtles may overwinter in aquatic or upland habitats (Holland 1994).

Upland habitats are also important to western pond turtles for nesting, overwintering, and overland dispersal (Holland 1994). Nesting sites may be as far as 1,312 feet or more from the aquatic habitat, although usually the distance is much less and generally around 328 feet (Jennings and Hayes 1994, Slavens 1995, Thomson et al. 2016). When turtles choose to overwinter in upland habitats, individuals typically leave the aquatic habitat in late fall, moving as much as 1,640 feet from the aquatic habitat (Holland 1994). A variety of habitat types above the normal high water mark can be used for overwintering sites. Turtles typically burrow into duff (leaf litter) or loose soil, where they remain during the winter months (Holland 1994). In aquatic habitat without major changes in water level (e.g., ponds, lakes, reservoirs etc.), pond turtles may overwinter in the water and use undercut banks, bottom mud, downed wood or rocks (Ernst and Lovich 2009). For reasons not entirely clear, western pond turtles may move into upland habitats for variable intervals at other times of the year, during which times they may be found burrowed into duff or under shrubs (Rathbun et al. 1993).

Western pond turtles spend considerable time basking in order to thermoregulate, preferring body temperatures between 75°F and 90°F. Individuals often bask above the water level on emergent logs, rocks, rocks, vegetation, or other objects. Turtles may sometimes bask at the surface, however, and sometimes within vegetation, where water temperatures may be 18°F to 27°F warmer than the water immediately below (Holland 1994).

Distribution

General

The range of the western pond turtle in North America extends primarily from Pacific slopes of western Washington State (where it may now be extinct) south to the San Francisco Bay area, where it intergrades with the southwestern pond turtle (*C. m. pallida*) (Stebbins 2003, Thomson et al. 2016). Occurrences east of the crest of the Sierra Nevada include Susanville in Lassen County (Stebbins 2003). The species is absent from desert regions, except in the Mojave Desert along the Mojave River and its tributaries (California Department of Fish and Wildlife 2017a). Outside California, occurrences east of the Pacific crest include the Truckee, Carson, and East Walker Rivers in Nevada; Drews Creek in Lake County, Oregon; the Canyon Creek area in Lake County, Oregon; and introduced occurrences along the Deschutes River at Bend in Deschutes County, Oregon (Jennings and Hayes 1994, Stebbins 2003).

In the RCIS Area

Of the 1322 total CNDDB records for western pond turtle, nine occurrences of the species are in Colusa and Sutter counties. Of those nine, only three are within the RCIS area; two occurrences are located in aquatic (non-rice) habitat the RCIS area; one in the Sutter NWR (Sutter Bypass canal); one in protected habitat along the Feather River; and another along the Sacramento River in the southern corner of the RCIS area near the Fremont Weir Wildlife Area (Figure E-8, Appendix E, *Focal Species Habitat Models)*. Although unreported on CNDDB, western pond turtles have also been documented in the Colusa NWR and Delevan NWR (Germano and Bury 2001).

There are several occurrences reported west of the RCIS area in Bear Valley and south of the RCIS area along Putah Creek in Yolo County. Western pond turtle occurrences are also reported on the Feather River east of the RCIS area and northeast of the RCIS area at Grady Lodge Wildlife Area and in aquatic habitat near Butte Creek in Butte County. It is possible that western pond turtle once occurred in higher numbers or were more widely distributed in the RCIS area, although there are no documented extirpation of occurrences in Colusa and Sutter counties. However, loss of habitat through the draining of wetland and habitat alteration due to agriculture, has likely reduced population sizes.

A species recovery plan is not available for the western pond turtle and no recovery units have been identified.

Modeled Habitat in the Distribution Area

Model Parameters

Model parameters for western pond turtle were developed to capture aquatic foraging habitat and upland nesting and overwintering habitat in the RCIS area (ICF 2018b). Aquatic habitat type includes all potentially suitable aquatic habitat (i.e., perennial water) and was modeled by selecting all mapped open water, lacustrine, Sacramento and Feather Rivers, rice and freshwater emergent wetland land cover types with a 10-foot buffer zone (to include basking sites on shores and banks) around all perennial streams and ponds from the U.S. Geological Survey National Hydrography Dataset. Aquatic habitat was further subdivided into aquatic-rice habitat and aquatic-non-rice habitat. Unlike slow-moving perennial waters and emergent wetlands, agricultural rice generally provides poor-quality aquatic habitat for adult pond turtles and suitable nesting and wintering habitat might not be available near many rice fields. Mature rice fields likely provide valuable cover and foraging habitat for hatchlings. Nesting and overwintering habitat includes all potentially suitable upland habitat for egg laying and overwintering. This habitat was modeled by selecting all natural vegetation types that occur within 1,312 feet of aquatic habitat (Jennings and Hayes 1994), excluding urban/developed and cultivated agriculture land cover types. Potentially suitable nesting and overwintering habitat includes all potentially suitable overwintering habitat outside of the nesting habitat. This habitat was modeled by selecting all natural vegetation types that occur between 1,312 and 1,640 feet from mapped aquatic habitat (Reese and Welsh 1997). Note that potentially suitable nesting habitat may also be used as overwintering habitat. This habitat type excludes urban/developed and cultivated agriculture land cover types.

Model Results

There are 66,599 acres of aquatic non-rice, 215,528 acres of aquatic rice, 1,850 acres of suitable nesting/wintering, and 21,892 acres of potentially suitable nesting/wintering modeled western pond turtle habitat in the RCIS area. Figure E-8, Appendix E, *Focal Species Habitat Models*, displays modeled aquatic-rice, aquatic non-rice, suitable nesting/wintering, and potentially suitable nesting/wintering habitat for western pond turtle in the RCIS area. The known occurrences are shown in the modeled aquatic habitat; the three occurrences in the RCIS area are associated with the Sacramento River, Feather River, and the Sutter Bypass canal.

Because the lacustrine and riverine land cover type includes larger canals, streams, and rivers, and high-gradient streams cannot be distinguished from low-gradient streams in the GIS database, the habitat model consequently overestimates the extent of stream habitat and potentially suitable aquatic habitat. Portions of the Sacramento River and Feather River have flow velocities too high to provide habitat for pond turtle, with the exception of low-velocity backwater areas. Some agricultural water conveyance channels associated with rice agriculture may not support habitat because they do not maintain water perennially, but cannot be distinguished in the GIS database from channels that maintain water intermittently, thus the model overestimates the extent of aquatic rice habitat type.

Not all areas mapped as aquatic habitat, nesting/wintering, and potentially suitable nesting/wintering habitat for western pond turtle provides suitable habitat. For example, the amount of suitable wetland habitat on the NWRs is likely an overestimate, as not all of the area on the NWRs mapped by CDFW’s Great Valley Ecoregion land cover dataset (California Department of

Fish and Wildlife 2016a) is managed as wetland habitat suitable for western pond turtle (U. S. Fish and Wildlife Service 2009).

2.9.2.9 Swainson's Hawk (*Buteo swainsoni*)

Regulatory Status

- **State:** Threatened
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** None

Life History

Swainson's hawk are a medium-sized migratory raptor that seasonally migrate south through central interior and southern California in September and October, and north in March through May (Grinnell and Miller 1994). Migration occurs in large flocks and individuals migrate to overwinter in Central America and as far as South America (Brown and Amadon 1968). Females average larger than males, but there are no distinguishing plumage characteristics for separating the sexes. Home ranges are highly variable depending on cover type, and fluctuate seasonally and annually with changes in vegetation structure (e.g., growth, harvest) (Estep 1989, Woodbridge 1991, Babcock 1995). Smaller home ranges consist of high percentages of alfalfa, fallow fields, and dry pastures (Estep 1989, Woodbridge 1991, Babcock 1995). Larger home ranges are associated with higher proportions of cover types with reduced prey accessibility, such as orchards and vineyards, or reduced prey abundance, such as flooded rice fields. Breeding occurs in late March to late August, with activity peaking in late May through July. Swainson's hawk nests and roosts in large trees in flat, open grassland, agricultural landscapes, and riparian corridors. Swainson's hawks exhibit a high degree of nest site fidelity, using the same nests, nest trees, or nesting stands for many years (England et al. 1997). Pairs are monogamous and may maintain bonds for many years (England et al. 1997). Immediately upon arrival onto breeding territories, breeding pairs begin constructing new nests or repairing old ones. One to four eggs are laid in mid- to late April, followed by a 30- to 34-day incubation period. Nestlings begin to hatch by mid-May followed by an approximately 20-day brooding period. The young remain in the nest until they fledge in 38 to 42 days after hatching (England et al. 1997).

Ecological Requirements

Swainson's hawks forage in open, grass-dominated vegetation, sparse shrublands, and open woodland. Swainson's hawks also forage in agricultural land such as alfalfa, hay fields, pastures, and rangelands where prey are available, but generally do not forage in most perennial crops or annual crops that grow taller than grasslands (where prey are harder to find and capture). Foraging habitat value is a function of patch size (i.e., Swainson's hawks are sensitive to fragmented landscapes; use will decline as suitable patch size decreases), prey accessibility (i.e., the ability of hawks to access prey depending on the vegetative structure), and prey availability (i.e., the abundance of prey populations in a field). In the Central Valley, agricultural land use or specific crop type determines the foraging value of a field at any given time. Important land cover or agricultural crops for foraging are alfalfa and other hay, grain and row crops, fallow fields, dryland pasture, and annual grasslands. Hay crops, particularly alfalfa, provide the highest value because of the low vegetation structure (high prey accessibility), relatively large prey populations (high prey availability), and because farming operations (e.g., weekly irrigation and monthly mowing during the growing season) enhance prey accessibility.

Swainson's hawk nest in scattered trees within suitable foraging habitat, and in riparian and open woodland, when within or adjacent to suitable foraging habitat. Swainson's hawk will also nest in urban/suburban areas with large trees adjacent to suitable foraging habitat (England et al. 1997, James 1992). In the Central Valley, Swainson's hawks usually nest in large native trees such as valley oak, cottonwood (*Populus fremontii*), walnut (*Juglans hindsii*), and willow (*Salix* spp.), and occasionally in non-native trees such as eucalyptus (*Eucalyptus* spp.). Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Stringers of remnant riparian forest along drainages contain the majority of known nests in the Central Valley (Estep 1984, Schlorff and Bloom 1984, England et al. 1997). This appears to be a function of nest tree availability, however, rather than dependence on riparian forest. Nests are usually constructed as high as possible in the tree, providing protection to the nest as well as visibility from it.

Distribution

General

In California, Swainson's hawk is an uncommon resident and migrant and generally only occurs during the breeding season in desert, shrubsteppe, grassland, and agricultural habitats in the Central Valley and Great Basin bioregions (Woodbridge 1998, California Department of Fish and Wildlife 2017b). Until 1990, few credible winter records were reported for Swainson's hawk in California; most Swainson's hawk wintering locally in California are reported from the Sacramento-San Joaquin River Delta (Erickson et al. 1990, Yee et al. 1991, Herzog 1996). Swainson's hawks arrive on their breeding grounds in the Central Valley from early March to early April. The breeding season extends through mid-to-late August, when most young have fledged and breeding territories are no longer defended. By late August premigratory groups begin to form. The fall migration begins early to mid-September. By early October, most Swainson's hawks have migrated out of the Central Valley.

In the RCIS Area

Swainson's hawk is found throughout the RCIS area, and is closely associated with agricultural land cover types (Figure E-9, Appendix E, *Focal Species Habitat Models)*. There are 156 CNDDB occurrences in the RCIS area. The distribution of the species generally follows the location of hay, grain, and row crops. The majority of nesting pairs occur along the Sacramento River and Feather River, with a large concentration of occurrences on the Feather River around Nicolaus. Swainson's hawk have also been documented nesting along the Sutter Bypass and within the Sutter NWR. There are also multiple occurrences along I-5 in the western portion of the strategy area and scattered occurrences around Sycamore Slough. Few Swainson's hawk nests have been reported around the base of the Sutter Buttes.

There are also large clusters of Swainson's hawk nesting occurrences just outside of the RCIS area in Yolo County, with high nesting concentrations north of Woodland to County Road 12; along oak and cottonwood-dominated riparian corridors such as Willow Slough, Putah Creek, and the Sacramento

River; and between Davis and Woodland, and west to approximately Interstate 505 and east to the Sacramento River.

In California, the majority of breeding Swainson's hawks are located in the Central Valley, with over half of the breeding population occurring in Yolo, Solano, Sacramento and San Joaquin Counties (California Department of Fish and Wildlife 2017b). While suitable habitat for breeding Swainson's hawks occurs in the RCIS area, a larger portion of the population breeds south of the RCIS area than within it.

In 1994, CDFW was in the process of preparing a recovery plan for the species. The plan was to establish criteria for the species' recovery through preservation of existing habitat, population expansion into former habitat, recruitment of young into the population, and detail other specific recovery efforts. The plan, however, has not yet been published. Swainson's hawk is not listed under the Federal ESA; therefore, there is no designated critical habitat.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for Swainson's hawk were developed to capture nesting habitat and foraging habitat in the RCIS area. The entire RCIS area is in the Central Valley and provides potentially suitable nesting and foraging habitat, where suitable land cover is present. Nesting habitat includes all woodland land cover types, including blue oak woodland, eucalyptus, montane hardwood, and valley foothill riparian land cover (ICF 2018b). Where possible, or to the extent that they were mapped, remnant woody vegetation types outside of blue oak and montane woodland occurring in isolated patches in agricultural fields or field boarders were included as potential nesting habitat. Isolated trees and roadside trees, which are used by Swainson's hawk as nest trees (Estep 1989, Anderson et al. 2007), were not mapped and, thus, the extent and distribution of potential nesting habitat is underestimated.

Foraging habitat was subdivided into natural foraging habitat and agricultural foraging habitat, to distinguish between foraging habitats that may be subject to distinctly different management regimes (ICF 2018b). Historically, Swainson's hawks used large areas of open landscape, such as the Central Valley grasslands and oak savanna, as foraging habitat. With the substantial conversion of these annual grassland to agricultural land, the hawks have shifted nesting and foraging into agricultural lands. Mapped natural foraging habitat includes uncultivated grassland and vernal pool complex land cover types. Vernal pool complex provides foraging habitat in the upland grassland component of the complex, and in the basins that support vernal pools, once they have dried out by mid-spring. Swainson's hawk take advantage of farming activities that expose and concentrate prey, such as cultivating, harvesting, and disking. Additionally, large fields that support low vegetative cover (e.g., hay fields, grain crops) provide high densities of prey (Bechard 1982, Estep 1989). Modeled agricultural foraging habitat includes all cultivated agricultural land cover types, including irrigated row crops and alfalfa that occur in the RCIS area. This modeled habitat excludes orchard and vineyard, and rice (flooded rice fields) agriculture land cover types because they lack adequate prey populations and are rarely used (Estep 1989, Babcock 1995, and Swologaard 2004). The suitability of agricultural land cover as foraging habitat for Swainson's hawk varies as agricultural crop types are rotated annually or periodically, and thus changes across the landscape over time.

Model Results

There are 28,216 acres of modeled natural foraging, 102,234 acres of modeled agricultural foraging, and 16,979 acres of modeled nesting Swainson's hawk habitat in the RCIS area. Figure E-9, Appendix E, *Focal Species Habitat Models*, displays modeled habitat for Swainson's hawk in the RCIS area. Suitable agricultural modeled foraging habitat is dispersed widely throughout the Central Valley floor with the majority of the modeled habitat located in the southern portion of the RCIS area where suitable agricultural crop types are grown. Large areas in the north-central and eastern portion of the RCIS area generally do not provide foraging habitat, as these areas are dominated by rice lands. There is limited modeled natural foraging habitat in the RCIS area, with the majority of the habitat (i.e., nesting habitat) associated with riparian areas, at the foot of the Sutter Buttes, and along the boundaries of protected wildlife management areas. Modeled nesting habitat is primarily restricted to riparian corridors. The habitat model does not capture isolated or small roadside tree-rows, which is potentially suitable nesting habitat when it occurs among suitable foraging habitat; thus, the model likely underestimates potential nesting habitat. The known nesting locations are shown in the modeled habitat, with the majority of occurrences along the Sacramento River, the Feather River, and Sutter Bypass riparian corridors and within agricultural lands. Known nest sites, mapped as occurrences along I-5, are likely isolated trees and roadside nest trees, often associated with agricultural foraging habitat.

There is little nesting or foraging habitat for Swainson's hawk modeled on the Sacramento, Delevan, Colusa, and Sutter NWRs. Although patches of suitable foraging habitat and stands of nest trees occur on these NWRs, they are mapped by CDFW's Great Valley Ecoregion land cover dataset (California Department of Fish and Wildlife 2016a) as freshwater emergent wetland, which is not modeled as Swainson's hawk habitat. This is a limitation of the land cover dataset. Swainson's hawk likely forage on these NWRs in grasslands and pastures, and in managed wetlands when they are seasonally dry.

2.9.2.10 Tricolored Blackbird (*Agelaius tricolor*)

Regulatory Status

- **State:** Threatened
- **Federal:** Under review. Petitioned action may be warranted.
- **Critical Habitat and Recovery Planning:** Tricolored blackbird is under review for listing under federal ESA; thus, at this time, critical habitat is not designated and a federal recovery plan is not available.

Life History

Tricolored blackbirds are among the most colonial of North American passerine birds (Bent 1958, Orians 1961a, 1961b, Orians and Collier 1963, Payne 1969, Beedy and Hamilton 1999). Breeding colonies historically attracted thousands of birds. In the 1930s, a single colony in Glenn County was estimated to include as many as 200,000 nests (approximately 300,000 adults) (Neff 1937). In more recent years, as many as 20,000 or 30,000 tricolored blackbird nests have been recorded in cattail marshes of 9 acres or less (DeHaven et al. 1975a), and individual nests may be built less than 1.5 feet apart (Neff 1937). The average size of breeding colonies varies among geographic regions and nesting substrate (Graves et al. 2013).

Many tricolored blackbirds reside throughout the year in the Central Valley of California (Beedy 2008). Local populations can move considerable distances, however, and some are migratory and move from inland breeding locations to wintering habitats in the Sacramento–San Joaquin River Delta and coastal areas. They may later move northward into the Sacramento Valley, northeast California, and southern Oregon to nest again (Hamilton 1998, Beedy 2008). Thus, individual tricolored blackbirds may overwinter and breed at several sites, or re-nest at the same site during a given breeding season, depending on environmental conditions and their previous nesting success (Hamilton 1998, Beedy and Hamilton 1999, Meese 2006a). In the northern Central Valley and northeastern California, individuals move after their first nesting attempts, whether successful or unsuccessful (Beedy and Hamilton 1997). The second breeding attempt often occurs in a different, more northerly location for Central Valley breeders (Hamilton 1998). Although when breeding conditions are favorable, a second breeding attempt may occur in the same or adjacent locations (Meese 2006b, 2007, 2008). Comparable movements have not been reported in southern California, where the species is believed to be resident. Females typically lay three to four eggs and incubate them for 11 to14 days, then both parents feed young until they fledge 9 to 14 days after hatching (Beedy and Hamilton 1999). Banding studies indicate that significant movement into the Sacramento Valley occurs during the post-breeding period (DeHaven et al. 1975b) and large roosts form at managed wildlife refuges and other marshes near abundant food supplies such as rice and water grass (*Echinochloa crus galli*) (Beedy and Hamilton 1997).

Tricolored blackbird's colonial and itinerant breeding system (commonly moving to different breeding sites each season) may have evolved to exploit a rapidly changing environment where the locations of secure nesting habitat and rich insect food supplies were ephemeral and likely to change each year (Orians 1961a, Orians and Collier 1963, Payne 1969).

Ecological Requirements

Tricolored blackbirds have three basic requirements for selecting their breeding colony sites: open, accessible water; a protected nesting substrate, including either flooded, thorny, or spiny vegetation; and a suitable foraging space such as grasslands, agricultural lands, and open woodland, providing adequate insect prey within a few miles of the nesting colony (Hamilton et al. 1995, Beedy and Hamilton 1997, Meese et al. 2014).

Tricolored blackbird is a highly gregarious species in all seasons and are known to form the largest breeding colonies of any North American passerine; an individual colony at a single site can be made up of thousands of birds (U.S. Fish and Wildlife Service 2017b). Historically, breeding colonies were strongly associated with emergent marshes with tall, dense cattails or tules (California Department of Fish and Wildlife 2017b), but there has been a shift to non-native vegetation and active agricultural areas (U.S. Fish and Wildlife Service 2017b). An increasing percentage of tricolored blackbird colonies in recent surveys were found in Himalayan blackberry, thistles, wild rose, and other thorny vegetation (Beedy et al. 1991, Beedy 2008, Holyoak et al. 2014); however, these vegetation types represent a small percentage of tricolored blackbird nesting colonies in the RCIS area, as cattails and other wetland vegetation is the primary nesting substrate used in the RCIS area (University of California, Davis 2017).

Opportunistic foragers, tricolored blackbirds consume locally abundant food resources, with high quality foraging areas include habitats such as irrigated pastures, lightly grazed rangelands, dry seasonal pools, mowed alfalfa fields, feedlots and dairy farms (Beedy and Hamilton 1997).

Distribution

General

The tricolored blackbird is nearly endemic to California, with more than 99% of the global population occurring in the state, and other populations in Oregon, Washington, Nevada, and western coastal Baja California (Meese et al. 2014). In California, tricolored blackbird occurs in the Central Valley and surrounding foothills, and in coastal areas from Sonoma County to San Diego County. Approximately 75% of the species breeding population has occurred within the Central Valley (Tricolored Blackbird Working Group 2009). This species also locally breeds in northeastern California. In winter, it is widespread along the Central Coast and San Francisco Bay area. There are 907 CNDDB occurrences for this species within its range.

In the RCIS Area

There are 56 CNDDB occurrences of tricolored blackbird colonies in the RCIS area (these are recordings over many years. The number of colonies in the RCIS area in a single year is considerably smaller). The largest concentration of occurrences in the RCIS area, including nesting colonies, have been recorded in protected freshwater wetlands in the northern region of the RCIS area (Figure E-10, Appendix E, *Focal Species Habitat Models)*, particularly near Colusa NWR, Delevan NWR, and Sacramento NWR. There are also multiple occurrences in agricultural lands near the towns of Williams and Maxwell, and a few scattered occurrences in agricultural lands in the central and southern region of the RCIS area. There are a few scattered locations around the base of Sutter Buttes, and in the eastern portion of the strategy area near Yuba City.

Not too far outside of the RCIS area, tricolored blackbird colonies have been reported within agricultural fields around Willow Creek north of the RCIS area, near Little Butte Creek in Butte and in agricultural areas west of Thermalito Afterbay in Glenn County, northeast of Marysville near Jack Slough, and surrounding the Yuba River in Yuba County. There are also multiple occurrences in Yolo County near Knights Landing, Woodland, Davis, and in agricultural lands north of Winters and south Madison.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for tricolored blackbird were developed to capture habitat associated with nesting and foraging for the species. Tricolored blackbird colonies require access to water, suitable nesting substrate, and located within a few miles of foraging habitat (Beedy and Hamilton 1999, Hamilton 2004). Modeled tricolored blackbird nesting habitat includes all potentially suitable breeding habitat in natural vegetation types; this habitat type was modeled by selecting freshwater emergent wetland vegetative cover types that occur in the RCIS area (ICF 2018b). Although foothill riparian vegetation and cultivated agricultural crop types may capture some blackberry bramble, riparian bramble, and small ponds and wetlands that occur in slow water portions of these riparian corridors, riparian and agricultural crop vegetation types were excluded from modeled nesting habitat including these types would vastly overestimate nesting habitat in the RCIS area.

Foraging habitat includes all potentially suitable foraging habitat. This habitat was modeled by selecting annual grassland, pasture, grain and hay crops, and rice land cover types that occur within 8 miles of nesting habitat (ICF 2018b). This modeled habitat type excludes irrigated row crops and intensively managed orchards and vineyards, as the species is not known to regularly feed in these crop types (Beedy and Hamilton 1997).

Model Results

There are 43,676 acres of nesting and 272,892 acres of foraging modeled tricolored blackbird habitat in the RCIS area. Figure E-10, Appendix E, *Focal Species Habitat Models*, displays modeled nesting and foraging habitat for tricolored blackbird within the RCIS area. Suitable habitat is modeled throughout the undeveloped lands in the RCIS area. The majority of nesting habitat is modelled within protected wildlife management area easements, within NWRs, and easements along the Colusa Basin Drainage canal. Foraging habitat is mapped throughout the RCIS area and is primarily associated with agricultural lands. The known occurrences are shown within the modeled habitat, and the majority of known nesting occurrences are shown within modeled nesting habitat, except for one occurrence on SR 99 south of Yuba City. The habitat model may underestimate the extent and distribution of some potential nesting habitat used by tricolored blackbird because these vegetation types were not mapped and included in the model parameters. Vegetation that was not mapped include large stands of blackberry (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), and nettles (*Urtica* sp.) (Hamilton 1998, Beedy and Hamilton 1999). However, these nesting substrates (e.g., Himalayan blackberry) are rarely used as nesting substrates in the RCIS area, and most nesting colonies and aggregations in Colusa County and Sutter County are in freshwater emergent wetland vegetation–cattail (*Typha* spp.) and bulrush or tule (*Schoenoplectus* spp.); of the records with available vegetation data, only 6 of 62 records (9.7%) report vegetation types other than emergent wetland vegetation (University of California, Davis 2017).

Not all areas mapped as wetland cover types provides suitable breeding habitat. For example, the amount of suitable nesting habitat on the NWRs is likely an overestimate—not all of the area on the NWRs mapped by CDFW's Great Valley Ecoregion land cover dataset (California Department of Fish and Wildlife 2016a) is managed as perennial wetland nesting habitat suitable for tricolored blackbird (U. S. Fish and Wildlife Service 2009).

2.9.2.11 Yellow-Billed Cuckoo, Western U.S. Distinct Population Segment (*Coccyzus americanus occidentalis*)

Regulatory Status

- **State:** Endangered
- **Federal:** Threatened
- **Critical Habitat:** Proposed on August 15, 2014 (FR 79: 48548 2014b)
- **Recovery Planning:** N/A

Life History

The western yellow-billed cuckoo is an uncommon summer resident in valley foothill and desert riparian habitat in California. Cuckoos migrate north from South American wintering grounds and arrive in California onto breeding territories in June. Limited information is available on home range and territory size; however, patch size, type and quality of habitat, and prey abundance largely determine the size of territories (Halterman 1991).

Once the birds arrive onto breeding territories, pair formation takes place from late June to mid-July and is followed by nest building. Eggs are laid mid-June to mid-July. Clutch size is usually three to four eggs, rarely five (Bent 1940) and both female and male share incubating and brooding duties, and provisioning young with food. Development of young is very rapid with a breeding cycle of 17 days from egg-laying to fledging (Halterman 1991). Parental care continues for an additional 3 to 4 weeks before the southern migration begins (Halterman 1991). The species is restricted to the mid-summer period for breeding presumably due to a seasonal peak in large insect abundance (Rosenberg et al. 1982).

Western yellow-billed cuckoos are primarily foliage gleaners (Laymon 1998) and forage within riparian canopy primarily on slow-moving insects, such as sphinx moth larvae. As food resources vary greatly from year to year, food availability has been shown to significantly affect reproductive success (Laymon et al. 1997). Following a relatively short period of post-fledging juvenile dependency, cuckoos migrate out of California from approximately mid-August to early September. The species migrates to South America during the non-breeding season and is thus not present in the Central Valley between October and May.

Ecological Requirements

The western yellow-billed cuckoo is a riparian obligate species. Its primary habitat association is willow-cottonwood riparian forest, but other species such as alder (*Alnus glutinosa*) and box elder may be an important habitat element in some areas, including occupied sites along the Sacramento River (Laymon 1998). Nests are primarily in willow trees; however, other species are occasionally used, including cottonwood and alder. Along the Sacramento River, English walnut trees and more rarely prune, plum, and almond trees in adjacent orchards have also been reportedly used for nesting (Laymon 1980). Several nests on the Sacramento River were draped with wild grape (Gaines and Laymon 1984, Laymon 1998). Canopy cover in riparian habitat is typically dense (averaging 96.8% at the nest) and large patch sizes (generally greater 49.4 acres are typically required (Laymon 1998).

Riparian patches used by breeding cuckoos vary in size and shape, can range from contiguous stands of mixed native/exotic vegetation to irregularly shaped mosaic of dense vegetation with open areas and mainly nest in patches that are 50 acres or more in extent (Halterman et al. 2015). They have not been found nesting in isolated patches (1 to 2 acres) or narrow, linear riparian habitats that are less than 33 to 66 feet wide. In California, yellow-billed cuckoo are most likely found in patches of willow-cottonwood riparian habitat greater than 200 acres in size (Halterman et al. 2015). Along the Sacramento and Feather Rivers, primary factors influencing nest site selection include the presence of cottonwood/willow riparian forest, patch size, and density of understory vegetation. Laymon and Halterman (1989) found a significant trend toward increased occupancy with increased patch size. In California, except for the population along the Colorado River, cuckoos occupied 9.5% of 21 sites 49 to 98 acres in extent, 58.8% of 17 sites 98 to 197 acres in extent, and 100% of 7 sites greater than 197 acres in extent (Laymon and Halterman 1989). On the Sacramento River, Halterman (1991) found that the extent of patch size was the most important variable in determining occupancy.

Cottonwood (*Populus fremontii*) trees are important as foraging habitat, particularly as a source of insect prey. All studies indicate a highly significant association with relatively expansive stands of mature cottonwood-willow forests, especially dynamic riverine habitats where the river is allowed to meander and willows and cottonwoods can regenerate on point bars and stream banks (Grecco 2008). However, western yellow-billed cuckoos will occasionally occupy a variety of marginal habitats, particularly at the edges of their range (Laymon 1998). Continuing habitat succession has also been identified as important in sustaining breeding populations (Laymon 1998). Meandering streams that allow for constant erosion and deposition create habitat for new rapidly growing young stands of willow, which create preferred nesting habitat conditions. Channelized streams or levied systems that do not allow for these natural processes become over-mature and presumably less optimal (Grecco 2008).

Distribution

General

The range of western yellow-billed cuckoo historically extended from southern British Columbia to the Rio Grande in northern Mexico, and east to the Rocky Mountains (Bent 1940). Western yellow-billed cuckoos winter in South America from Venezuela to Argentina (Laymon and Halterman 1985). They migrate north in late June and early July (DeSchauensee 1970). In California, where much of its historical range has been greatly reduced, western yellow-billed cuckoos still occur in isolated sites in the Sacramento Valley from Tehama to Sutter Counties, along the South Fork of the Kern River, and in the Owens Valley, Prado Basin, and Lower Colorado River Valley (Gaines and Laymon 1984, Laymon 1998, California Department of Fish and Wildlife 2017d) (Figure E-11, Appendix E, *Focal Species Habitat Models*). The species is considered rare and local in southwestern United States and believed to be extirpated north of Sacramento Valley (Huges 1999). Currently, the only known populations of breeding western yellow-billed cuckoo are several disjunct locations in California, Arizona, and western New Mexico (Halterman 1991).

In California on the Sacramento River, birds arrive onto breeding territories; pair formation occurs from late June to mid-July and is followed by nest building and raising of young (Halterman 1991). The species is restricted to the mid-summer period for breeding presumably due to a seasonal peak in large insect abundance (Rosenberg et al. 1982). To accommodate this, development of young is very rapid with a breeding cycle of 17 days from egg-laying to fledging. Following a relatively short period of post-fledging juvenile dependency, cuckoos migrate out of California from approximately mid-August to early September. The species migrates to South America during the non-breeding season and is thus not present in the Central Valley between October and May (California Department of Fish and Wildlife 2017d).

In the RCIS Area

There are 19 CNDDB occurrences reported for western yellow-billed cuckoo in the RCIS area. In the RCIS area, there are recorded occurrences of western yellow-billed cuckoo (from north to south) on the Sacramento River north of Colusa, along Butte Creek, within the Sutter Bypass–Sutter NWR, along the East Canal (southeast of Robbins and east of Reclamation Road) in the southern portion of RCIS area along the Sacramento River, and along the Feather River near Nicolaus and Yuba City (Figure E-11, Appendix E, *Focal Species Habitat Models)*. The majority of the occurrences are in the Sacramento River NWR in the northern region of the RCIS area between the town of Colusa and the Colusa and Glenn County border.

North of the RCIS area, there are numerous occurrences of yellow-billed cuckoo tightly clustered around the Sacramento River riparian corridor in Glenn and Butte counties. Northeast of the RCIS area, there are additional occurrences along Butte Creek and in the Upper Butte Basin Wildlife Area. Occurrences have also been documented south of the RCIS area at Putah Creek, in East Sacramento, and near Clarksburg, in Yolo County; the two later occurrences are considered extirpated.

Yellow-billed cuckoo breeding populations of greater than five pairs that persist annually in California are limited to two known locations: the Sacramento River from Colusa north to Red Bluff, and the South Fork of the Kern River from Canebrake Ecological Reserve to Isabella Reservoir (Laymon 1998). The reach of the Sacramento River in the northern portion of the RCIS area is important for the conservation of this species. Other reaches of waterways in the RCIS area where small populations of cuckoos (< 5 pairs) breed, although not annually, include the Feather River and Butte Creek; although recent surveys have not detect recent breeding on some of the tributaries to the Sacramento River (Dettling and Howell 2011, Dettling et al. 2014, Dettling et al. 2015). Management of these tributaries for the benefit of the species would support the conservation of yellow-billed cuckoo.

In 2015, the USFWS proposed critical habitat units for western yellow-billed cuckoo (U.S. Fish and Wildlife Service 2014b) (Figure 2-8). Two proposed units would be located within the RCIS area: CA-2 Sacramento River and CA-3 Sutter Bypass. The southern portion of the proposed critical habitat unit CA-2, from the Glenn/Colusa county boarder south to the downstream boundary of the Colusa-Sacramento River State Recreation Area next to the town of Colusa, Colusa County would be within the RCIS area. The entire proposed critical habitat unit, CA-3, would be located within the RCIS area. It would be a 7-mile-long continuous segment of the Sutter Bypass, primarily on the Stutter NWR.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for yellow-billed cuckoo were developed to capture nesting and foraging habitats for the species. The yellow-billed cuckoo is a riparian obligate species and its primary habitat association, willow-cottonwood riparian forest, is used both for nesting and foraging habitat (Laymon 1998, 1980). This modeled habitat includes all potentially suitable breeding habitat in the valley foothill riparian land cover type that occur in patch sizes of 25 acres or greater and have a width of at least 330 feet (Gaines 1974, Laymon and Halterman 1989, ICF 2018b).

Model Results

There are 10,221 acres of modeled western yellow-billed cuckoo habitat in the RCIS area. Figure E-11, Appendix E, *Focal Species Habitat Models*, displays modeled nesting/foraging habitat for western yellow-billed cuckoo within the RCIS area. Modeled western yellow-billed cuckoo nesting/foraging habitat is primarily restricted to the riparian corridors of the Sacramento River (particularly north of Colusa), Butte Creek and protected areas around Butte Creek, the Feather River, and within in the Sutter Bypass. The model mapped patches of potentially suitable nesting/foraging habitat within the Butte Sink Wildlife Management Area easements and in easements south of the North Central Valley Wildlife Management Area; these areas contained land cover and habitat patch configurations consistent with model parameters (i.e. patches of riparian vegetation with sufficient area to support cuckoos); however, there are no known CNDDB occurrences of yellow-billed cuckoo in this area. Modeled habitat is not present along the Colusa Basin Drainage and there are no known occurrences of yellow-billed cuckoo in this area. The known yellow-billed cuckoo occurrences fall almost entirely within the modeled habitat, and occurrences are concentrated along the Sacramento River, Butte Creek, and Feather River riparian corridors.

2.9.2.12 Bank Swallow (*Riparia riparia*)

Regulatory Status

- **State:** Threatened
- **Federal:** None
- **Critical Habitat:** N/A
- **Recovery Planning:** Bank Swallow *(Riparia riparia)* (California Department of Fish and Game 1992).

Life History

The bank swallow is a migrant found primarily in riparian and other lowland habitats in California during the spring-fall season. Upon arrival from wintering grounds, the bank swallows reestablish breeding colonies. They nest in colonies ranging from 10 to almost 2,000 active nests (Garrison 1999). During the nesting season, bank swallows are restricted to riparian, lacustrine, and coastal areas with vertical banks, coastal bluffs, open pit mines, roadcuts, and cliffs with fine-textured or sandy soils, into which the birds dig nesting cavities (California Department of Fish and Wildlife 2017e). Generally, the western population nests in near-vertical banks and bluffs, while the eastern population nests in sand in gravel quarries (Garrison 1999). Following a short courtship, both sexes spend 4 to 5 days digging a nest burrow in soft sand/loam strata. Females typically lay four or five eggs, and feed their young at the nest until the young fledge 18 to 20 days later. Banks swallows are primarily monogamous, and each pair tends one nest. The pair will actively defend the nest burrow and the immediate vicinity of individual burrows. After breeding, numbers decrease in July and August as colonies are abandoned and swallows begin migrating south. During migrations, bank swallows may form mixed-species flocks of swallows and congregate at wetlands and other open habitat with high concentrations of aerial insect prey.

Bank swallows forage by hawking insects and feed predominately over open riparian areas, but also over brushlands, grassland, wetlands, water, and cropland where concentrations of aerial insects are found. At nesting colonies, they forage mostly within approximately 660 feet of their nesting burrows, but this range can vary depending on the distance to good foraging areas (Garrison 1998).

Ecological Requirements

Bank swallows are social, colonial nesters. Important breeding habitat characteristics include soil moisture, texture, orientation of bank face, bank height, verticality (slope) of the face, and proximity of the colony to foraging areas (California Department of Fish and Game 1992). In California, bank swallows most often nest in steep earthen riverbanks subject to frequent winter erosion events. Sites with grassland adjacent to vertical banks are considered of highest suitability (Garcia et al. 2008). Burrows that remain available from a previous season may be used in subsequent years.

Bank swallow colonies are often found in fine silt and sandy loam soils (California Department of Fish and Game 1992) represented as three main types: sea cliffs, or hard consolidated sand; riverbanks of sand and sandy earth; and actively worked sand and gravel pits (Hickling 1959, as cited in California Department of Fish and Game 1992). In California, bank swallows most often nest in steep earthen riverbanks subject to frequent winter erosion events. Unique combinations of optimal habitat characteristics may dictate the size and success of individual bank swallow colonies. Burrows that remain available from a previous season may be used in subsequent years.

Bank swallows are aerial insectivores that forage over lakes, ponds, rivers and streams, meadows, fields, pastures, and bogs (Garrison 1999). Grasslands and croplands immediately adjacent to colonies also provide foraging habitat for bank swallows (California Department of Fish and Game 1992). Adult birds foraging along the Sacramento River typically forage within 164 to 656 feet of the colony location (Garrison 1998), and the normal maximum foraging distance can be as great as 5.0 to 6.2 miles (Mead 1979).

Distribution

General

The bank swallow is one of the most widely distributed swallows of the world. The North American population spends its winter in South America and the eastern Caribbean. Other populations breed throughout Europe, Asia, and North Africa (Garrison 1999). Bank swallow are spring and fall migrants in interior California and less common on the coast, and an uncommon and local summer resident in California (California Department of Fish and Wildlife 2017e). Occasionally the species is found in southern California in winter. The western North American population of bank swallows arrive from South America to breeding grounds in California from mid-March to May. During spring migration, the first individuals arrive in California in mid-March, with numbers peaking in May; during fall migration, the first individuals leave in late July, with a few birds remaining until mid-September (Humphrey and Garrison 1987, Garrison 1999, Garrison 2002).

Formerly a more common breeder in California, the bank swallow range in California is estimated to have been reduced 50% since 1900, with approximately 110 to 120 colonies currently remaining in the state (California Department of Fish and Wildlife 2017e). Approximately 70 to 90% of the known breeding population in California occurs along the banks of the Sacramento and Feather Rivers in the northern Central Valley, with the majority of colonies remaining along the middle Sacramento River (California Department of Fish and Wildlife 2017e, Bank Swallow Technical Advisory Committee 2013, California Department of Fish and Game 1992). It is estimated that 50 to 60 breeding colonies occur along the middle Sacramento River and 15 to 25 colonies occur along the Feather River where natural river banks remain and where the rivers meanders in a natural state (California Department of Fish and Wildlife 2017e). Tributaries to the Sacramento River north of the confluence of the Feather River are also known to historically support small colonies of bank swallow (Laymon et al. 1987, Garrison 1998). Butte Creek, a tributary to the Sacramento River, also provides potentially suitable nesting habitat for the species (Butte Regional Conservation Plan 2015).

In the RCIS Area

There are 61 CNDDB reported bank swallow occurrences in the RCIS area. Bank swallow occurrences have been recorded along the Sacramento River throughout the RCIS area, with the majority of occurrences reported in the northern region of the RCIS area, and all along the Feather River (Figure E-12, Appendix E, *Focal Species Habitat Models*). The majority of the bank swallow occurrences are along the Feather River in the eastern boarder of the RCIS area and on the Sacramento River. No CNDDB occurrences are reported along Butte Creek, however, incidental observations of bank swallow have been reported on Butte Creek (eBird 2017, Little 2017).

Butte Creek also provides potentially suitable nesting habitat, though to a lesser extent than the Sacramento and Feather Rivers, due to levees on one or both sides of the creek. Nesting habitat for bank swallow on Butte Creek includes banks that are along unleveed and unchannelizd portions of the waterway.

Outside of the RCIS area, the numerous occurrences along the Feather River extend north from Live Oak to just south of Thermalito Afterbay. Occurrences north of the RCIS area continue along the Sacramento River north to just south of Redding. Bank swallow are also reported along Cache Creek in Yolo County and there are few occurrences along the American River, south of the RCIS area.

Although there are bank swallow nesting colonies scattered across Northern California, the core of California's bank swallow population is within and in the immediate vicinity of the RCIS area (Bank Swallow Technical Advisory Committee 2013), making the reaches of the Sacramento River and its major tributaries within the RCIS area highly important for the conservation of the species. The Bank Swallow Recovery Plan (California Department of Fish and Game 1992) identifies actions needed to protect the bank swallow, but does not specify specific recovery units. The recovery plan states that the focus of any long-term strategy for the recovery of the bank swallow must be the maintenance of a viable population within the Sacramento River valley and its major tributaries. The bank swallow is not listed under the ESA; therefore, critical habitat is not designated.

Modeled Habitat Distribution in the RCIS Area

Model Parameters

Model parameters for bank swallows were developed to capture nesting habitats for the species. National Hydrography Dataset linear flowlines (Section 2.5.2.2, *Stream Layer*) were used to model bank swallow habitat. Potentially suitable habitat was modeled to occur along the Sacramento River, Feather River, and Butte Creek. Along the Sacramento River, where data are available, river lengths hardened with revetment and riprap were removed as potentially suitable habitat, as bank swallow cannot nest in banks with hardscape. Sacramento River Revetment–River Mile 243 to 80 GIS data (California Department of Water Resources 2014) were used to identify stretches of revetment and rip-rap. Stretches with revetment were buffered by 500 feet and removed from potentially suitable nesting habitat. The suitability of river banks (e.g., Sacramento, Feather River and Butte Creek) as nesting habitat for bank swallow varies along rivers and over time, as riverine process are dynamic and influenced by factors such as local river dynamics and flood control projects, so the amount and location of suitable nesting habitat will vary over time.

Model Results

There are 54 river miles of modeled bank swallow habitat in the RCIS area—11 miles on the Sacramento River, 30 miles on the Feather River, and 12 miles on Butte Creek. Figure E-12, Appendix E, *Focal Species Habitat Models*, displays modeled nesting habitat for bank swallow in the RCIS area. Modeled nesting habitat is restricted to the banks of major waterways in the RCIS area, particularly the riparian corridors of the Sacramento River, Feather River, and Butte Creek. Modeled habitat is discontinuous and present where revetment and rip-rap are absent along the river banks. Modeled habitat is not present along the Sutter Bypass or Colusa Basin Drainage Canal. The majority of known bank swallow colony occurrences correspond to modeled nesting habitat. Of the known occurrences of colonies in the RCIS area, 22 records are not mapped within modeled habitat; this is likely due to relatively small inaccuracies in the location of mapped nest colony sites, as these occurrences are reported as general locations in CNDDB, there could be revetment on the river banks that was previously reported as habitat, or both. Additionally, modeled habitat discrepancies may reflect the inherent dynamic characteristic of bank swallow habitat.

The habitat model may overestimate the extent of and distribution of potential nesting habitat on Butte Creek along the Butte Sink Wildlife Management Area easement, in the Lower Butte Creek Complex. There are no known CNDDB occurrences of bank swallow on Butte Creek. A lack of occurrence records in modeled habitat may be due to a lack of annual comprehensive surveys along the Sacramento River and its tributaries (Bank Swallow Technical Advisory Committee 2013), no public reporting of survey efforts on private lands, and or no survey history. Site-specific conditions (i.e., the presence/absence of eroding, vertical river banks and bluffs) will dictate whether bank swallow could be present and should be assessed to determine whether the habitat on the site could support the species.

2.10 Habitat Connectivity

FGC 1852(c)(4) states that an RCIS will include, "important resource conservation elements within the RCIS area, including, but not limited to, important ecological resources and processes, natural communities, habitat, habitat connectivity, and existing protected areas, and an explanation of the criteria, data, and methods used to identify those important conservation elements." This section describes habitat connectivity within the RCIS area and to natural habitats adjacent to the RCIS area.

Loss of habitat connectivity is one of the leading threats to biodiversity in the RCIS area. Movement is essential for wildlife to find mates, seasonal habitat, shelter, and food. Wildlife also needs to be able to move beyond their home ranges to find new habitat. Movement is essential to gene flow, which is necessary to maintain genetic diversity and increase the likelihood of long-term persistence of plant and animal populations. When populations are isolated in habitat patches, and individuals are unable to move through the landscape to other habitat patches and populations, populations are more susceptible to reduced genetic diversity (and associated deleterious effects), localized loss of habitat, disease, and ultimately extirpation. Although effects will vary for different species, landscape features can influence plant and wildlife's ability to move at a range of scales. Rugged topography, land cover types, and human development can all affect the ability of organisms to move through an area. Furthermore, as climate change alters habitats, animals and plants will be under increasing pressure to disperse to new areas to adapt to climate change. In fragmented habitats, such as the RCIS area, wildlife can be struck by vehicles or get stuck in fences as they attempt to cross roads and other barriers to reach suitable habitat. As climate change alters habitat conditions, the ability of wildlife to move across the landscape will become increasingly threatened without concerted efforts to maintain habitat connectivity and increase permeability across the landscape.

Scientific conclusions regarding the conservation significance of landscape connectivity have appeared with increasing frequency in recent years, addressing conservation across a full range of biological organization from genes to ecosystems (e.g., Rudnick et al. 2012, Fletcher et al. 2016). Landscape connectivity has been an important element in conservation discussions for decades, as it can reduce some negative effects of habitat fragmentation and related impacts on population viability and genetic isolation, part of the "rescue effect" (Brown and Kodric-Brown 1977) for populations of small size. Current understanding of ecological connectivity (e.g., Crooks and Sanjayan 2006) incorporates a combination of *structural connectivity* (the physical relationship between landscape elements, such as corridors of natural areas) and *functional connectivity* (the behavioral ability of individual organisms, and of ecological elements and processes, to move across the physical structure of landscapes). Structural connectivity does not imply functional connectivity.

2.10.1 Connectivity across Terrestrial and Wetland Landscapes

The California Essential Habitat Connectivity Project (CEHC Project) (Spencer et al. 2010) is a statewide assessment of large, intact blocks of natural habitat and a "least-cost" modeling of connections between them. The CEHC Project used a GIS-based modeling approach to create a statewide wildlife habitat connectivity map and to identify the biological value of connectivity areas. The project was commissioned by more than 60 federal, tribal, state, local agencies, and non-governmental organizations to facilitate incorporating natural resources consideration into regional analysis and land use planning.

The RCIS area, and the Central Valley as a whole, is highly fragmented from over a century of land conversion. The majority of the Central Valley is under private ownership and has largely been converted to agriculture and urban/developed land covers, with few remaining large (>2,000 acres) blocks of natural land cover that supports native biodiversity (called natural landscape blocks in Spencer et al. 2010). Over a century of land conversion and fragmentation in the Central Valley has reduced natural habitats to a large number of smaller natural landscape blocks. These blocks tend to be small and isolated with the smallest average block size of any ecoregion in California, at less than 9,000 acres (Spencer et al. 2010). There are twelve natural landscape blocks located in the RCIS area (from north to south): the most southeastern portion of the Sacramento NWR/Provident Main Canal, Sacramento NWR, Delevan NWR, Colusa Basin, Butte Sink, Colusa NWR, portions of the Sutter Buttes that are in the valley floor, the Sutter Bypass NWR, the eastern portions of Capay Hills, eastern portions of Clark Valley, and a small portion of an unnamed large natural landscape block. The average block size in the RCIS area is approximately 4,431 acres. Figure 2-30a shows natural landscape blocks and small natural areas in the region of the RCIS area, as identified in the CEHC Project (Spencer et al. 2010).

There are nine natural landscape blocks in the RCIS area—Sacramento NWR/Provident Main Canal, Sacramento NWR, Delevan NWR, Colusa Basin, Butte Sink, the lower elevational portions of Sutter Butte, Colusa NWR, Sutter NWR, and the most eastern portions of Clark Valley, Capay Hills, and an unnamed natural landscape block (Table 2-9; and Figure 2-30a). The natural landscape blocks comprise wetland, riverine and riparian, grassland, and some woodland and cultivated agricultural (Table 2-9). No large landscape blocks intersect the southwestern border of the RCIS area. The three large natural landscape blocks—Clark Valley, Capay Hills, and an unnamed block—that are located at the western border of the RCIS area are low mountain ranges of the Inner Northern California Coast Range system and connect to the flat agricultural areas in the western portion of the RCIS. The natural landscape blocks of the Sacramento NWR complex provide connectivity along the Sacramento River and the riparian habitat surrounding the river.

Table 2-9. Natural Landscape Blocks in the RCIS Area

Natural Landscape Block	Total Size (acre)	Extent in the RCIS Area (acre)	Dominant Land Cover Types
Sacramento National Wildlife Refuge/Provident Main Canal	11,839	962	Seasonal wetland, semi & permanent wetland, annual & perennial grassland, alkali meadow complex.
Sacramento National Wildlife Refuge	11,631	8,810	Freshwater seasonal, semi-, and permanent wetland, vernal pool, alkali meadow, annual and perennial grassland.
Delevan National Wildlife Refuge	5,658	5,658	Freshwater seasonal and permanent wetland, vernal pool/ alkali meadow complex, annual grassland, perennial grassland, willow riparian forest.
Colusa Basin	6,077	6,077	Seasonal wetland, semi & permanent wetland, unmanaged freshwater wetland, alkali meadow complex, vernal pool, cottonwood willow forest, annual & perennial grassland.
Butte Sink	22,012	16,494	Seasonal wetland, freshwater wetland, annual grassland, cottonwood willow riparian, mixed riparian forest.
Sutter Butte (North & South)	30,951	4,152	Cultivated crops, annual grassland, blue oak woodland.
Colusa National Wildlife Refuge	4,498	4,498	Seasonal wetland, semi & permanent wetland, vernal pool, alkali meadow, annual grassland, perennial grassland.
Sutter National Wildlife Refuge	3,412	3,412	Seasonal wetland, semi-permanent wetland, unmanaged freshwater wetland, mixed riparian forest, flooded willow, annual grassland.
Clark Valley, Capay Hills, & unnamed natural block	246,382	1,443	Low mountain range with cultivated agriculture, annual grassland, foothill valley riparian, oak woodland, mixed chaparral.

RCIS = regional conservation investment strategy

In addition to the natural landscape blocks in the RCIS area, there are numerous, smaller natural landscape areas scattered through the RCIS area; the CEHC Project refers to these areas a small natural areas. The small natural areas meet the natural landscape block criteria, as defined by the

CEHC Project, but are smaller than 2,000 acres and are not connected by what are called essential connectivity areas (Spencer et al. 2010). Essential connectivity areas are linear corridors or wide areas that serve to connect the natural landscape blocks.

The natural landscape blocks in and adjacent to the RCIS area are connected by three essential connectivity areas. From north to south: the Sacramento NWR-Clark Valley, the Colusa NWR–Sacramento NWR /Provident Main Canal, and the Colusa Basin-Butte Sink (Figure 2-30a). The essential connectivity areas in the RCIS area consists mostly of cultivated agriculture (rice fields) and managed freshwater wetlands. Less than half of the land within the Central Valley essential connectivity areas include natural land cover types, with the majority in agricultural uses (Spencer et al. 2010). The predominate land cover types of the essential connectivity areas in the RCIS area are rice agriculture and freshwater emergent wetland; approximately 39% of the total area in the RCIS area is rice and approximately 36% of the total area is freshwater emergent wetland. Although CEHC assumes that natural lands are more permeable than human-modified lands, agricultural landscapes are comparatively more permeable than developed areas, and provides some level of connectivity to natural landscape blocks within the RCIS area. The agricultural land also provides habitat suitable for a suite of species. For example, ricelands provide habitat for wintering waterfowl and giant garter snake, and alfalfa fields provide foraging habitat for Swainson's hawk. Valley foothill riparian is also present along river and creek corridors, such as Butte Creek, Sacramento River, and Feather River. Valley foothill riparian supports a diversity of species and a variety of plant and animal species that are restricted to this natural community for all or important parts of their life cycle, such as western yellow-billed cuckoo and valley elderberry longhorn beetle. It also provides continuous corridors and stopover habitat that facilitates movement between habitat areas for many migratory wildlife species. In addition, freshwater emergent wetlands and a matrix of seasonal wetlands (including vernal pools) and annual grasslands is found throughout the RCIS area.

The extensive land conversion and fragmentation in the Central Valley has reduced landscape connectivity across the Central Valley, between the Coast Range and the Sierra Nevada Foothills. The CEHC Project does not identify any essential connectivity areas in the immediate region of the RCIS area that connect entirely across the Central Valley floor. Rather, the general RCIS area is described as a "missing linkage" area; an area where extensive restoration efforts would be needed to re-establish connectivity function between the small and highly fragmented natural lands that are surrounded by an agricultural matrix.

Following is a brief summary of the essential connectivity areas in the RCIS area[28].

- The Sacramento NWR-Clark Valley essential connectivity area connects the natural landscape blocks in the RCIS area to the interior coastal foothills in the northeastern corner of the RCIS area and to the north of the RCIS area in Glenn County. The Sacramento NWR-Clark Valley connectivity area predominately supports rice agriculture with small amounts of freshwater emergent wetland.

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[28] The RCIS relies on CEHC to identify habitat connectivity because it identifies and names the essential connectivity areas, natural landscape blocks, and small natural areas in the RCIS area. However, this RCIS recommends protecting and enhancing connectivity between the Sutter Buttes and Sierra Nevada foothills, as identified in the Conservation Biology Institute's model (Conservation Biology Institute 2018).

- The Colusa NWR–Sacramento NWR/Provident Main Canal connectivity area runs north to south along the Main Canal thorough the managed wetlands of the Delevan NWR to freshwater emergent wetlands, annual grassland, and the valley foothill riparian areas of the Sacramento NWR.
- The Colusa Basin-Butte Sink connectivity area runs east to west, north of the City of Colusa. This essential connectivity area supports mostly rice agriculture, annual grasslands, some valley foothill riparian associated with the Sacramento River and Butte Creek, with scattered freshwater emergent wetland habitat. The Colusa Basin–Butte Sink connectivity area links the managed wetlands of the Colusa NWR and wetland and riparian habitat of the Sacramento River to the Sutter Buttes and Butte Creek.

Figure 2-30b shows the permeability of the essential connectivity areas, as modeled in the CEHC Project (Spencer et al. 2010). Permeability refers to the relative resistance of a connectivity area to ecological movements. Spencer et al. (2010) characterizes permeability based primarily on land cover naturalness, under the assumption that less human-modified areas are less resistant to most ecological movements, and lands that are protected against habitat conversion and managed for ecological values (e.g., NWR or conservation easement) would have lower relative resistance to altered lands (e.g., major highway or developed residential area).

Figure 2-31 shows a combination of the structural and species connectivity, as modeled by the Conservation Biology Institute (CBI) (Conservation Biology Institute 2018). Drawing from least-cost corridor theory and circuit theory, CBI modeled and mapped structural and wildlife habitat connectivity, and their combination, for the Sacramento Valley. The models used vector maps of core habitat areas and raster maps of resistance to movement to identify and prioritize least-cost linkages between core areas and map pinchpoints within the linkages. The resistance map displays the relative energetic cost, difficulty, or risk of moving across the area (Figure 2-31) (Gallo and Greene 2018, Gallo et al. in press).

CBI's connectivity model aligns moderately with the CECH Project's connectivity areas – both identify the Butte Sink and the Colusa Basin as areas with high connectivity (Figures 2-30a, 2-30b, and 2-31). CBI's connectivity model generally identifies low-moderate connectivity pathways west to the interior coast range, whereas the CEHC Project identifies essential connectivity areas that link the wildlife refuges and management areas from the Colusa Basin north to the Sacramento Wildlife Refuge, before connecting west to the interior coast range (Figure 2-30a). Because CBI's model was ecologically focused on habitat quality, it did not consider protected area status in mapping core areas or linkages. Hence, these westward linkages tend to align with small creeks passing through working lands as opposed to the linkages of the CECH Project that connect the currently protected lands of the western valley in a "dot-to-dot" type pattern. Each approach has its merits, and the one used, or their combination, depends on the targeted conservation objectives and strategies.

A primary difference between the two models is that CBI's connectivity model identifies linkages with moderate connectivity between the Sutter Buttes and the Sierra Nevada foothills (Figure 2-31); whereas the CECH Project does not identify essential connectivity areas between the Sutter Buttes, or anywhere in the RCIS area and the Sierra Nevada foothills (Figures 2-30a and 2-30b). The CECH Project used expert opinion to determine which linkages were important to map, and CBI's model used a transparent and systematic prioritization based on ten variables. Climate change and its effects were considered as part of this analysis.

Although much of the working lands in the RCIS area fall outside of natural landscape blocks and essential connectivity areas, as identified by the CEHC (Spencer et al. 2010), working lands provide important habitat values for focal species and other native species (e.g., Section 2.11, *Working Landscapes*, and Chapter 3, Section 3.7.1, *Working Landscapes*). Maintaining, restoring, and enhancing remnant patches of habitat within working landscapes helps to enhance permeability across working lands. Multi-scale, multi-stakeholder, sustainable land management strategies that not only focus on conservation areas such as wildlife refuges and habitat corridors, but also address working landscapes that function as habitat, are essential to achieving landscape permeability.

2.10.2 Riverine and Riparian Connectivity

The riparian corridors of the Sacramento River, Butte Creek, Feather River, and Sutter Bypass provide important corridors for landscape connectivity, connect upland natural areas in the RCIS area to natural areas outside of the RCIS, and provide aquatic connectivity up- and downstream in the rivers and streams that flow through the RCIS area. The CEHC Project (Spencer et al. 2010) considers riparian corridors critical to connecting remaining natural areas in the Central Valley and stresses the importance of riparian restoration to restore lost connections.

Key riparian corridors in the RCIS area include the following.

- The Butte Creek riparian corridor, which links to the Sutter Buttes, and could provide access to higher elevational refuges under changing climate conditions (Figure 2-26).
- The Sutter Bypass, which links to the Sutter NWR and Feather River riparian corridor and small natural areas east of the RCIS area (Figure 2-30a).
- The Colusa Basin Drainage Canal, which links riparian corridors and habitats in the Colusa Basin, through the Knights Landing area, to the Sacramento River and Feather River confluence in the southern extent of the RCIS area.
- The Feather River, along the eastern boarder of the RCIS area, which provides riparian connectivity for focal species in the RCIS, including habitat for valley elderberry longhorn beetle, western yellow-billed cuckoo, and Swainson's hawk.

These riparian corridors also provide connectivity to other large natural landscape blocks and essential connectivity corridors outside of the RCIS area. For example, east of the RCIS area is the Bear River–Chaparral Hill/Yuba River essential connectivity area. This is a large connectivity area that roughly follows the Yuba River and tributaries east, out of the Central Valley into the foothills of the Sierra Nevada. Northeast of the RCIS is the North Table Mountain–Ishi Wilderness essential connectivity area; the RCIS is connected to this area through the West Branch of the Feather River and Butte Creek as they flow southward into the Central Valley.

In addition to the important riparian areas these waterways provide for terrestrial wildlife, these waterways provide key linkages for focal fish species, such as Chinook salmon, steelhead, and green sturgeon. Fish migrate through the rivers in the RCIS area to and from spawning habitat outside the area, and rear in floodplains that are connected to stream channels. Along some reaches of the rivers in the RCIS area, floodplains are separated from river channels by levees, and can no longer provide rearing habitat for fish, among other ecosystem services. Aquatic habitat within the RCIS area is relatively well connected within the channels of the Sacramento River, Feather River, and Butte Creek, because the waterways are large rivers or major tributaries and there are no total barriers to fish passage (Figure 2-32a-c). However, CDFW has identified a few fish passage priorities to improve movement through waterways in the RCIS area (California Department of Fish and Wildlife 2017f) in the Sutter Bypass, Feather River, and Tisdale Bypass. Weir #1 Sutter Bypass is a priority for modification (rehabilitation of weir structure and fish ladder) to allow fish to move into Butte Creek and allow access to 90 miles of holding and spawning habitat. On the Feather River, CDFW identified the Sunset Pumps Diversion Dam a fish passage priority (California Department of Fish and Wildlife 2017f). DWR is planning the Sunset Project of Integrated Restoration and Efficiency project[29], which includes removing the Sunset Pumps Facility and restoring the channel elevation of the Feather River, improving fish passage and other ecosystem functions. A fish barrier was constructed in the Colusa Basin Drain on the downstream end of the existing Knights Landing Outfall Gates to keep adult salmon from entering the Colusa Drain. If fish enter the drain, they are unable to return to the Sacramento River (ICF International 2015).

Partial barriers to fish passage in the RCIS area include weirs and water diversions. The Sutter and Tisdale Bypasses limit fish movement into the Sacramento River. Both of these bypasses are only flooded during precipitation events in the winter and spring, when flows are high in the Sacramento River. The Tisdale Weir connects the Tisdale Bypass to the Sutter Bypass and Sacramento River. CDFW identified the Tisdale Weir as a fish passage priority in 2017 (California Department of Fish and Wildlife 2017f); the 2017 CVFPP Update includes refinements to project concepts that would improve fish passage at the Tisdale Bypass (California Department of Water Resources 2017). In addition to the weirs, there are numerous diversions along all of the waterways in the RCIS area, including screened and unscreened diversions (CalFish 2017) (Figure 2-32a-c). These diversions, however, do not block fish passage. There are also some road crossings that have been identified as a possible barrier to fish passage during low flows. There are dams upstream of the RCIS area that block fish passage and historical spawning habitat. This is discussed in greater detail in Section 2.13.4, *Dams and Water Management/Use.*

2.11 Working Landscapes

FGC 1852 (e)(1) requires that an RCIS consider "the conservation benefits of working lands for agricultural uses," which are described in Chapter 3, Section 3.7.1, *Working Landscapes*, and summarized below. To support this analysis, this section describes the extent of farmland and rangeland in the RCIS area. This information is based on the latest annual report of agricultural production in Colusa and Sutter Counties compiled by each county's Agricultural Commissioner (Colusa County 2015, Sutter County 2015).

Central Valley working lands, including those within the RCIS area, provide important habitat for native birds and other wildlife, including focal species such as tricolored blackbird, Swainson's hawk, and giant garter snake. Native birds such as breeding waterfowl, wintering, and migrating waterfowl and shorebirds, and riparian songbirds derive cover, forage, reproduction, and dispersal functions from agricultural lands (Central Valley Joint Venture 2006, Golet et al. 2018, Reynolds et al. 2017). Rice fields, irrigated cereal grains, alfalfa, and pasture provide important foraging habitat for focal species. Agricultural lands with enhanced field borders or fence rows (i.e., planted with vegetation that provides food and cover plants) provide habitat for wildlife in the agricultural

[29] https://water.ca.gov/Programs/Integrated-Regional-Water-Management/Fish-Passage-Improvement-Program/Feather-River

landscape (Natural Resource Conservation Service 2007). When flooded and managed as part of an interconnected riverine and riparian ecosystem, agricultural habitat also provides valuable rearing habitat for salmonids (Katz et al. 2017), and may increase available food and nutrients for fish downstream (e.g., California Natural Resources Agency 2016). Therefore, it is important to maintain, and increase, where feasible, wildlife-friendly agriculture (California Department of Fish and Wildlife 2015).

Working landscapes also provide several ecosystem services, including water supply, groundwater recharge, and climate change stabilization. Working landscapes maintain water supply in the RCIS area through man-made infrastructure, such as dams, reservoirs, and canals, as well as through functioning watersheds and managed aquifers. Aquatic channels on farmlands can provide habitat for native species, while provisioning groundwater recharge areas downstream. In addition, the per-acre emission for California's farms are an average of 58 times lower than those from its urban areas (Shaffer and Thompson 2015).

2.11.1.1 Farmland

Approximately 428,350 acres of land in the RCIS area (84%) is utilized for agricultural production. More than half of the agricultural land within Colusa and Sutter County is considered Prime and Statewide Importance Farmland, with some large areas of Local and Unique Farmland (138,550 acres) and Native Vegetation and Grazing Land (see Section 2.3.2, *Land Use*, and Table 2-2 for a description of agricultural land uses in the RCIS). Prime farmland (277,091 acres within the RCIS area) is defined by FMMP as farmland that has the best combination of chemical and physical features to sustain long-term high yield crops. Statewide Importance Farmland (12,707acres within the RCIS area) is categorized as farmland of slightly lower quality than prime farmland, due to steep slopes or soil moisture (Figure 2-11).

Major crops of Colusa County include rice, processing tomatoes, almonds, wheat, vegetable seeds, walnuts and prunes. In 2015, 26 different agricultural commodities were grown in Colusa County. The total value of agricultural crops produced in 2015 was $901,764,000 up from $876,347,000 in 2014, but down from $920,110,300 in 2013 (Colusa County 2015). The value of almonds, the County's largest crop was $418,566,000 in 2015, which increased substantially from 2013 ($279,147,000). Rice, processing tomatoes, walnuts, and vegetable seeds rounded out the top five crops in 2015 (Colusa County 2015).

The gross value of Sutter County agriculture production for 2015 was $544,044,000, which is a decrease of $182,022,000 or 25% below 2014's value of $726,066,000 (Sutter County 2015). Rice returned to the top ranking crop in 2015 with a total value of $142,210,000, which was a 5% decrease. Sutter County grew approximately 25 commodities in 2015. Rounding out the top five in 2015 were walnuts ($77,545,000), prunes ($54,507,000), peaches ($48,363,000), and almonds ($22,809,000).

2.11.1.2 Rangeland

The grassland and oak woodland natural communities in the RCIS area evolved under the influence of prehistoric herbivores—including large herds of deer, elk, antelope, and other grazing animals—and without competition from non-native annuals, which currently dominate much of the region. In the absence of these large native herbivores, appropriate livestock grazing of cattle, sheep, and goats is a valuable range management tool, used to manage infestations of invasive plants, promote populations of native plants and animals, and reduce wildfire fuel loads.

Livestock grazing is the most widespread land management practice in the world, affecting 70% of the land surface of the western United States (Krausman et al. 2009). Grazing reduces the amount of accumulated plant litter, thereby favoring native plant establishment and growth and enhancing the overall composition of native plant communities in the reserve. Non-native annual grasses and herbs tend to rapidly monopolize landscapes and can inhibit the germination of seeds and growth of native species through the capture of water and mineral resources and the physical and chemical effects of accumulated plant litter. Grazing intensity and type and class of stock can vary depending on the management objectives in a particular location. For example, in some cases fairly aggressive grazing practices can be used to manage invasive pest plants, provided enough residual dry matter is retained to protect soil health and prevent the risk of erosion. Generally moderate grazing can also improve conditions for focal species by reducing dense ground cover, which can impede movement and decrease populations of burrowing rodents (Ford et al. 2013).

There are approximately 5,649 acres of grazing land in the RCIS area—approximately 1% of the RCIS area (Figure 2-11).

2.12 Gaps in Scientific Information

The conservation strategy presented in Chapter 3, *Conservation Strategy*, is based on the best available scientific information. This section includes a discussion about information gaps that create uncertainties in the development of the conservation strategy, and if filled, could be used to modify or improve the objectives, actions, and priorities in the RCIS area. Gaps can be created from a lack of information or by shortcomings in how information is disseminated.

2.12.1 Stream Diversions

All of the focal fish species are anadromous, and use the rivers in the RCIS area to migrate from the ocean to spawning grounds, and emigrate from natal rivers and streams to the ocean. Diversions can entrain fish and redirect them into agricultural fields or a dead-end waterbody. Entrained fish can become stranded and eventually die from lack of good water quality.

As described in Section 2.10.2, *Riverine and Riparian Connectivity*, aquatic habitat is relatively well connected within the channels of the Sacramento River, Feather River, and Butte Creek. There are, however, many diversions in the RCIS area. Although many have been identified (Section 2.10, *Habitat Connectivity*, and Figure 2-32a-c), many likely have not been assessed for their potential to affect anadromous fish. Additional research should be conducted to assess the relative threats of diversions in the RCIS area to identify those that should be modified to reduce impacts.

2.12.2 Green Sturgeon Life History

As discussed in the Draft Recovery Plan for the southern distinct population segment of green sturgeon (National Marine Fisheries Service 2018) (Section 2.2.5.3, *Green Sturgeon*), green sturgeon are difficult to study because they use several different habitats depending on life history phase. Many life history traits are unknown and more research and monitoring needs to be done to determine how best to enhance green sturgeon habitat and survival. The following research priorities were listed as High in the Draft Recovery Plan.

- Conduct research to identify contaminants and contaminant concentrations in all life stages of green sturgeon and their prey base.
- Conduct research to determine the toxicity of identified contaminants on green sturgeon (e.g., physiologically) and their prey base.
- Conduct research to gain a better understanding of the prey base of all life stages of green sturgeon and potential effects of non-native species and climate change.
- Conduct research to determine how native and non-native species compete with green sturgeon for habitat.
- Conduct research to evaluate spawning substrate suitability in the Sacramento and Feather rivers.
- Evaluate the effects of habitat modification and/or restoration (e.g., levee alteration, channel reconnection, floodplain connectivity measures) on green sturgeon recruitment and growth.

2.12.3 Valley Elderberry Longhorn Beetle Species Occurrence Data

The CNDDB (California Department of Fish and Wildlife, California Natural Diversity Database 2018) was the primary source of species occurrence data for the valley elderberry longhorn beetle. While those data are considered high quality, because of the verification process used by CDFW, there are inherent gaps. First, only positive data are presented (i.e., where an occurrence is found). While positive occurrence data are very useful, the database does not identify where surveys have been conducted for each species with negative survey results (i.e., where an occurrence was not detected). Knowing where species do not occur, in habitat that may appear suitable, provides valuable information that can be used to identify areas for restoration and enhancement actions. For example, an inventory of elderberry shrub distribution in and adjacent to the RCIS area, along with surveys of elderberry shrubs to determine the presence of recent exit holes, would inform where habitat protection, restoration, and possibly, translocation, could occur to expand valley elderberry longhorn beetle populations. Surveys of existing restoration sites within or adjacent to the RCIS area would improve understanding of landscape-scale and site-specific factors associated with successful elderberry shrub establishment and persistence. Because this information is not readily available, the habitat model for valley elderberry longhorn beetle likely over-predicts where it may occur.

2.12.4 Effects of Environmental Toxin on Focal Species

Environmental toxins, from agricultural pesticides, herbicide runoff, and rodenticides, have the potential to pose direct and indirect threats to focal species and degrade their habitat. Environmental toxins may directly contact and harm focal and other native species, contaminate prey or food items, or reduce abundance of prey items. For example, the level of sensitivity of the red or blue elderberry (*Sambucus* ssp.) to herbicides, the host plants for the valley elderberry longhorn beetle, is unknown. Additionally, the sensitivity of the beetle to pesticide exposure and response to exposure, and the overall effect of pesticides on its habitat are unknown (U. S. Fish and Wildlife Service 2014a). Aerial sprayed herbicides to control invasive aquatic plants, such as water hyacinth, may negatively alter the habitat suitability of aquatic environments shared by the giant garter snake, as well as adversely affect the species (California Department of Fish and Game 2004). Pesticides and herbicides used in agricultural lands adjacent to riparian habitat may also indirectly reduce prey base, by limiting insect abundance for western yellow-billed cuckoo and small mammal prey for the Swainson's hawk. Rodenticides used in bait stations in agricultural lands and along levee systems to control unwanted small mammals, such as California ground squirrels and voles, may have direct effects on Swainson's hawks, if they eat sick or dead small mammals that have consumed the rodenticides. Laymon (1980) documented sublethal poisoning of young yellow-billed cuckoos by pesticides spayed on active nests in orchards, and other studies have shown preferred prey items can become contaminated by pesticides (Laymon and Halterman 1987). A better understanding of the effects of environmental toxins, such as herbicides, pesticides, and rodenticides on focal species, and the development of appropriate guidelines for their usage would contribute to establishing pest control techniques that support the conservation of the focal species.

2.12.5 Bank Swallow Nesting Habitat Suitability

In the RCIS area, bank swallow nesting habitat is maintained by dynamic hydrogeomorphic processes that erode and create bank habitat, with the location of suitable habitat changing over time. The dynamic and ephemeral nature of suitable bank habitat makes protecting that habitat challenging, as the location of areas in need of protection may change over time. River meander modeling could be used to help identify areas where potential bank habitat may be regenerated through hydrogeomorphic processes, to help target specific habitat enhancement actions that may not necessarily need permanent conservation easements (e.g., durability agreement to maintain banks free from revetment over a period of time).

2.13 Pressures and Stressors on Focal Species and other Conservation Elements

FGC Section 1852(c)(5) requires that an RCIS include a summary of historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, on the focal species, habitat, and other natural resources, as identified in the best available scientific information, including, but not limited to, the SWAP (California Department of Fish and Wildlife 2015).

Understanding the pressures and stressors experienced by the focal species and their habitats within the RCIS area is one of the critical steps necessary to identify conservation actions and habitat enhancement actions to counteract them. The RCIS area is almost entirely within the Central Valley and Sierra Nevada province, as defined in the SWAP. The RCIS area is similarly almost entirely within portions of the Great Valley ecoregion. For the Central Valley and Sierra Nevada province, the SWAP identifies 21 categories of pressures affecting conservation targets in the province. Of these pressures, 13 are identified as affecting conservation targets in the Great Valley ecoregion, and six are identified as affecting native fish within Sacramento HUC 1802. This RCIS uses the same pressure categories identified for the RCIS area as those defined in the SWAP, with two exceptions. This RCIS does not include the pressures of logging and wood harvesting and mining and quarrying, as these pressures are generally not currently occurring in the RCIS area.[30]

[30] One aggregate mine occurs in Colusa County and two occur in Sutter County, but outside the RCIS area. For details, see http://www.conservation.ca.gov/cgs/information/publications/ms/Documents/MS_52_2012.pdf

The following pressures, as defined in the SWAP, are described in the following sections.

- Agricultural and forestry effluents.
- Annual and perennial non-timber crops.
- Climate change.
- Commercial and industrial areas.
- Dams and water management/use.
- Household sewage and urban waste water.
- Housing and urban areas.
- Invasive plants and animals.
- Livestock, farming, and ranching.
- Recreational activities.
- Roads and railroads.
- Utility and service lines.

Each of these pressures and resultant stressors is discussed below in a general context, as well as in relation to the focal species and other conservation elements discussed in this chapter, including stressors to natural communities, habitat connectivity, and working landscapes. The SWAP provides a general overview of each of these pressures. For some pressures, the SWAP also includes an analysis of the pressures applicable to the Great Valley ecoregion of the Central Valley and Sierra Nevada province. Some of these pressures result in similar or related stressors, and so are discussed together. A matrix showing the association between pressures and each focal species is included in Table 2-10.

Table 2-10. Pressures Acting on each Focal Species

Focal Species	Commercial and Industrial Areas; Household Sewage and Urban Waste Water; Housing and Urban Areas	Annual and Perennial Non-timber Crops; Agricultural and Forestry Effluent; Livestock, Farming, and Ranching	Climate Change	Invasive Plants and Animals	Roads and Railroads; Utility and Service Lines	Dams and Water Management/Use	Recreational Activities
Valley Elderberry Longhorn Beetle	X	X	X	X	X	X	X
Green Sturgeon	X	X	X	X	X	X	X
Central Valley Steelhead	X	X	X	X	X	X	X
Sacramento Winter-Run Chinook Salmon	X	X	X	X	X	X	X
Central Valley Spring-Run Chinook Salmon	X	X	X	X	X	X	X
Central Valley Fall/Late Fall-Run Chinook Salmon	X	X	X	X	X	X	X
Giant Garter Snake	X	X	X	X	X	X	-
Western Pond Turtle	X	X	X	X	X	X	X
Swainson's Hawk	X	X	X	-	X	X	-
Tricolored Blackbird	X	X	X	-	X	X	-
Western Yellow-Billed Cuckoo	X	X	X	-	X	X	-
Bank Swallow	X	X	X	-	X	X	X

2.13.1 Annual and Perennial Non-Timber Crops; Agricultural and Forestry Effluents; Livestock, Farming, and Ranching

According to the recent *Colusa County General Plan Update Background Report* (Colusa County 2010), 75% of Colusa County is croplands. The majority of these lands are on the Central Valley floor and contained in the RCIS area. Conversely, only 1% of county lands are designated specifically for grazing, and these lands are located within the communities of Arbuckle, Maxwell, Princeton, Grimes, Stonyford, and in the unincorporated areas adjacent Colusa and Williams. Grazing is also an identified as potentially occurring in the foothill areas, west of the RCIS area. As such, the majority of the effects on the RCIS focal species and other conservation elements are tied more to crop production than to rangeland grazing or livestock production.

As described in the SWAP (page 2-36) (California Department of Fish and Wildlife 2015),

> Agriculture is an essential component of California's economy. The state is a major producer in the fruit, vegetable, tree nut, and dairy sectors (U.S. Department of Agriculture 2014). Historic conversions of native habitat to agriculture in California have been significant. Today approximately 70% of the Central Valley is used for agriculture, with the vast majority of this land conversion occurring prior to the 1970s (U.S. Geological Survey 2014). While agricultural lands no longer represent native vegetation types, they can provide important habitat for wildlife species, such as flooded rice fields of the Central Valley that provide waterfowl habitat. Habitat loss and or degradation can occur through land conversion from one type of agriculture to another, including conversion of field and row crops or grazing lands to orchards or vineyards. Deep ripping of fields to create subsurface conditions conducive to orchards and vineyards can destroy wetlands as well as essential upland habitat for sensitive species such as California tiger salamander, and lead to habitat fragmentation. Diversion of water for irrigation can contribute to altered hydrologic regimes, and nutrient laden runoff can degrade aquatic habitat. Other impacts from agricultural practices include the use of chemical fertilizers, herbicides, rodenticides, and other chemicals that can affect non-target species and degrade water quality. Illegal marijuana groves, particularly in the northern portions of the state, have similar but more pronounced impacts than other agriculture, because of their location in remote and otherwise undisturbed areas and lack of regulatory oversight.
>
> Belsky et al. (1999) found that studies overwhelmingly show that livestock grazing negatively affects water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, in-stream and streambank vegetation, and aquatic and riparian wildlife. Other researchers have found benefits from grazing and have advocated for grazing as a useful and necessary conservation tool.

The RCIS area is largely defined by its rural agricultural setting, with no large urban population center in the RCIS area. Agricultural use is the primary driver of conversion of natural lands. Much of the RCIS area is in active agricultural production (approximately 537,000 acres of agriculture land cover, or about 85% of the RCIS area), consisting of numerous farming operations, some of which cover thousands of contiguous acres of land.

2.13.1.1 Effects on Focal Species

According to the SWAP (page 2-36) (California Department of Fish and Wildlife 2015),

> Ongoing agricultural practices can have a range of direct and indirect ecosystem consequences, positive or negative, based on timing, duration, and intensity. In addition, different cropping systems (e.g., organic versus conventional farming, or highly diversified fields versus large monocultures) can have different levels of impacts on natural ecosystems across the landscape. Many on-farm practices

> for conservation can reduce impacts/benefit ecosystems. The location of certain cropping systems and crop types are important factors in moving toward a long-term sustainable agricultural system.
>
> Field crops can provide foraging habitat for raptors, such as Swainson's hawk, and rice fields and stock ponds can provide foraging and aquatic habitat for reptiles such as giant garter snake (federal and state threatened), amphibians, bats and birds, such as tricolor blackbird. Agriculture can harm those same species through chemical treatments, removal of nesting habitat, or direct mortality from harvesting and maintenance activities. Agricultural runoff containing fertilizers and pesticides can also pollute and degrade aquatic and marine habitat. Conversely, crop damage from wildlife can cause substantial economic loss and public health risks necessitating enhanced measures to control access to crops by wildlife.
>
> Legislation, public policies, and landowner conservation practices have helped slow impacts of agricultural practices to species and habitats. For example, farmers can apply for subsidies to avoid disruption of tricolored blackbird nesting, to restore wetlands and other waters, to implement best management practices for grazing, and to manage field crops for the benefit of wildlife (e.g., rice field management to provide habitat for giant garter snake and migratory birds) (U.S. Department of Agriculture 2015).

Other effects of farming activities are also described in the SWAP (page 5.3-27) (California Department of Fish and Wildlife 2015).

> Rain and irrigation runoff carry silt and agricultural chemicals, degrading surface water quality and reaching groundwater. For example, significant amounts of nitrogen fertilizer applied through agricultural practices have contaminated groundwater supplies in agricultural communities throughout the State (Viers et al. 2012). Herbicides and pesticides can have toxic effects on aquatic plants and animals and chemical contaminants can upset the ecological balance of aquatic systems. For example, nutrients increase aquatic plant and algal growth, resulting in lowered oxygen levels when the excessive plant matter decomposes. Elevated nutrient levels have also been implicated in amphibian deformities, because nutrient-rich environments favor the parasitic flatworm that causes deformities in many frog species (Johnson and Chase 2004). Also, pesticide drift has been shown to favor hybrid tiger salamanders over native California tiger salamanders (Ryan et al. 2012). Silt and sediment also degrade aquatic environments, increasing turbidity and shading out aquatic vegetation, along with scouring away or smothering stream-bottom sediments that are important spawning sites and invertebrate habitats. Runoff problems are particularly severe on steeply sloping, erosion-prone soils, where strawberries, artichokes, and vineyard grapes are commonly grown. Planting practices that result in large amounts of soil disturbance, such as the establishment of vineyards and strawberry and artichoke mounds, also contribute substantially to sediment runoff.
>
> (page 2-37) Central Valley agriculture contributes to the conservation of numerous species of waterfowl and shorebird along the Pacific Flyway, and significantly in the maintenance of winter habitat for the greater sandhill crane, a California-listed threatened species. In the absence of native habitats, grain crop fields provide essential winter flooded roost habitat for sandhill cranes, ameliorating the effects of ongoing conversion of farmlands to incompatible crops such as orchards and vineyards (Ivey et al. 2014). There is clearly a balance that can be achieved through incentive based, non-regulatory collaboration and partnerships with conscientious ranchers and farmers. SWAP 2015, as well as the California Climate Adaptation Strategy, relies upon fostering this balance as much as possible, but will require a concerted effort to sustain a dialog with farmers, ranchers, land managers, agency staff, and the public about the benefits of working together for the benefit of fish and wildlife.

Environmental toxins from agricultural pesticides have the potential to pose direct and indirect threats on focal species and degrade habitat quality. The effects of environmental toxins is a scientific information gap in the RCIS area. However, environmental toxins have been shown elsewhere to directly cause harm to nesting yellow-billed cuckoo (Laymon 1980), contaminate prey or food items of the yellow-billed cuckoo (Laymon and Halterman 1987), alter giant garter snake aquatic environments (California Department of Fish and Game 2004), and may pose unknown exposure effects on host plants for the valley elderberry longhorn beetle.

2.13.1.2 Effects on Other Conservation Elements

Natural communities and habitat connectivity in the RCIS area have been affected by agricultural land uses within the RCIS area. Habitat conversion to cropland has fragmented and isolated areas of remaining natural habitat, limiting habitat connectivity. Agricultural land uses, when not managed carefully, may also indirectly affect the quality of remaining natural lands through degradation of ground and surface water, overdraw of groundwater, reducing availability for remaining trees, shrubs and in-stream flows. Despite these potential effects, agricultural lands provide important habitat values for wildlife.

2.13.2 Commercial and Industrial Areas, Household Sewage and Urban Waste Water, Housing and Urban Areas

This group of pressures generally describes those activities that result in land conversion and associated indirect effects of land conversion, including increased effluent releases into local streams. Land conversion includes the full spectrum of natural lands transformation into developed lands, often transitioning through various agricultural uses before becoming completely devoid of characteristics that support habitat for focal species.

Land conversion and associated indirect effect stressors are primarily the result of growth driven by increased populations and economic prosperity. As described in Section 2.3.1, *Local Government Planning Boundaries and General Plans*, the RCIS area is predominantly rural, and dominated by agriculture, with relatively small populations. Land conversion for development is not expected to be a significant stressor in the RCIS area. Little growth is expected in Sutter County (D. Libby, pers. comm. 2018), with modest growth anticipated in Colusa County (Colusa County 2012), Both counties are zoned to maintain agriculture, open space, and their rural character (Figures 2-9 and 2-10).

In addition to past and future population growth, the RCIS area supports a robust agricultural economy. This is illustrated by Table 2-4 that shows 80% of the RCIS area is currently in agricultural production, and less than 17% of the RCIS area currently supporting natural communities.

Past conversion of natural communities for development and cultivated agricultural uses affects remaining patches of natural communities and aquatic resources. Isolated patches of habitat are often less suitable or unsuitable for focal species (this stressor is discussed in greater detail in Section 2.13.2.1, *Effects on Focal Species and Habitats*) than large, contiguous patches of habitat. Other stressors include light pollution, noise pollution, and degradation of aquatic resources. Aquatic resource degradation occurs through both point-source (e.g., waste water treatment plant releases) and non-point source (e.g., urban and stormwater runoff) releases. Both point and non-point sources are regulated by the Regional Water Quality Control Boards, however, capture and/or treatment of non-point sources is an on-going challenge in urban areas. Urban development contributes to increased runoff, especially during storm events, due to increased extent of impermeable surfaces common to urban areas. Such increases can result in greater levels of scour and/or incision of local creeks, increased sediment loads, alterations of downstream hydrology, and decreased groundwater recharge. Also, new development may increase the amount of pollutants such as grease, oil, and lawn pesticides that can be transported from residences during wet weather.

Domesticated animal feces are also a pollutant associated with urban runoff, and also may carry pathogens as well.

Other facilities associated with urbanization including power plants, sewage plants, and other industrial facilities also contribute pollutants to local aquatic resources. An increase in the quantity of pollutants reaching local waterways through higher runoff may affect the biological and physical characteristics of aquatic habitats. High runoff temperature may also result in an increase of in-stream water temperatures when runoff enters local streams.

2.13.2.1 Effects on Focal Species and Habitats

In the Great Valley ecoregion of the Central Valley and Sierra Nevada province, the SWAP describes the following (page 5.4-34) (California Department of Fish and Wildlife 2015).

> Growth and development fragment habitats into small patches that cannot support as many species as larger patches can. These smaller fragments often become dominated by species more tolerant of habitat disturbance, while less-tolerant species decline. Populations of less-mobile species often decline in smaller habitat patches because of reductions in habitat quality, extreme weather events, or normal population fluctuations. Natural recovery following such declines is difficult for mobility-limited species. Such fragmentation also disrupts or alters important ecosystem functions, such as predator-prey relationships, competitive interactions, seed dispersal, plant pollination, and nutrient cycling (Bennett 1999; ELI 2003).

As described in Section 2.13.2, growth and development aren't expected to be significant stressors in the RCIS area. However, even low-levels of growth can affect populations and habitats if growth reduces habitat connectivity. Loss of habitat connectivity would affect all of the focal species in the RCIS area. Loss of connectivity between open space patches that provide habitat for focal species can cause a reduction in genetic diversity due to the loss of the ability of populations to disperse and intermix. High genetic diversity can allow populations to adapt to changing environmental conditions, evolve resistance to disease, and minimize physiological and behavior problems (Falk et al. 2001). For some species with limited ranges, especially reptiles and small mammals, habitat loss and connectivity to suitable habitat can threaten survival of a population if individuals cannot migrate to suitable replacement habitat. Maintaining connectivity allows limited-range species to shift habitats to adjacent areas if populations experience loss of habitat. Barriers to movement could also extirpate local, smaller populations of focal species in the RCIS area.

Each of the focal species are impacted by conversion of native habitats to agricultural production or urban development (Table 2-10). For example, Swainson's hawk, tricolored blackbird, and giant garter snake have experienced dramatic declines in the ecoregion due to widespread habitat loss and habitat fragmentation from the conversion of grassland habitat to the urban and agriculture uses other than livestock grazing, described above (Gervais et al. 2008). Over 90% of the wetland habitat within the historic range of western pond turtle has been eliminated due to agricultural development, water diversion projects, and urbanization (U.S. Fish and Wildlife Service 1992).

Focal fish species are also directly impacted by habitat conversion and habitat fragmentation. Habitat loss can result in the elimination of individuals or populations of these species from the area that is converted, and these species can also be affected by proximity to converted lands from runoff and pollution associated with urban development and associated infrastructure and trampling (in the case of rangelands). Loss of juvenile fish rearing habitat in the form of lost natural river morphology and function, and lost riparian habitat and in-stream cover (National Marine Fisheries Service 2014) can occur from residential development close to streams and rivers.

2.13.2.2 Effects on Other Conservation Elements

All of the other conservation elements in the RCIS area could be affected by land conversion within the RCIS area. The major impact of new development is the conversion from undeveloped to developed land cover, which reduces biodiversity and eliminates natural habitat. Habitat conversion may further isolate areas of remaining natural habitat, increasing the edge (i.e., boundary) and the distance between habitats, limiting habitat connectivity and landscape linkages. Additionally, development can convert farmland and rangeland to areas with large amounts of impervious surfaces (e.g., concrete or asphalt) which have little or no value for the focal species in the RCIS area.

2.13.3 Climate Change

Climate change is a major challenge to the conservation of natural resources in California and the RCIS area. Climatic changes are already occurring in the state and have resulted in observed changes in natural systems. For example, small mammal distributions were found to shift upwards along an elevational gradient in Yosemite National Park, consistent with an increase in minimum changes in temperature over the last century (Moritz et al. 2008). Projected changes in climate, including extreme events such as fire, drought, flood, extreme temperatures, and storm events, are likely to have significant impacts on habitats, species, and human communities in the near future.

In the Great Valley ecoregion of the Central Valley and Sierra Nevada province, the SWAP describes the following stressors related to climate change (page 5.4-29–5.4-30) (California Department of Fish and Wildlife 2015).

Temperature

Average annual temperatures in the Central Valley are expected to increase 1.4° to 2.0°C (2.5° to 3.6°F) by 2070, and 1.5° to 4.5°C (2.9 to 7.9°F) by 2100 (PRBO 2011). January average temperatures are projected to increase 2.2° to 3.3°C (4 to 6°F) by 2050 and 4.4° to 6.7 °C (8°F and 12°F) by 2100. July average temperatures are projected to increase 3.3° to 3.9°C (6° to 7°F) in 2050 and 6.7° to 8.3°C (12°F to 15°F) by 2100 (California Emergency Management Agency 2012).

Precipitation and Snowpack

In the Central Valley, lower-elevation areas are projected to experience declines in annual precipitation of 2.5 to 5 cm (1 to 2 inches) by 2050 and up to 8.9 cm (3.5 inches) by 2100, while more elevated areas are projected to experiences losses of up to 25.4 cm (10 inches).

Freshwater Hydrologic Regimes

In the Sierra Nevada, the considerable loss in snowpack is projected to decrease the duration and magnitude of flows. Approximately 20% decrease in runoff and riverflow is expected by 2090. The combined effect of changes in precipitation, temperature, and snowpack are expected to produce an earlier arrival of annual flow volume by as much as 36 days by 2071–2100; and, warmer temperatures and more precipitation falling as rain rather than as snow are also projected to cause snowmelt runoff to shift earlier under all model simulations (PRBO 2011). Declining snowpack, earlier runoff, and reduced spring and summer streamflows will likely affect surface water supplies and increase reliance on groundwater resources in the Central Valley, which are often already overdrafted (PRBO 2011).

The SWAP provides the following overview of how the climate of the Central Valley is expected to change (page 5.4-31) (California Department of Fish and Wildlife 2015).

Although climate change is already affecting wildlife throughout the state (Parmesan and Galbraith 2004), and its effects will continue to increase, it has particular significance for this region's major river and estuarine systems.

In general, California winters will likely become warmer and wetter during the next century. Instead of deep winter snowpacks that nourish valley rivers through the long, dry summer, most of the precipitation will be winter rain that runs off quickly. For the Central Valley, this means more intense winter flooding, greater erosion of riparian habitats, and increased sedimentation in wetland habitats (Field et al. 1999; Hayhoe et al. 2004).

Hotter, drier summers, combined with lower river flows, will dramatically increase the water needs of both people and wildlife. This is likely to translate into less water for wildlife, especially fish and wetland species. Lower river flows will allow saltwater intrusion into the Bay and Delta, increasing salinity and disrupting the complex food web of the estuary. Water contaminants may accumulate during the summer as the natural flushing action decreases.

2.13.3.1 Effects on Focal Species and Habitats

Some of California's native species are more vulnerable than others to extended or frequent severe drought and may be at risk of extirpation. Small population size, short life expectancy relative to the drought duration, and inability to adequately cope with extreme events are reasons some taxa, including several of the Mid-Sacramento Valley RCIS focal species, are more vulnerable than others. The impacts of drought on some types of animals are more obvious than others.

Climate change may alter habitats in the RCIS area as temperatures and precipitation levels change, which could lead to the reduction in population sizes or extirpation of focal species that rely on those habitats, or require focal species in the RCIS area to migrate to other areas. Many of the focal species in the RCIS area are of special conservation concern because of their risk of extinction (Table 1-2), and are particularly vulnerable to climate change (California Department of Fish and Wildlife 2018a). Species that are particularly vulnerable often occur within a limited geographic range, exist in small populations, have specialized habitat requirements, and have low dispersal ability which make it difficult for them to migrate to more suitable areas as habitats shift with climate change. Aquatic species are particularly at risk (e.g., green sturgeon, Central Valley steelhead, Chinook salmon), because they could be extirpated by loss of aquatic breeding habitat (i.e., lethal water temperatures) during extended periods of drought. By identifying species most at risk from the effects of climate change, conservation and management efforts can be targeted to reduce and mitigate these impacts, such as by protecting and restoring existing habitat and linkages between habitats and climate change refuges, or through assisted migration. The State Wildlife Action Plan (California Department of Fish and Wildlife 2015b) identifies five of the focal wildlife species as climate vulnerable: steelhead, all Chinook salmon runs and Swainson's hawk (Table 2-10).

Increased and prolonged droughts and decreasing habitat connectivity may increase mortality in both juvenile and adult focal fish populations where water supply and quality reach critical lows. This poses a high risk for species (e.g., winter-run Chinook salmon, green sturgeon) with limited distribution and low population size (California Department of Water Resources 2015). Decreased stream flow and water quality during summer months in rivers and estuaries may also impact migration, juvenile fish over-summer rearing, and adult spawning.

In the climate risk analysis for California's at-risk birds (Gardali et al. 2012), Swainson's hawk is listed as a species with moderate vulnerability to climate change because of their use of very specific habitats and their long-distance migratory patterns (i.e., the timing of their migration needs to be matched with suitable climate conditions). Alfalfa, a high water-use crop, provides important foraging habitat for Swainson's hawk in the agricultural landscapes of the Central Valley and the RCIS area. Climate change may cause a decrease in water available for agriculture, and a consequent shift from growing alfalfa to less water-intensive crops that may provide lower quality foraging habitat for Swainson's hawk (e.g., safflower) (Friends of the Swainson's Hawk 2009).

Focal species in the RCIS area could respond to climate change in a number of ways. First, the timing of seasonal events, such as migration and egg laying, may shift earlier or later. Such shifts may affect the timing and synchrony of events that must occur together. Second, range and distribution of focal species may shift (Walther et al. 2002). This is of particular concern for narrowly distributed focal species that already have restricted ranges due to urban development or altitudinal gradients. Historically, some focal species could shift their ranges across the landscape. Today, urban and rural development prevents the movement of many species across the landscape.

Increases in disturbance events, and/or the intensity of disturbance events, such as fire or drought may also occur. This could increase the distribution of disturbance-dependent land cover types, such as California annual grassland, within the RCIS area (Rogers and Westfall 2007). An increase in the frequency and intensity of disturbance could increase the likelihood that these events will harm or kill individual focal species, many of which are already quite rare. Events that occur with unpredictable or random frequency (called stochastic events) such as those described in this section can have an inordinately negative effect on the focal species.

2.13.3.2 Effects on Other Conservation Elements

As described above, temperatures are expected to increase and water availability throughout the year is expected to decrease. This will likely affect all of the vegetated land uses in the RCIS area. In the California Vegetation Climate Vulnerability Assessment, Thorne et. al. (2016) assess the climate vulnerability of 29 natural vegetation community types in California. Of the natural vegetation community types assessed by Thorne et. al. (2016), seven occur in the RCIS area, and have moderate or higher vulnerability to projected climate change scenarios: California foothill and valley forests and woodland, non-native forest and woodlands, riparian forest and woodland, chaparral, coast sage scrub, California grassland, and freshwater marsh. Vulnerability was determined by using detailed spatial patterns of California's vegetation community types and examining how climate conditions will change at these locations. These vegetation communities exhibit differing sensitivity and adaptive capabilities to the effects of climate change. With less water availability, wetlands may shrink and convert to grassland and riparian areas may similarly transition to non-aquatic land cover types. Reduction in water availability is also likely to increase challenges associated with successfully operating working landscapes.

2.13.4 Dams and Water Management/Use

The management of water resources in California causes stress on rivers, the Delta, wetlands, estuaries, and aquifers As described in the SWAP (page 2-32) (California Department of Fish and Wildlife 2015).

> Water management activities include the operation of dams and diversions, development and operation of irrigation canal systems, extraction of groundwater, and construction of flood-control projects such as levees and channelization. Coastal lagoons and rivers suffer from the historic and ongoing conversion of tributary waterways into constructed stormwater infrastructure. The stormwater conveyances are managed to convey urban runoff and floodwater and can alter the hydrologic processes that are important to ecosystem function, such as sediment deposition, water

> filtration, support of riparian vegetation and wildlife movement corridors. These activities can reduce the amount of water available for fish and wildlife, obstruct fish passage, and result in numerous other habitat alterations. In all regions of the state, aquatic, wetland, and riparian habitats support rich biological communities, including many special status species, and degradation of these habitats represents a serious threat to the state's biological heritage.
>
> Increasing pressures from development and agriculture, as well as the expectation of longer droughts resulting from climate change, have exacerbated California's water shortages. Additionally, climate change is expected to result in more precipitation falling as rain rather than snow, which could lead to severe flooding and further straining our aging water management infrastructure. It is anticipated that additional water conservation, water recycling, watershed management, managed wetland water supply, conveyance infrastructure, desalination, water transfers, and groundwater and surface storage will be necessary. Reduction in snowpack storage, due to climate change, affects water supply reliability, hydropower, and the amount of runoff during extreme precipitation that leads to flooding. Increased flooding potentially causes more damage to the levee system and other infrastructure (California Department of Water Resources 2013).
>
> Conservation strategies in the aquatic ecosystems of the state will be heavily influenced by the ongoing efforts to manage water supplies. Many of California's water supply and flood protection infrastructure are no longer functioning properly or have exceeded their life cycles. This aging water supply and flood management infrastructure, badly in need of maintenance or replacement, has led to declines in species and ecosystems. The California Water Plan Update (California Department of Water Resources 2013) identified strategies for establishing reliable water supplies and restoring ecologically sensitive areas.

Water diversions are found throughout the Central Valley's rivers and tributaries. Water is diverted for agriculture, municipal and industrial uses, and managed wetlands (California Department of Fish and Wildlife 2015). In the Great Valley ecoregion of the Central Valley and Sierra Nevada province, the SWAP describes the following stressors (page 5.4-25) (California Department of Fish and Wildlife 2015).

> Dams and diversions have dramatically affected the aquatic ecosystems of the Central Valley, altering historical flooding regimes, erosion, and deposition of sediments that maintain floodplains. They also decrease riparian habitats and coarse gravel supplies needed for salmon and other native fish reproduction. Dam operations create rapid changes in flow rates that have led to the stranding of fish and exposure of fish spawning areas (California Department of Fish and Game 2005).

In the RCIS area, partial barriers to fish movement such as weirs and water diversions block fish movement to upstream habitat, alter water quality (i.e., temperature and flow), and kill fish through entrainment and entrapment (California Department of Fish and Wildlife 2015) (Section 2.10.2, *Riverine and Riparian Connectivity*). The SWAP continues to describe the following stressors (page 5.4-25–5.4-26) (California Department of Fish and Wildlife 2015).

Levee, bridge, and bank-protection structures are present along the rivers in RCIS area (Figure 2-12). Although levees and bank protection structures provide important flood-safety for residents and agricultural and commercial resources, these structures also prevent floodwaters from entering historic floodplains. Loss of floodwaters alter floodplain ecosystem processes and the character of floodplain habitats, such as cover and shade provided by riparian woodland. Constrained, high-flows scour and incise river channels and reduce or halt the formation of riparian habitat, channel meanders, and river oxbow channels (California Department of Fish and Wildlife 2015).

2.13.4.1 Effects on Focal Species

As described in the SWAP (page 5.4-27) (California Department of Fish and Wildlife 2015),

> Dams and diversions of the rivers that flow into the Sacramento and San Joaquin drainages have been particularly detrimental to anadromous Chinook salmon, steelhead and green sturgeon. Each of these species historically spawned in Sierra Mountain rivers and streams, their young swimming to the sea and returning a few years later as adult fish to spawn. The construction of dams and water diversions blocked fish passage, contributing to dramatic declines in salmon and steelhead populations of the Sacramento and San Joaquin drainages. Fewer anadromous fish also means fewer eggs, young fish, and fish carcasses that provide nutrients for numerous other aquatic species. Historically, one to three million Chinook salmon spawned each year in the western Sierra. Today, dams block salmon access to upstream spawning habitat in all but a few creeks. Late fall-, winter-, and spring-runs of salmon have collapsed. Steelhead and spring-run Chinook salmon are federally threatened, and winter-run Chinook salmon are listed federally and by the state as endangered. Fall- and late-fall run salmon are taxa of special concern. Natural and hatchery produced fall- run Chinook salmon continues to support ocean commercial and sport fisheries and a river fishery. Many other aquatic species are also affected by the migration impediments imposed by dams and their associated reservoirs.

Green sturgeon have also been blocked from spawning habitat in the upper Sacramento River by Shasta and Keswick dams and Oroville Dam on the Feather River. Restriction of spawning habitat is considered the foremost threat for green sturgeon (National Marine Fisheries Service 2018).

General degradation of fish rearing and migrating habitat from dams and water management includes elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, depredation by non-native species, and poor quality and reduced quantity of remaining habitat (National Marine Fisheries Service 1998a).

2.13.4.2 Effects on Other Conservation Elements

As described above, dams and other in-stream passage impediments have the greatest effect on habitat connectivity for covered fish species. Other water management facilities may also create impediments to movement. However, water supply management facilities are not entirely detrimental to other conservation elements. For example, the Sutter Bypass both provides flood protection and supports a portion of the remaining wetland habitat in the RCIS area (coincident with the Sutter NWR). Dams and water supply infrastructure is also critical for the success of working lands (primarily in crop production) in the RCIS area.

2.13.5 Invasive Plants and Animals

As described in the SWAP (page 2-43–2-44) (California Department of Fish and Wildlife 2015),

> Human introduction (directly or indirectly) of invasive species is a critical existing pressure that is expected to continue, and be exacerbated by climate change. Introduction of invasive species into the California ecosystem has occurred since the earliest European settlements. Some of these introductions have been intentional, such as the plants imported as ornamentals for horticulture, while other introductions have been unintentional when species arrive in the state along with the movement of people and goods. As California’s population and economic activity has grown into its current size, the points of origin for people and goods coming to the state now span the globe. This has led to a diverse society and economy, but also has left California vulnerable to introductions of species from all around the world.

California is particularly vulnerable to invasive species because of its diverse ecosystems and communities. This ecosystem diversity, however, also means that species from all over the world may be able to find suitable habitat somewhere in the state. When species are introduced into these habitats they often find conditions similar to their home range that will allow for the establishment of reproducing populations. For preventing the spread of invasive weeds, the area affected currently is only part of the equation; it is also important to consider the area that could be affected in the future, if a species is allowed to spread.

The quantity of potential habitat and the high volume of transportation into California from other states and countries have had the unintended effect of introducing so many invasive species into the state that management of these non-native organisms is now a high priority for resource managers. Efforts are underway to combat invasive species and prevent new introductions such as new regulations on the release of ballast water in California waters and mandatory inspections of recreational boats in some lakes. Although most of the thousands of species brought into our state cause no harm, a small percentage is able to thrive in California to the detriment of native plants and wildlife. The colonization by invasive species, particularly invasive grasses, is expected to increase with climate change (Sandel and Dengermond 2011).

Invasive species harm California's wildlife by disrupting native plant and animal communities. Some introduced species are voracious predators, such as introduced trout species that have significantly contributed to the decline in mountain yellow-legged frog (Hammerson 2008). Others out-compete native species for resources, some spread diseases, and some are capable of re-engineering the environment to suit their needs, changing hydrology, soil chemistry, and fire regimes. In addition, some are transmitting novel diseases into the state. Many also degrade recreational activities from hunting to boating, camping, and hiking. The introduction of invasive species has been an especially detrimental pressure on estuaries such as the San Francisco estuary, which is likely the most invaded estuary in the world with over 230 species of invasive species (Cohen and Carlton 1998). Though it is difficult to quantify harm from invasive species in financial terms, a conservative estimate places the cost to the United States at over $100 billion each year, including damage to agriculture and infrastructure (Pimentel et al. 1999). In California alone, invasive plants cost the state $82 million each year (California Invasive Plant Council 2008).

2.13.5.1 Effects on Focal Species and Habitats

Invasive plant and animal species put significant pressure on focal species within the RCIS area. Invasive species often reduce habitat quality for the focal wildlife and plant species, often due to the density and monotypic habitat that is formed by particularly invasive plants. Some invasive wildlife species depredate focal wildlife species.

In the Great Valley ecoregion of the Central Valley and Sierra Nevada province, the SWAP describes the following (page 5.4-36–5.4-37) (California Department of Fish and Wildlife 2015).

> Invasive plant and animal species are an important pressure on wildlife in this province, just as they are in other regions throughout the state (California Bay-Delta Authority 2000; California Invasive Plant Council 1999; California Department of Fish and Game 2005; Goals Project 1999; Hickey et al. 2003; Jurek 1994; Lewis et al. 1993; RHJV 2004).
>
> Introduced animals have invaded both terrestrial and aquatic environments. Not all introduced vertebrates are invasive, and they have varying effects on wildlife. The species of most concern in the region parasitize songbird nests, dominate limited nesting habitat, prey on native species, or otherwise damage wildlife habitats.
>
> Fifty-one new fish species have become established in California (Moyle 2002), dominating most of the rivers and streams in this region. These include species such as striped bass, white catfish, channel catfish, American shad, black crappie, largemouth bass, and bluegill. Many fish were historically introduced (via stocking) by federal and state resource agencies to provide sport fishing or forage fish to feed sport fish. Many introduced non-native fish and amphibians may out-compete

native fish for food or space, prey on native fish (especially in early life stages), change the structure of aquatic habitats (increasing turbidity, for example, by their behaviors), and may spread diseases (Moyle 2002). However, not all non-native species are considered invasive, which typically refers to species whose introduction causes or is likely to cause economic or environmental harm to human health. Several of the introduced predatory fish may have increased predation levels on Chinook salmon and other native fishes (California Bay-Delta Authority 2000).

In addition to introduced fish, native aquatic species are stressed by introduced bullfrogs, red-eared sliders (a turtle), and invertebrates. Introduced invertebrates, such as New Zealand mud snail, quagga mussels, Asian clam, zebra mussel, Chinese mitten crab, and mysid shrimp, are causing significant problems for native species in rivers, streams, and sloughs. While not all of the introduced aquatic species are invasive or have significant consequences for native species, biologists are concerned about the sheer dominance of these new species and their current and potential effects on the structure and function of the estuarine ecosystem.

Depredation by non-native species of all runs of juvenile Chinook salmon and steelhead affects these species in the lower Sacramento River and Delta where there are high densities of non-native fish species such as striped bass, smallmouth bass, and largemouth bass. These non-native predators, prey upon outmigrating juveniles and may have a direct impact on the population (National Marine Fisheries Service 2014). Introduced non-native prey species can also displace native prey species. The overbite clam, *Potamorcorbula amurensis*, a non-native bivalve, became established in the San Francisco Bay Estuary in 1988 and has become the common food of white sturgeon (California Department of Fish and Game 2002). Overbite clams can pass undigested through white sturgeon and they also bioaccumulate elenium, a toxic metal that green sturgeon are highly sensitive to (Linveille et al. 2002, White et al. 1989).

Invasion of exotic pest species into habitats occupied by giant garter snake, western pond turtle, and yellow-billed cuckoo is another threat to the continued survival of these focal species in the RCIS area. Saltcedar or tamarisk, an invasive pest plant species, is has establishes itself along riparian corridors. The changes in channel morphology, hydrology, and vegetation cover associated with saltcedar invasion has degraded and changed habitat suitability for pond turtles and yellow-billed cuckoo (Lovich and de Gouvenan 1998, Laymon 1998). Along the Sacramento River, domestic fig and black walnut have also become dominant tree species; these species likely offer little benefit to cuckoos as nesting or foraging habitat because the species' preferred prey are not found on these substrates and the trees do not provide good nest sites (Laymon 1998). The introduction of non-native turtles, including red-eared sliders (*Trachemys scripta*) and painted turtles (*Chrysemys picta*), also threatened pond turtles. The bullfrog (*Rana catesbeiana*) will consume any animal it can swallow, including hatchling and young western pond turtles (Holland 1994). The intensity of predation from bullfrogs has been shown to eliminate recruitment in some pond turtle populations (Overtree and Collings 1997). Predation by and competition with introduced species (e.g., house cats, bullfrogs, largemouth bass [*Micropterus salmoides*], catfish [*Ictalurus* spp.]) also poses threats to giant garter snake (U.S. Fish and Wildlife Service 2017a, Carpenter et al. 2002). Additionally, introduced predatory fish may compete with giant garter snake for smaller forage fish, and habitat alteration may facilitate other species of garter snake to access giant garter snake habitat, allowing them to compete more successfully with giant garter snake (California Department of Fish and Wildlife 1992, G. Hansen 1986).

Disease also effects focal species. For example, a shell disease of unknown cause has emerged as a concern for western pond turtle populations in Washington State, in which pond turtles with the disease show defects in the scutes and often deep pitting lesions that expose the underlying bone and frequently penetrate into the body cavity (Groves et al. 2016, Hallock et al. 2016). The causative agent for the shell disease has not yet been identified and it is unclear how shell disease is affecting turtle lifespan, reproduction, and recruitment. While it is unknown if western pond turtles in California are susceptible to the shell disease, introduction of an infected individual to local populations could threaten this species.

2.13.5.2 Effects on Other Conservation Elements

In the Great Valley ecoregion of the Central Valley and Sierra Nevada province, the SWAP describes the following as related to natural communities (page 5.4-36–5.4-37) (California Department of Fish and Wildlife 2015).

> Invasive plants can be found in many different habitats in this region. In grasslands, some of the more challenging plant invaders include eucalyptus, fountain grass, gorse, medusahead, tree of heaven, and yellow star thistle. In riparian and wetland areas, invading plants include edible fig, giant reed or arundo, Himalayan blackberry, pampas grass, Russian olive, tamarisk (or saltcedar), pennyroyal, pepperweed, tree of heaven, Scotch broom, and French broom. Oak woodlands are invaded by plants such as Scotch broom, French broom, pepperweed, medusahead, barbed goat grass, and yellow star thistle.
>
> Introduced plants also invade aquatic habitats. These aquatic invaders include Brazilian waterweed, egeria, Eurasian watermilfoil, hydrilla, water hyacinth, water pennywort, and parrot feather.

2.13.6 Recreational Activities

As described in the SWAP (page 2-41–2-42) (California Department of Fish and Wildlife 2015),

> Outdoor recreation and exposure to nature is important to foster an appreciation of nature; however, recreation in sensitive habitats could result in habitat degradation. Recreational use of public lands in California involves a large number of visitors, both from state residents and out-of-state tourists. Extensive areas of federal and state lands offer high-quality outdoor recreation opportunities. Visitation data (BBC Research and Consulting 2011) from federal agencies (National Park Service, U.S. Forest Service, Bureau of Land Management, USFWS, and the Corps) indicate that federally managed lands in California average approximately 90 million visitor days per year. The California State Parks System averages approximately 78 million visitor days per year.
>
> Large numbers of outdoor recreation users in sensitive areas can directly damage natural systems by reducing vegetative cover, compacting soil, disturbing biotic soil crusts (i.e., cryptogams), increasing soil destabilization and erosion, disturbing breeding and foraging areas, contaminating natural lands and waterways through inappropriate disposal of trash and human waste, and by introducing non-native species. Indirect impacts may also occur to natural areas through increased development of recreational access points and supporting infrastructure such as roads, visitor facilities, and campgrounds. Visitor litter in parks and public lands can encourage increased corvid populations (jay, crow, and raven), which contributes to greater competition with and predation upon other native wildlife.
>
> Recreational off-highway vehicle use can have adverse effects on soil conditions, native plant communities, and sensitive species. On public lands, authorized and unauthorized off-highway vehicle trails open relatively undisturbed areas to increased use. The vehicles can disturb or run over wildlife, crush and uproot plants, spread invasive plants, and disturb soils, contributing to erosion and sedimentation of aquatic habitats.
>
> Concentrated recreational use in highly sensitive areas, such as streams, coastal habitats, and riparian zones by hikers, picnickers, mountain bikers, and equestrians can damage these systems, reducing vegetative cover and disturbing sensitive species. Concentrated fishing, especially in populated area can lead to localized depletion of fisheries. Illegal trampling, and collecting, can deplete floral and faunal populations, reduce biodiversity, and alter trophic and community

> structures in frequently visited natural habitats. The negative impacts of pressures from recreation can be reduced through proactive recreation planning and public education.

The RCIS area supports several state and federal recreation areas including the following.

- Colusa-Sacramento River State Recreation Area.
- Colusa NWR.
- Delevan NWR.
- Sacramento NWR.
- Sutter NWR.
- Colusa Weir Recreation Area.
- Colusa Bypass Wildlife Area.
- Sacramento River Wildlife Area.

2.13.6.1 Effects on Focal Species

Demand for, and participation in, outdoor recreation is increasing at a notable rate. With increasing number of recreationalists, the type of recreation impacts and spatial extent of area affected are also changing (Flather and Cordell 1995). Outdoor recreation is the 2nd leading cause of decline of U.S. threatened and endangered species on public lands (Losos et al. 1995). Wildlife can be affected by recreation in a variety of ways, including direct and indirect mortality, lowered productivity, reduced used of habitat/preferred habitat, and aberrant behaviors that can reduce reproductive or survival rates (Purdy et al. 1987). The impact from recreation depends on the frequency, intensity, location, predictability, and type of use (e.g., day-hiking, bird watching, biking, snowmobiling, off road vehicle), as well as the type of wildlife including the species sensitivity to human presence, group size, age, and sex.

Birdwatching, photography, and other repeated low-impact human activity can cause an increase in the risk of nest predation of songbirds. High-use recreation areas, such as campgrounds and picnic areas, have been shown to have higher levels of nest predators, and horses can attract brown-headed cowbirds if stables or corrals are near (U.S. Fish and Wildlife Service 2002).

2.13.6.2 Effects on Other Conservation Elements

Working lands in this RCIS area are primarily comprised of lands in rice production (37% of the RCIS area and almost 59% of all cultivated agriculture). Rice fields are often flooded in the winter, creating habitat for migrating birds and also drawing hunters to some sites. This supports the income of farmers while also providing some services for migrating waterfowl.

2.13.7 Roads and Railroads; Utilities and Service Lines

As described in the SWAP (page 2-29) (California Department of Fish and Wildlife 2015),

> Existing infrastructure, such as roads and highways, can be a barrier to wildlife movement, creating fragmented habitats and direct mortality from vehicle and wildlife collisions. Continued population growth increases the demand for transportation facilities for urban, regional, intercity, and long-distance travel. Caltrans estimates that the capacity of existing rail, air, and highway transportation systems will need to be increased (California Department of Transportation 2015). The California

> Transportation Plan calls for an increase in intermodal transportation systems, including increased freeway reliability, express and high occupancy vehicle lanes, and increased connectivity between transportation types and across modes of transportation (California Department of Transportation 2015). The majority of these connections will occur along existing transportation corridors and increase mobility between existing modes of transportation including intercity bus and rail (California Department of Transportation 2015). The focus on improvements to existing corridors and connections between travel modes should minimize new habitat fragmentation from state highways. However, local roadways and other infrastructure have the potential to create additional habitat fragmentation.
>
> Roads pose a significant threat to long-term viability of wildlife populations and certain species are more susceptible to road-related impacts and at risk for road mortality and habitat fragmentation from infrastructure (Brehme et al. 2018). Amphibians and reptiles have been identified as being particularly susceptible to the negative effects of infrastructure in their habitat, due to their small body size (thus making them less visible to drivers), reduced mobility speed, and lack of behavioral avoidance of roads. Species such as, giant gartersnake, western pond turtle, California tiger salamander, and California red-legged frog, are a few amphibian and reptile species identified as at very high risk from the negative effects of roads (Brehme et al. 2018).

2.13.7.1 Effects on Focal Species

In the Great Valley ecoregion of the Central Valley and Sierra Nevada province, the SWAP describes the following (page 5.4-34) (California Department of Fish and Wildlife 2015).

> Growth and development, along with associated linear structures like roads, canals, and power lines, impede or prevent movement of a variety of animals. This is generally less significant than habitat loss but makes it more difficult for those species that need to move large distances in search of food, shelter, and breeding or rearing habitat and to escape competitors and predators. Animals restricted to the ground, like mammals, reptiles, and amphibians, face such obstacles as roads, canals, and new gaps in habitats. Attempts to cross these obstacles can be deadly, depending on the species and the nature of the gap (e.g., four-lane highways with concrete median barriers compared to narrow, rural two-lane roads). Fish and other water-bound aquatic species attempting to move either upstream or downstream are blocked by lack of water resulting from diversions, physical barriers like dams, and by entrainment in diverted water. Even the movement of highly mobile species like birds and bats can be impeded by such features as transmission lines and wind energy farms, particularly in focused flight corridors like Altamont Pass, and 50 new wind energy sites are currently proposed throughout the state on land managed by the Bureau of Land Management (California Department of Fish and Game 2005) Such species either cannot see or do not avoid these structures, and many die as a result. The actual extent of bird fatalities because of power-line collision in California is unknown; however, the California Energy Commission estimates that fatality rates because of Central Valley power-line collisions alone could reach as high as 300,000 birds per year (California Energy Commission 2002a; California Energy Commission 2002b).

Wildlife-vehicle (including trains) collisions are a large and growing concern among public transportation departments, conservation organizations and agencies, and the public. Wildlife-vehicle collisions are a safety concern for drivers and a conservation concern for most animal species. Recently, Loss et al. (2014) estimated that between 89 and 340 million birds may die per year in the US from collisions with vehicles. Many public transportation departments are trying different methods of reducing wildlife-vehicle collisions, including fencing roadways and providing crossing structures across the right-of-way to allow safe animal passage.

The California Roadkill Observation System[31] (University of California, Davis 2017), a site created by University of California, Davis's Road Ecology Center, records the locations of roadkill observations on major highways and freeways and includes records of carcasses cleaned up by the California Department of Transportation between 1987 and 2007. Using data from the California Roadkill Observation System, the Road Ecology Center identifies stretches of California highways that are likely to be hotspots (i.e., stretches of highway that are statistically different from other stretches) for wildlife-vehicle collisions. The California Roadkill Observation System accounts for both observed animal carcasses and traffic incidents, which can range from wildlife sightings on the roadway to wildlife-vehicle collisions. In 2016, in the RCIS area, I-5, SR 113, and SR 45 were analyzed by the Road Ecology Center. There is only one hotspot identified in the northern region the RCIS area along I-5 near Williams, which is the longest, densest stretch with higher levels of wildlife-vehicle collisions. The remainder of I-5, SR 113 and SR 45 in the RCIS area have low incidences of wildlife-vehicle collision, with slightly higher rates in small, scattered locations along SR 113 northeast of Knights Landing and SR 20 near the Colusa National Wildlife Refuge. Most of the observations in the RCIS area include various species birds and medium (e.g., bobcat, coyote, raccoon) and large mammals (e.g., wild pig, mountain lion, mule deer).

2.13.7.2 Effects on Other Conservation Elements

As described above, habitat connectivity is greatly affected by linear infrastructure, including roads and utility lines. Natural communities are also affected by removal. Conversion to roads is an obvious effect of development, but roads also support introduction of pollutants (e.g., gar oil and grease), litter, and sometime movement of invasive species. In the case of linear utilities, lands may be converted from a forested community to a grassland community. This is particularly true of power lines where downed trees disrupting service or starting wildfires is of great concern. Linear facilities do not have any particular adverse effects on working lands in the RCIS area.

[31] http://www.wildlifecrossing.net/california/

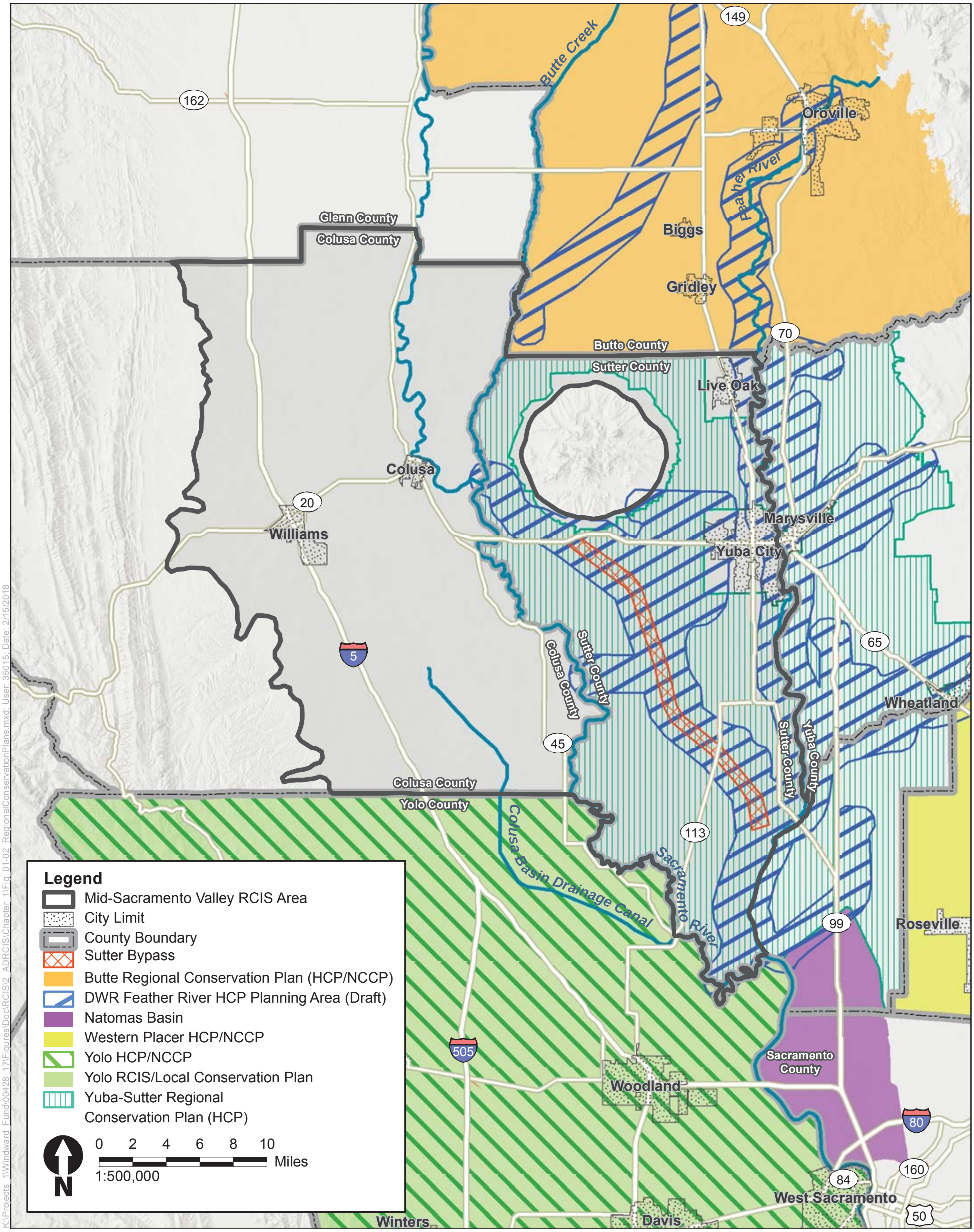

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Figure 2-1
Approved and In-development Regional Conservation Plans and Strategies within and Adjacent to the Mid-Sacramento Valley RCIS Area

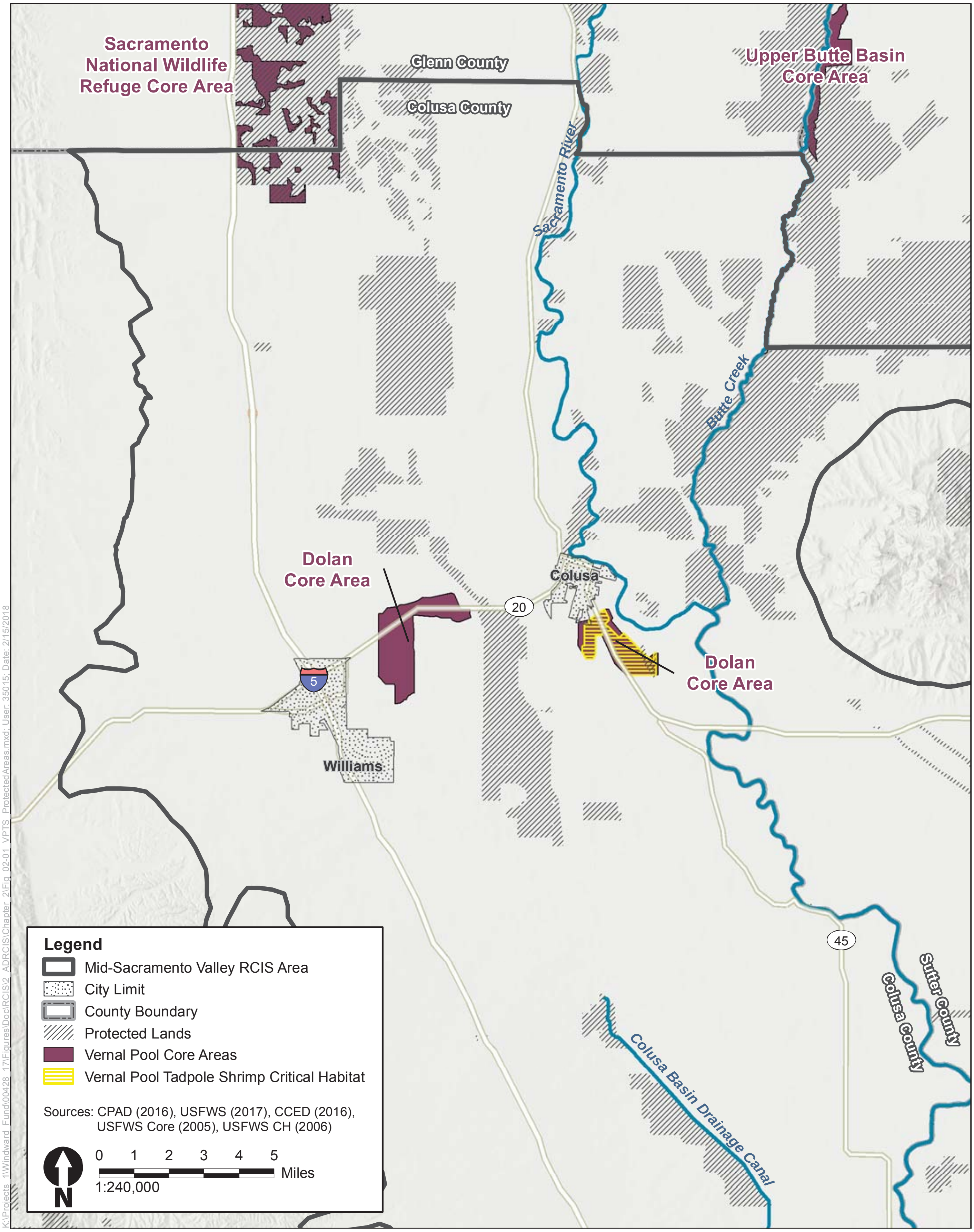

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Figure 2-2
Vernal Pool Tadpole Shrimp Critical Habitat and Recovery Areas in the Mid-Sacramento Valley RCIS Area

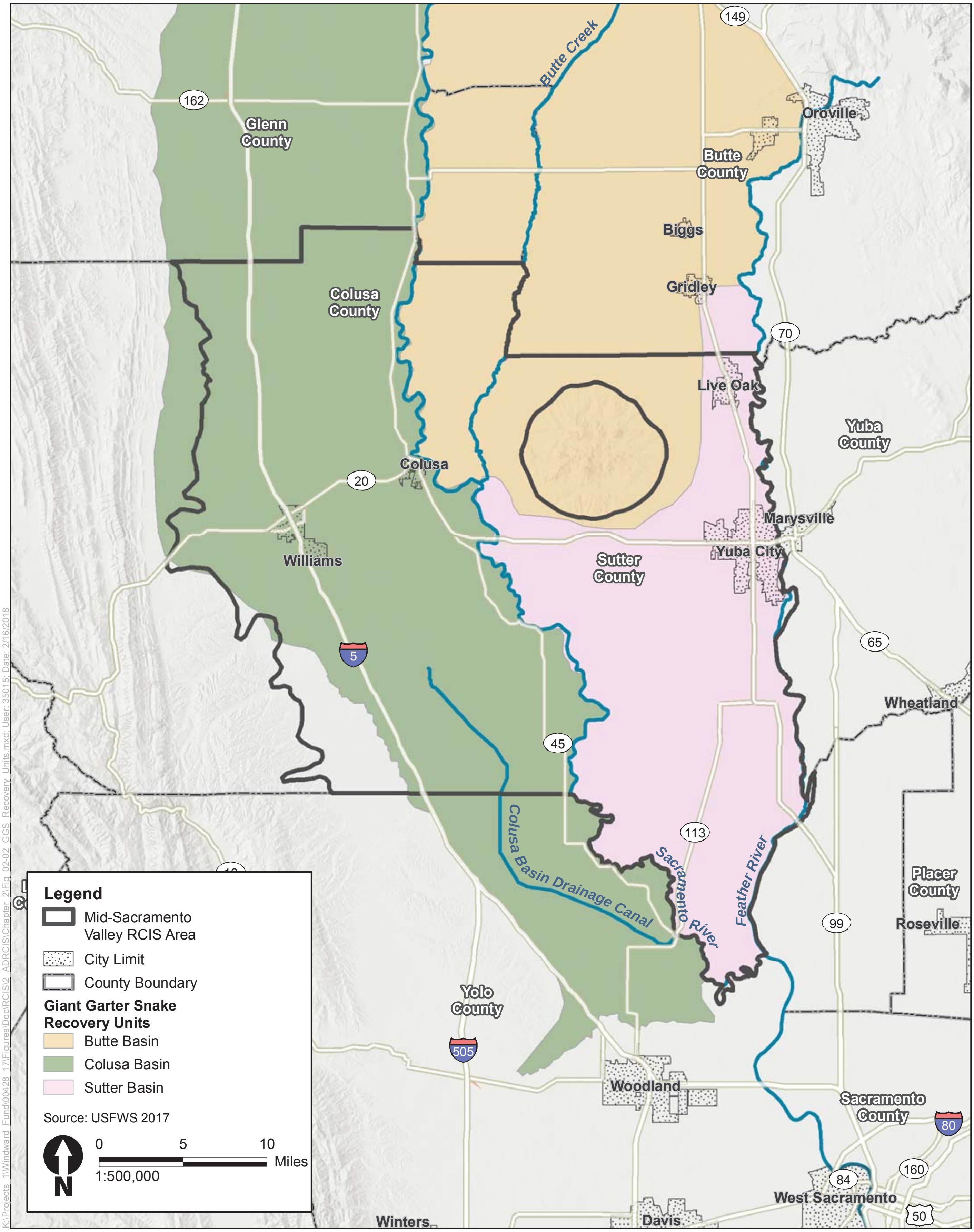

Figure 2-3
Giant Garter Snake Recovery Units in the Mid-Sacramento Valley RCIS Area

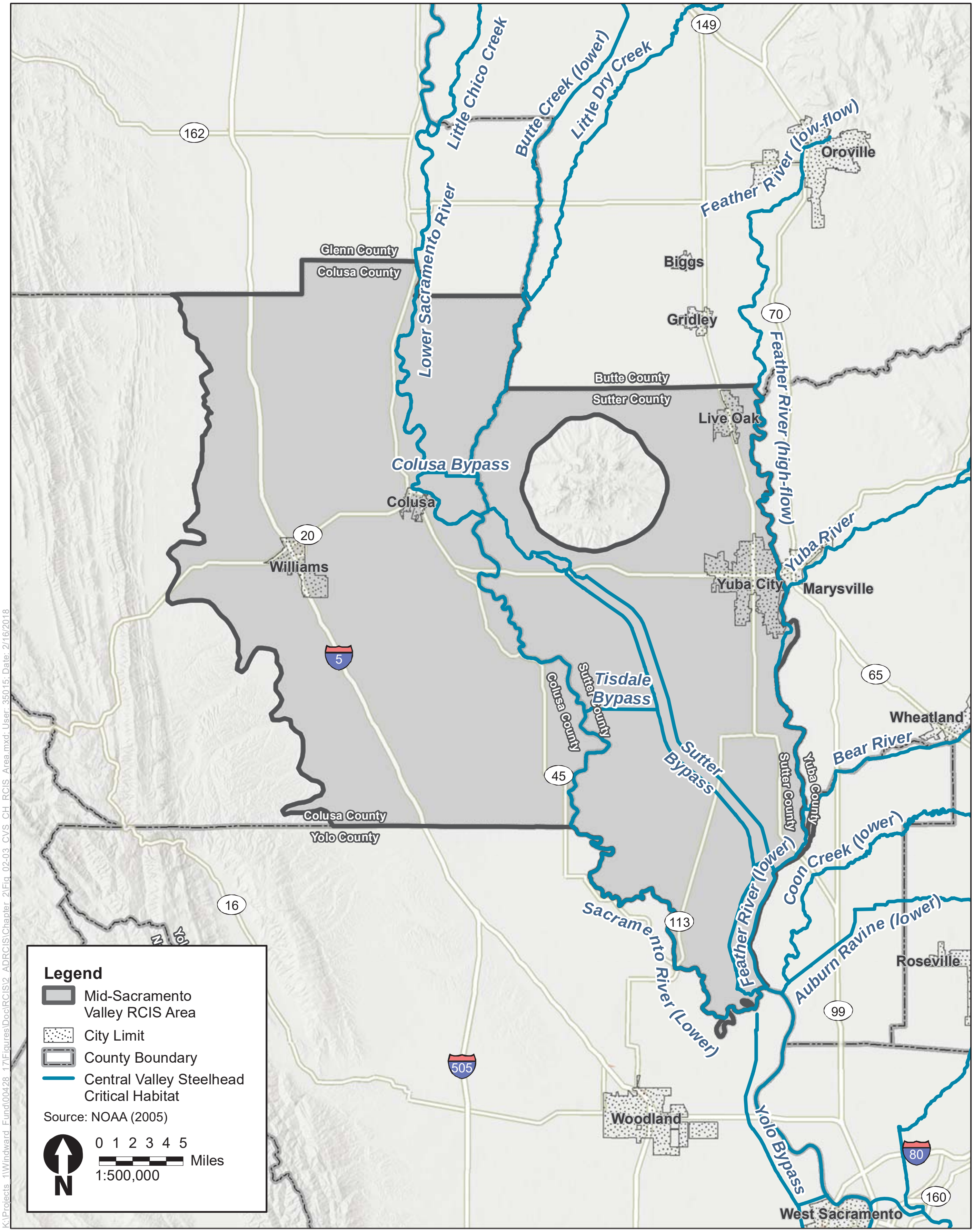

Figure 2-4
Central Valley Steelhead Critical Habitat in the Mid-Sacramento Valley RCIS Area

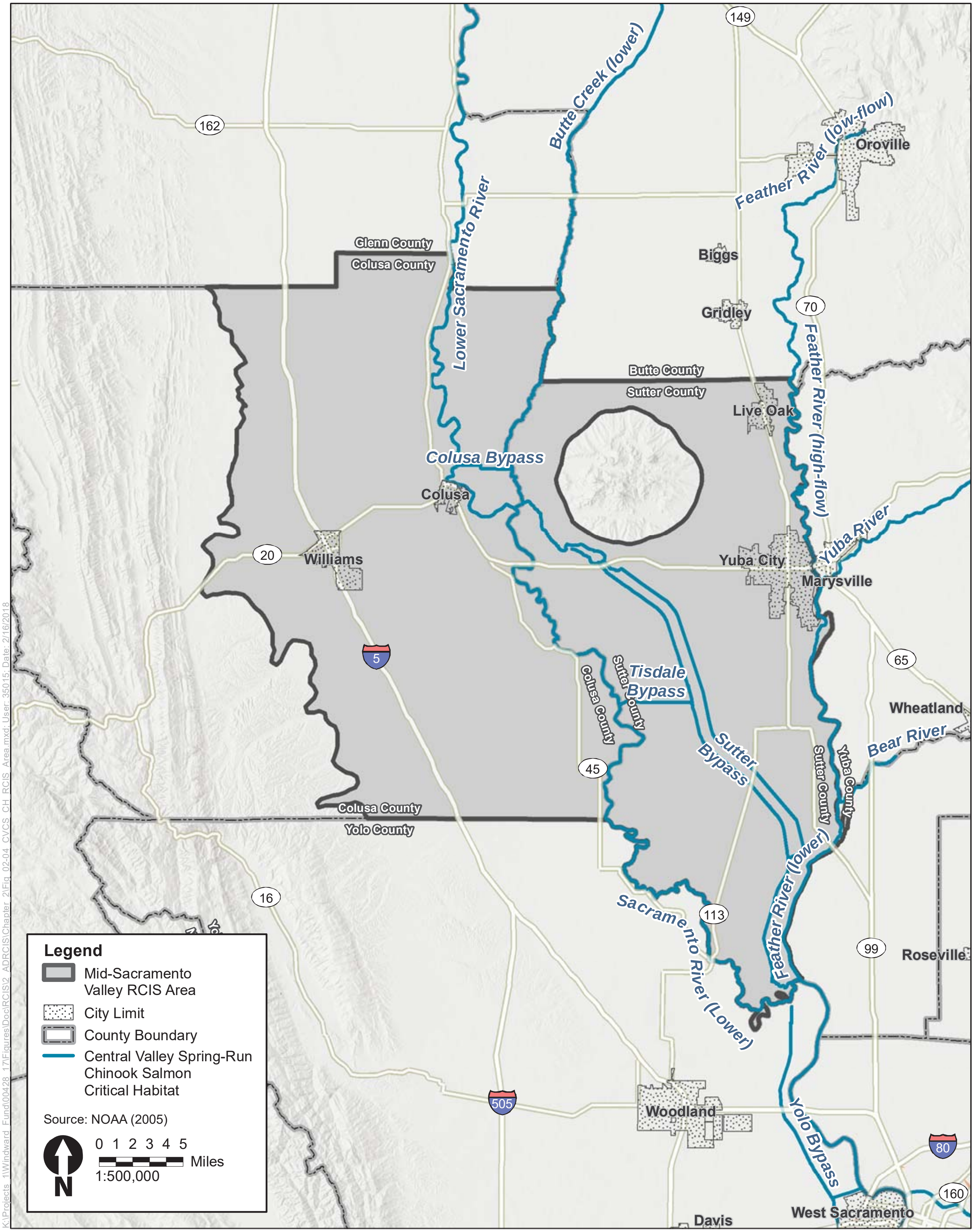

Figure 2-5
Central Valley Spring-Run Chinook Salmon Critical Habitat in the Mid-Sacramento Valley RCIS Area

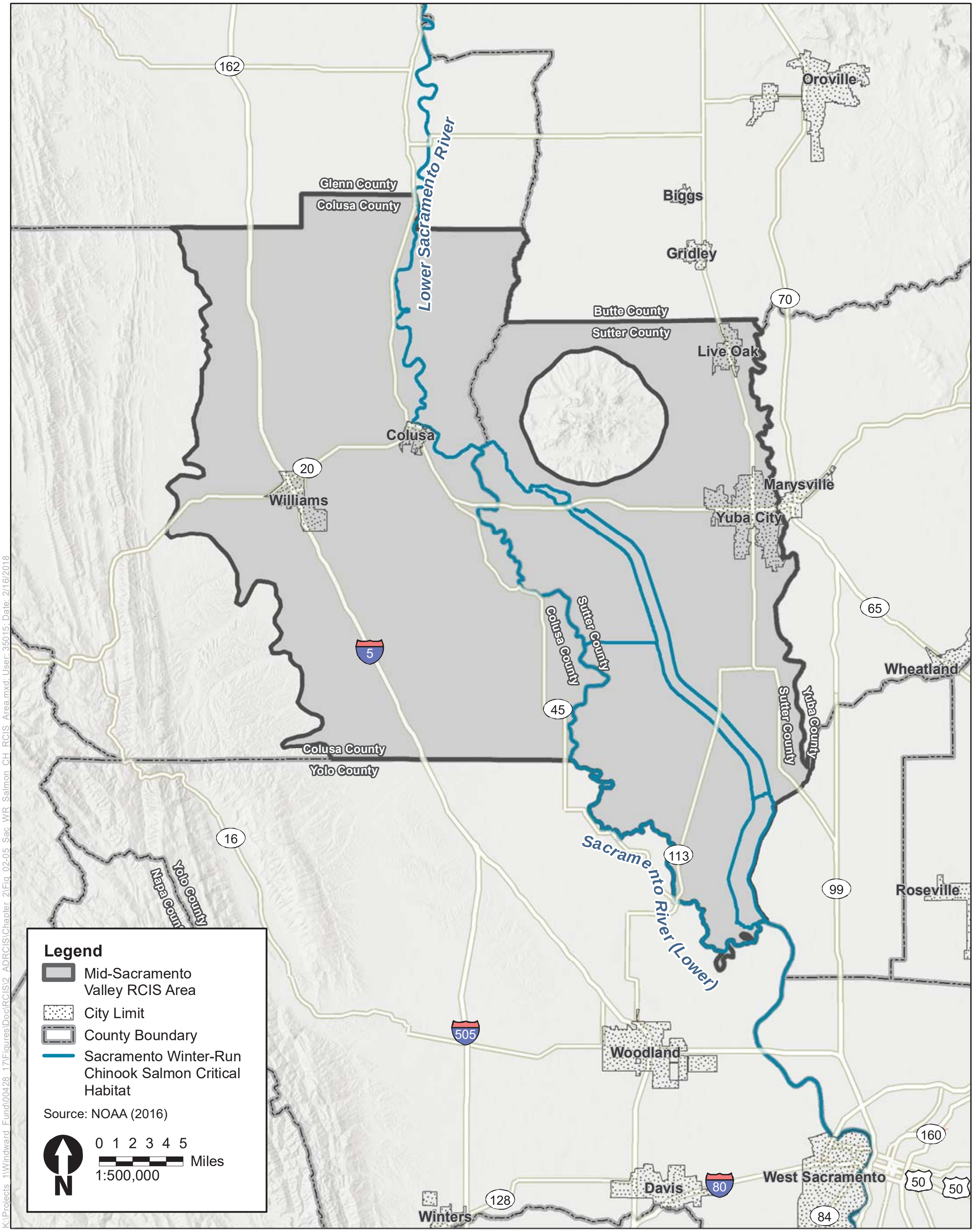

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Figure 2-6
Sacramento Winter-Run Chinook Salmon Critical Habitat in the Mid-Sacramento Valley RCIS Area

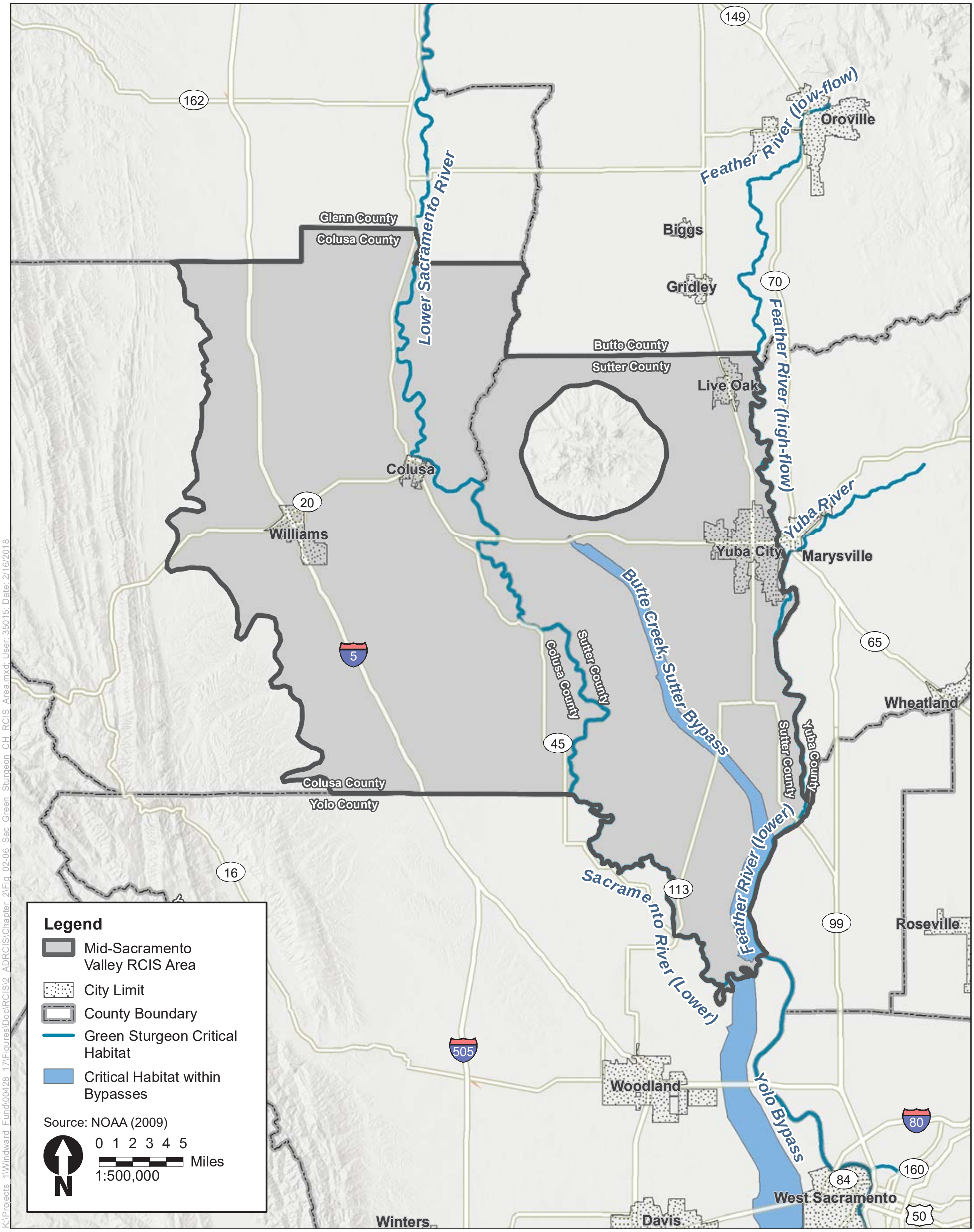

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Figure 2-7
Green Sturgeon Critical Habitat in the Mid-Sacramento Valley RCIS Area

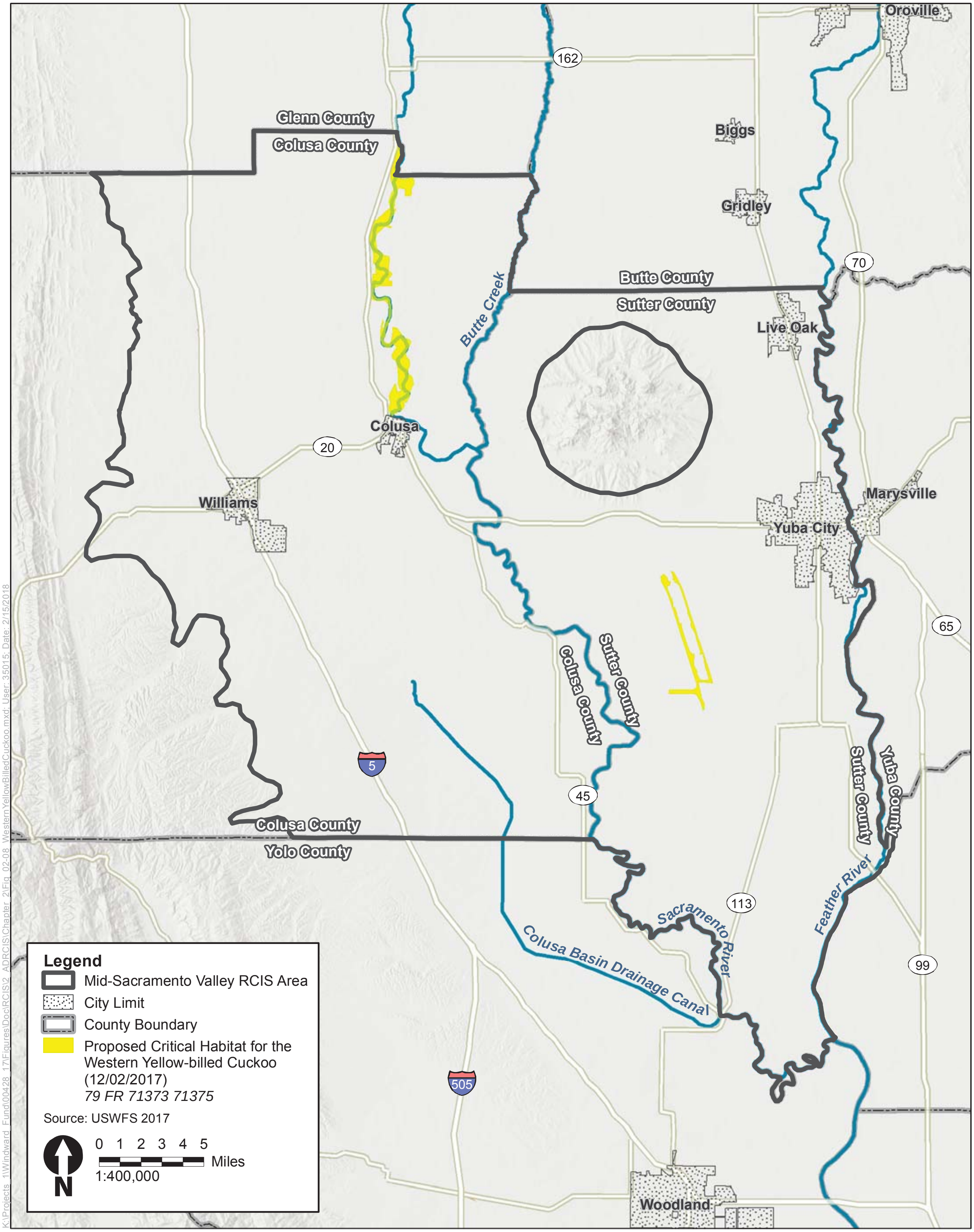

Figure 2-8
Proposed Critical Habitat for the Western Yellow-billed Cuckoo in the Mid-Sacramento Valley RCIS Area

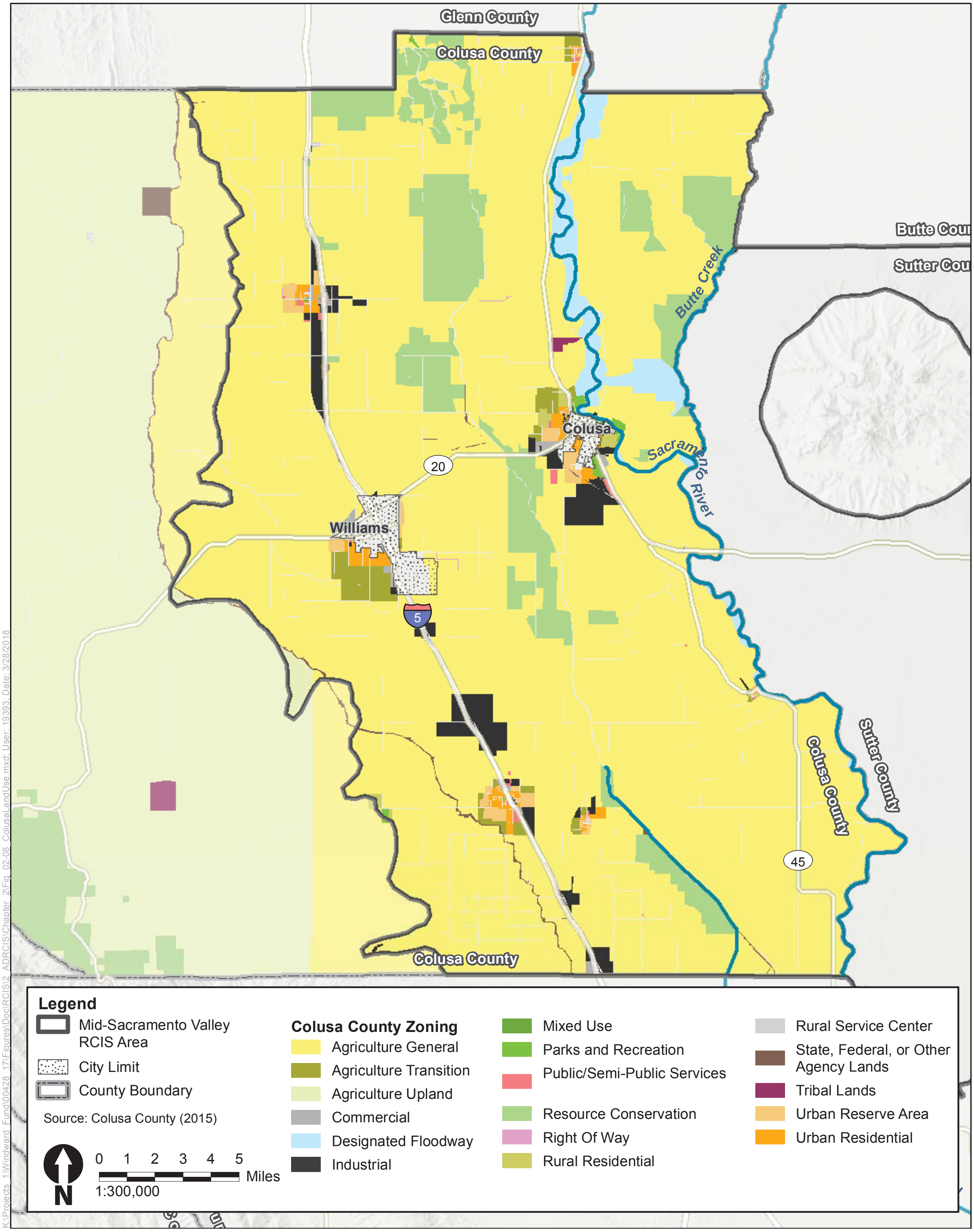

Figure 2-9
Colusa County Zoning Map

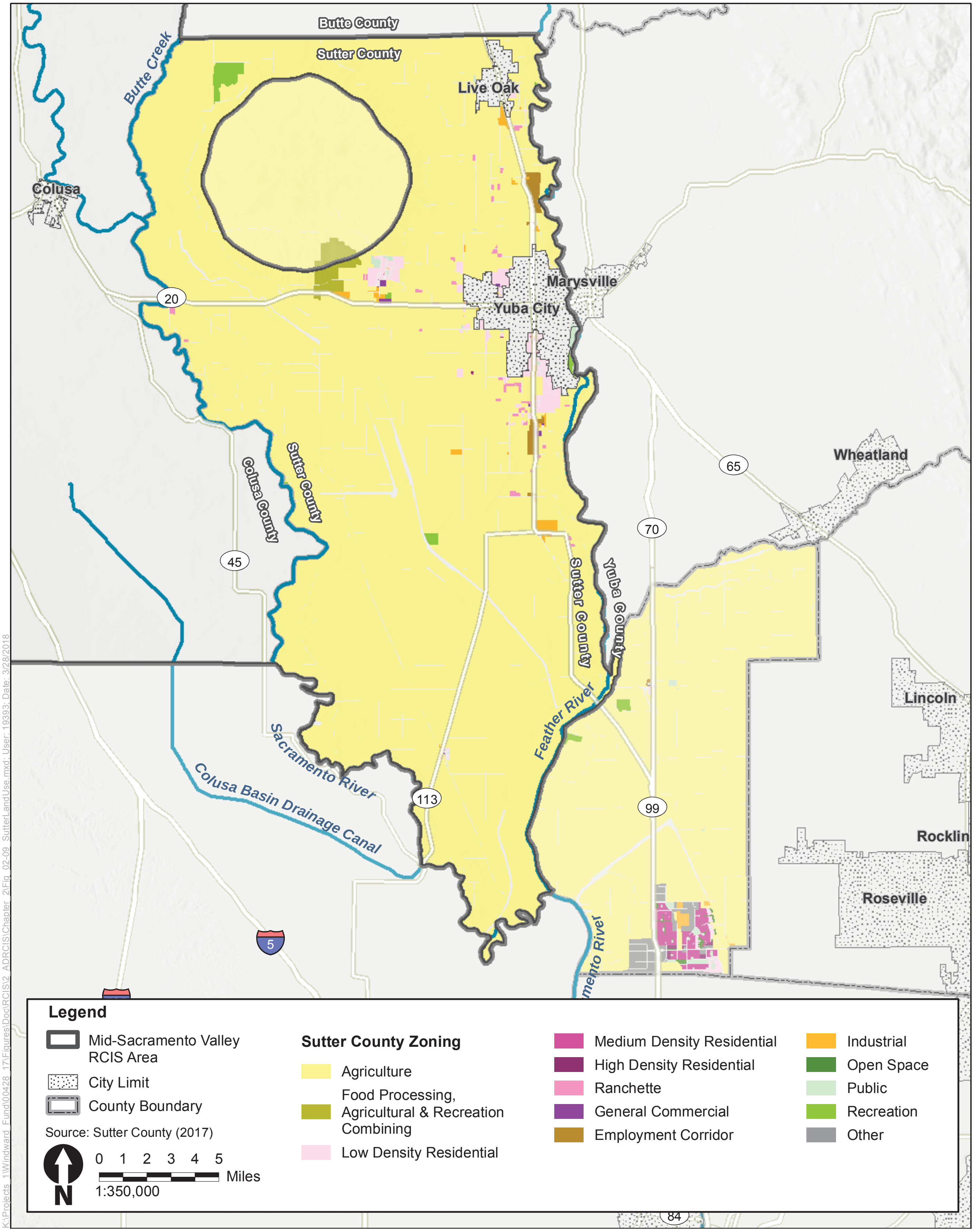

Figure 2-10
Sutter County Zoning Map

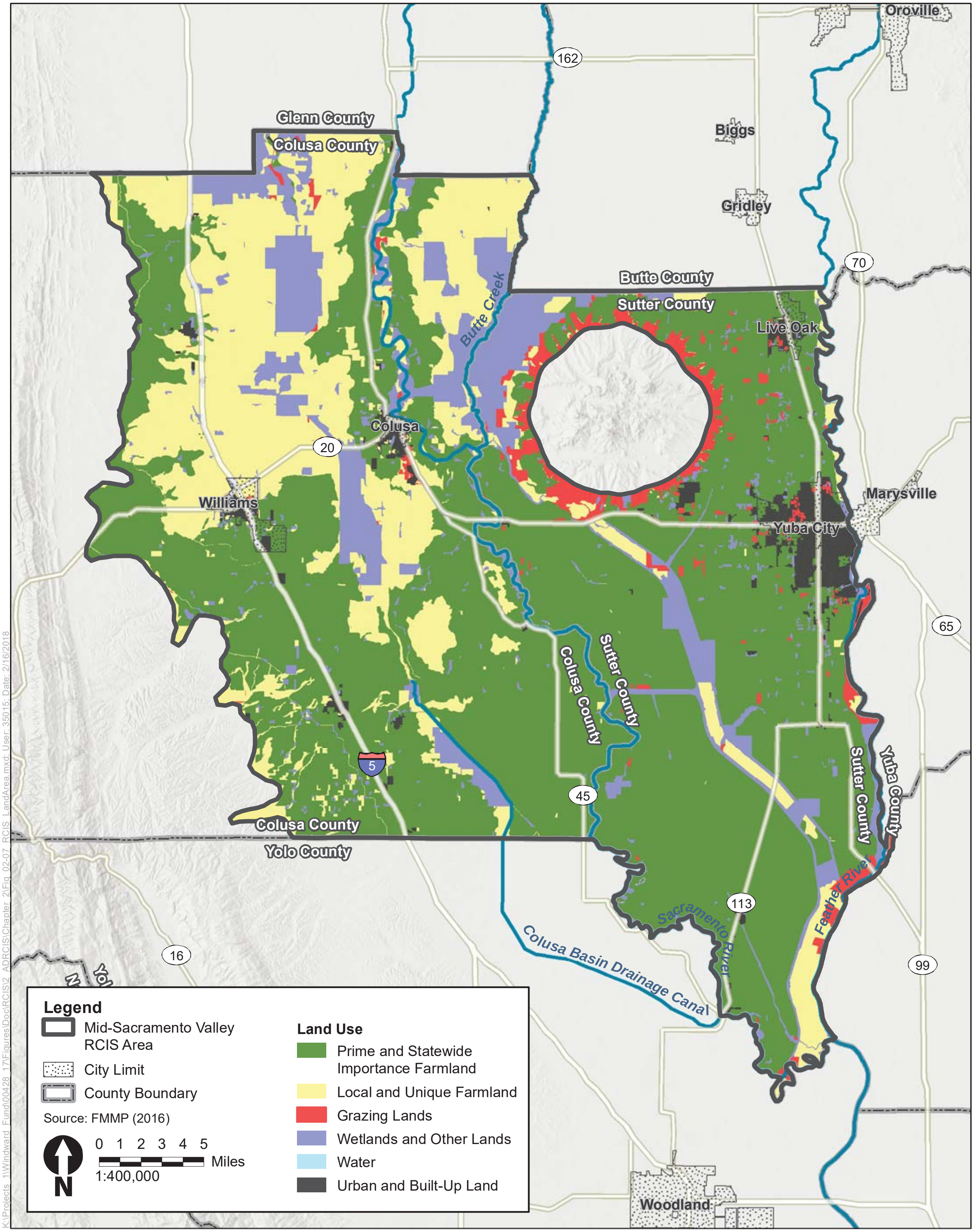

Figure 2-11
Land Use in the Mid-Sacramento Valley RCIS Area

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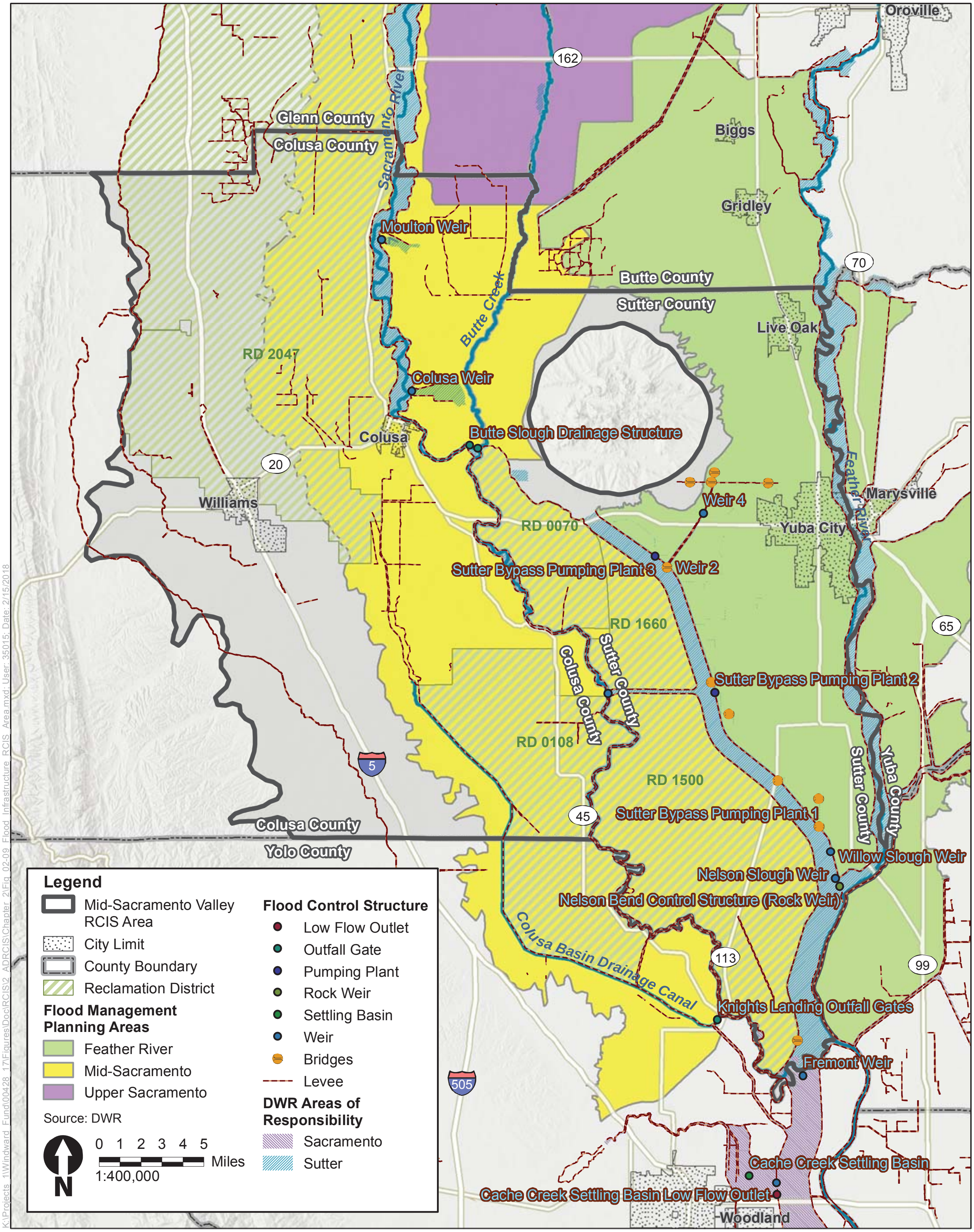

Figure 2-12
Flood Control Infrastructure in the Mid-Sacramento Valley RCIS Area

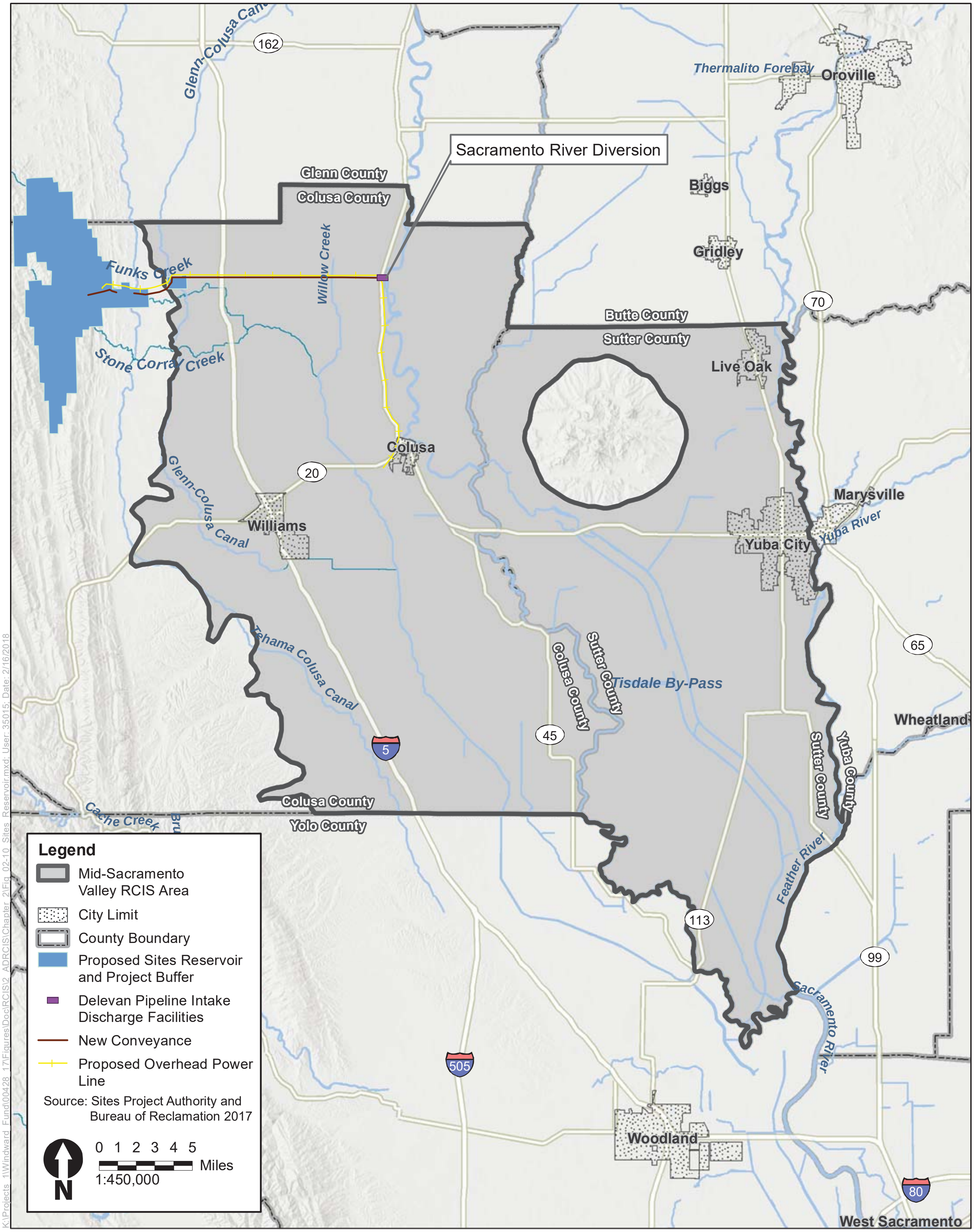

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Figure 2-13
Proposed Sites Reservoir Project near the Mid-Sacramento Valley RCIS Area

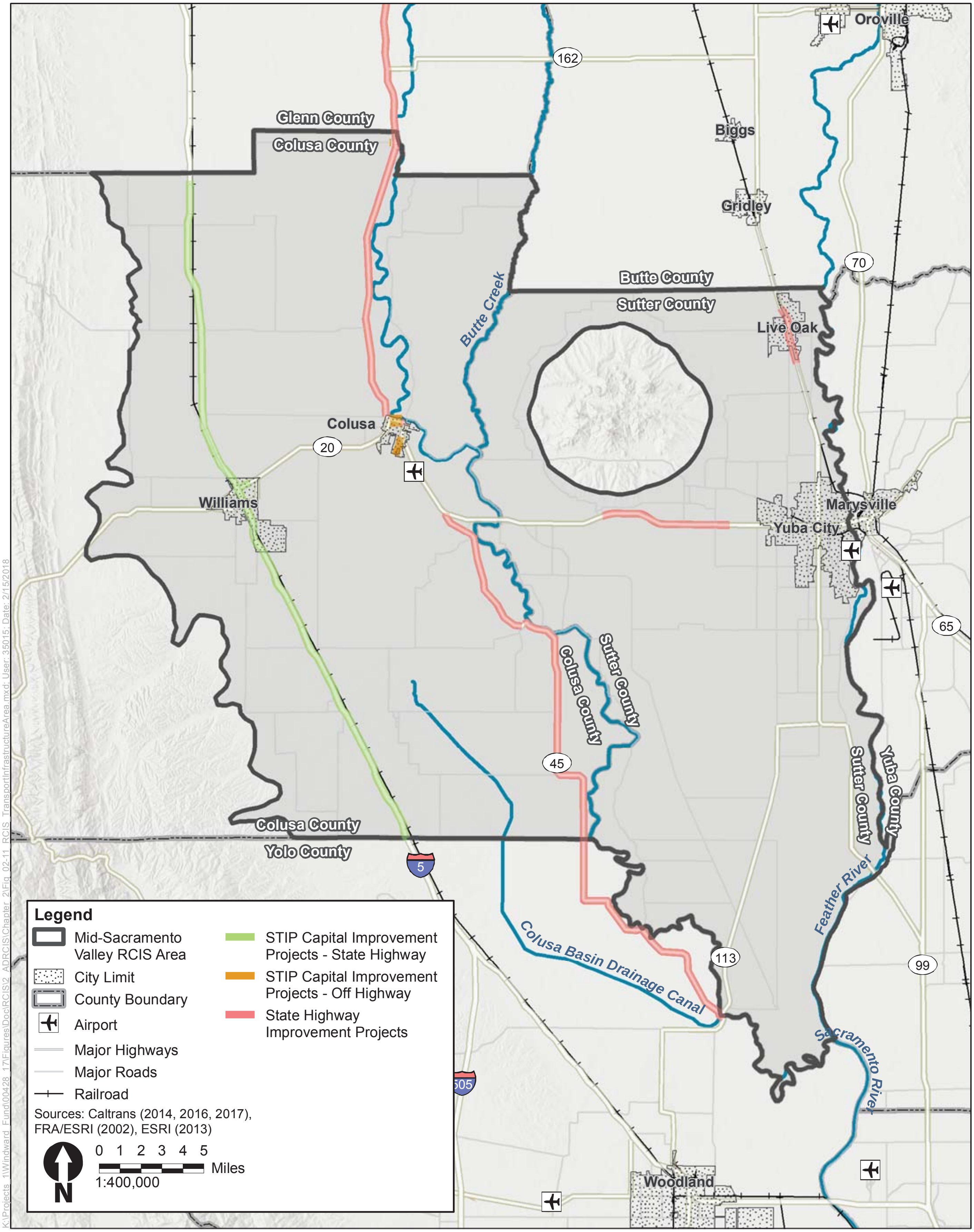

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Figure 2-14
Major Transportation Infrastructure and Potential Infrastructure Projects in the Mid-Sacramento Valley RCIS Area

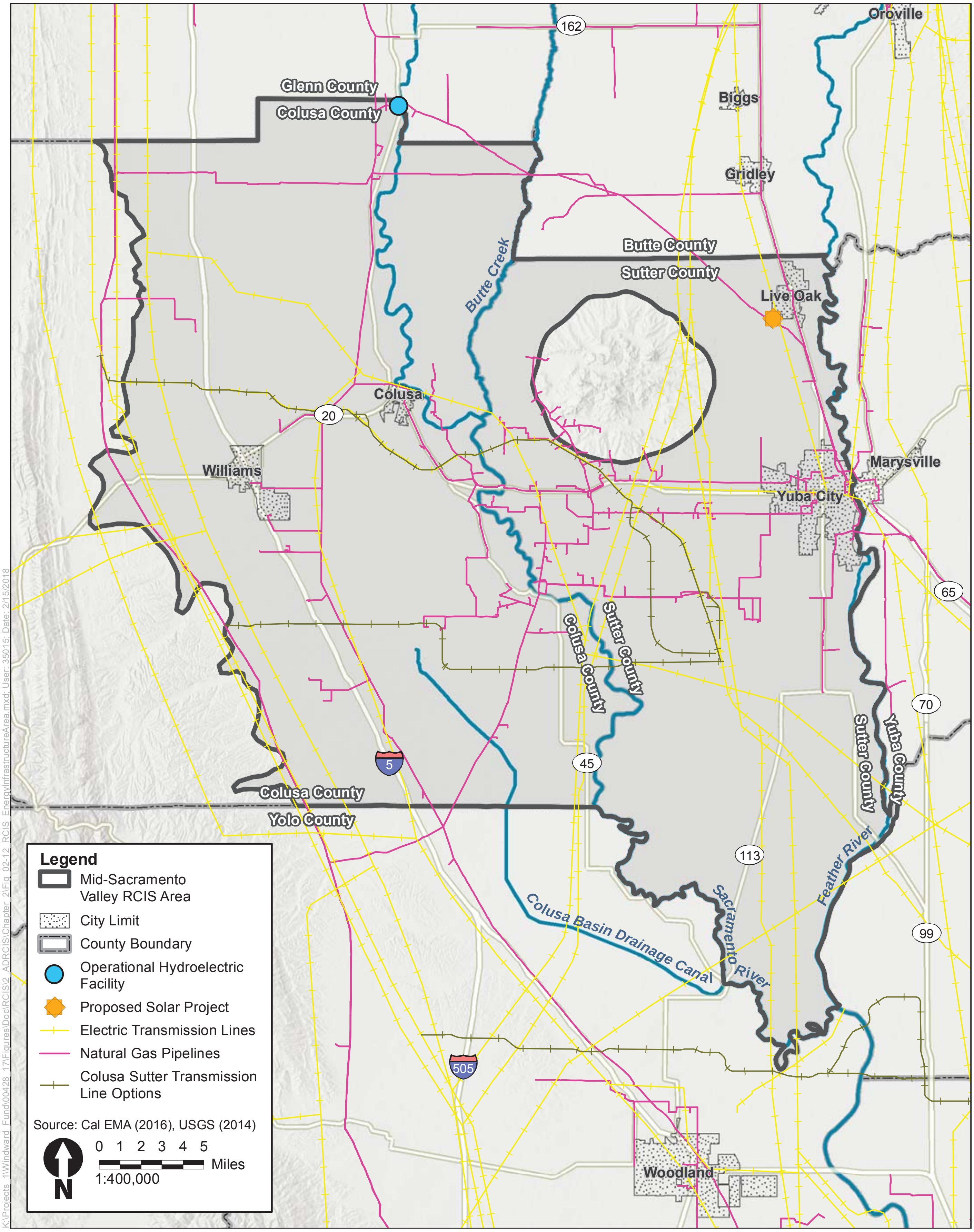

Figure 2-15
Energy Infrastructure in the Mid-Sacramento Valley RCIS Area

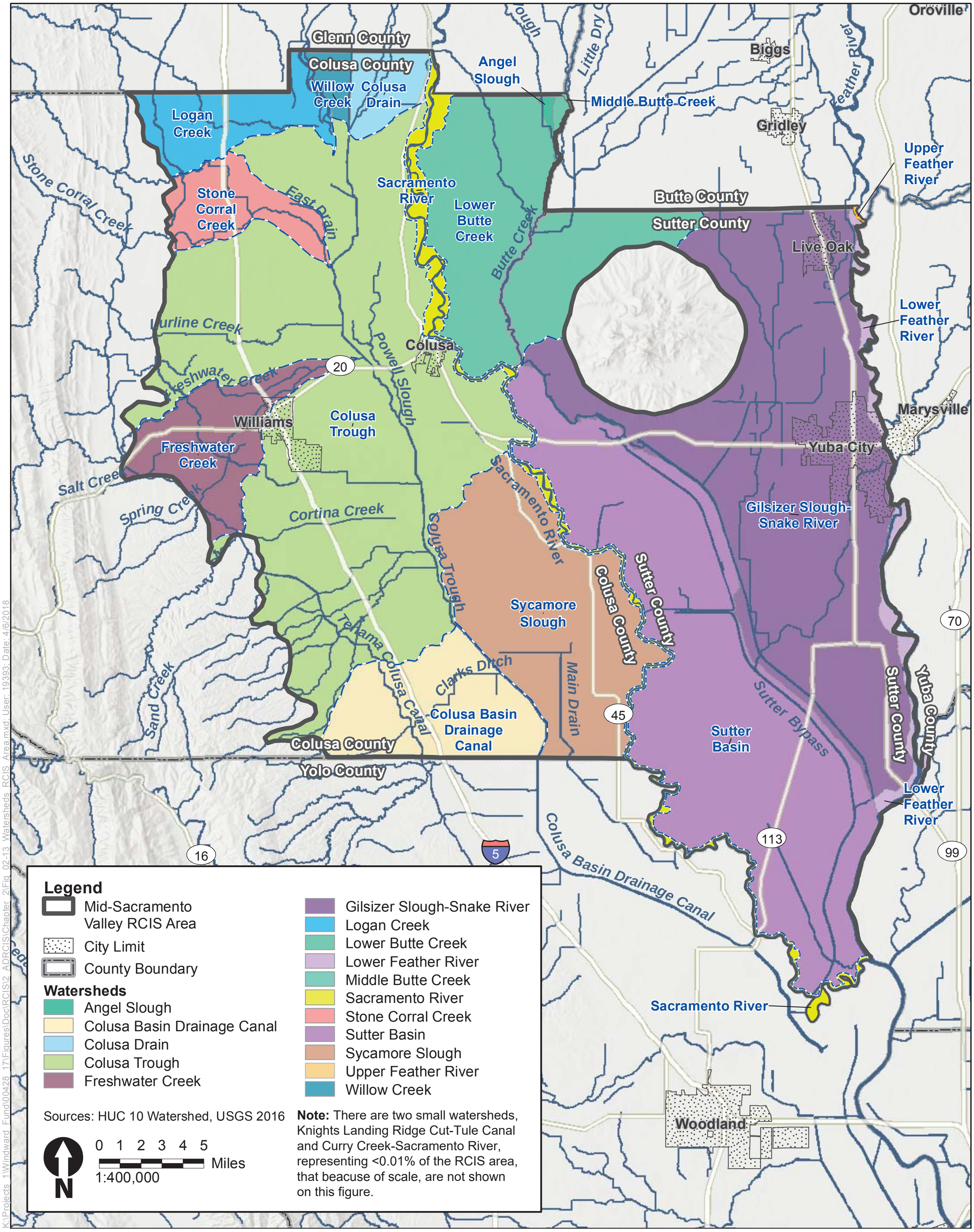

Figure 2-16
Watersheds in the Mid-Sacramento Valley RCIS Area

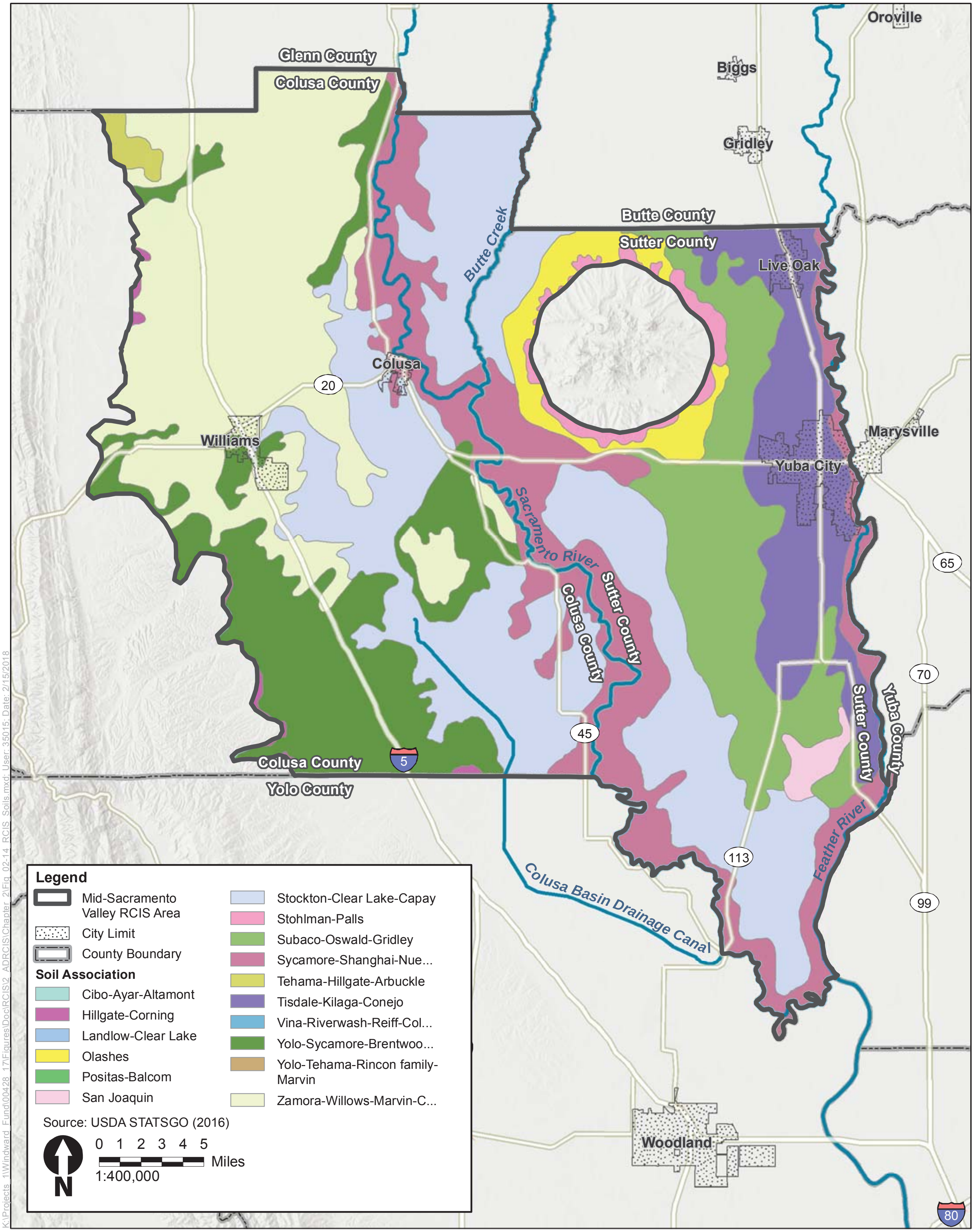

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Figure 2-17
Soil Associations in the Mid-Sacramento Valley RCIS Area

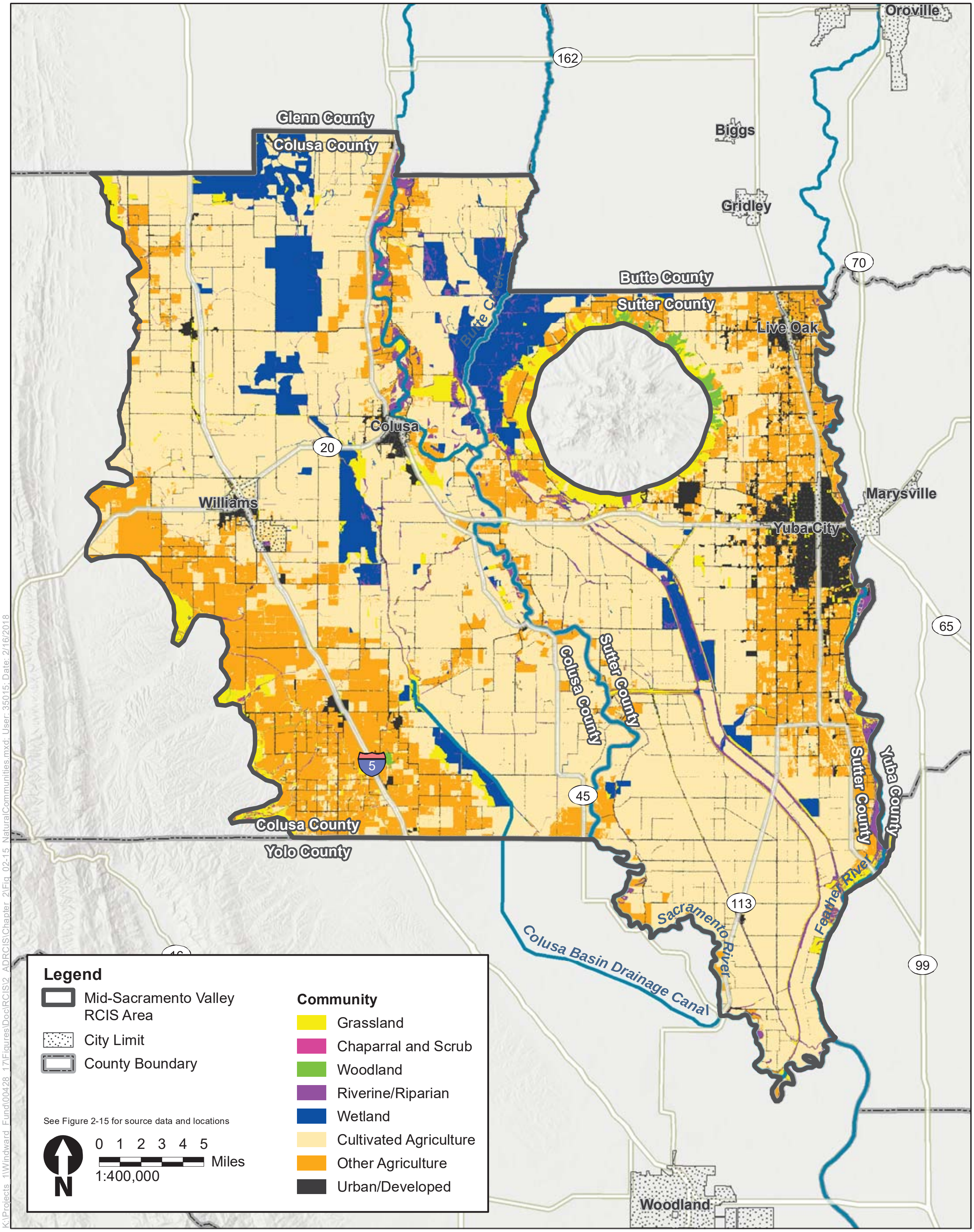

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Figure 2-18
Natural Communities, Agricultural Lands, and Urban/ Developed Lands in the Mid-Sacramento Valley RCIS Area

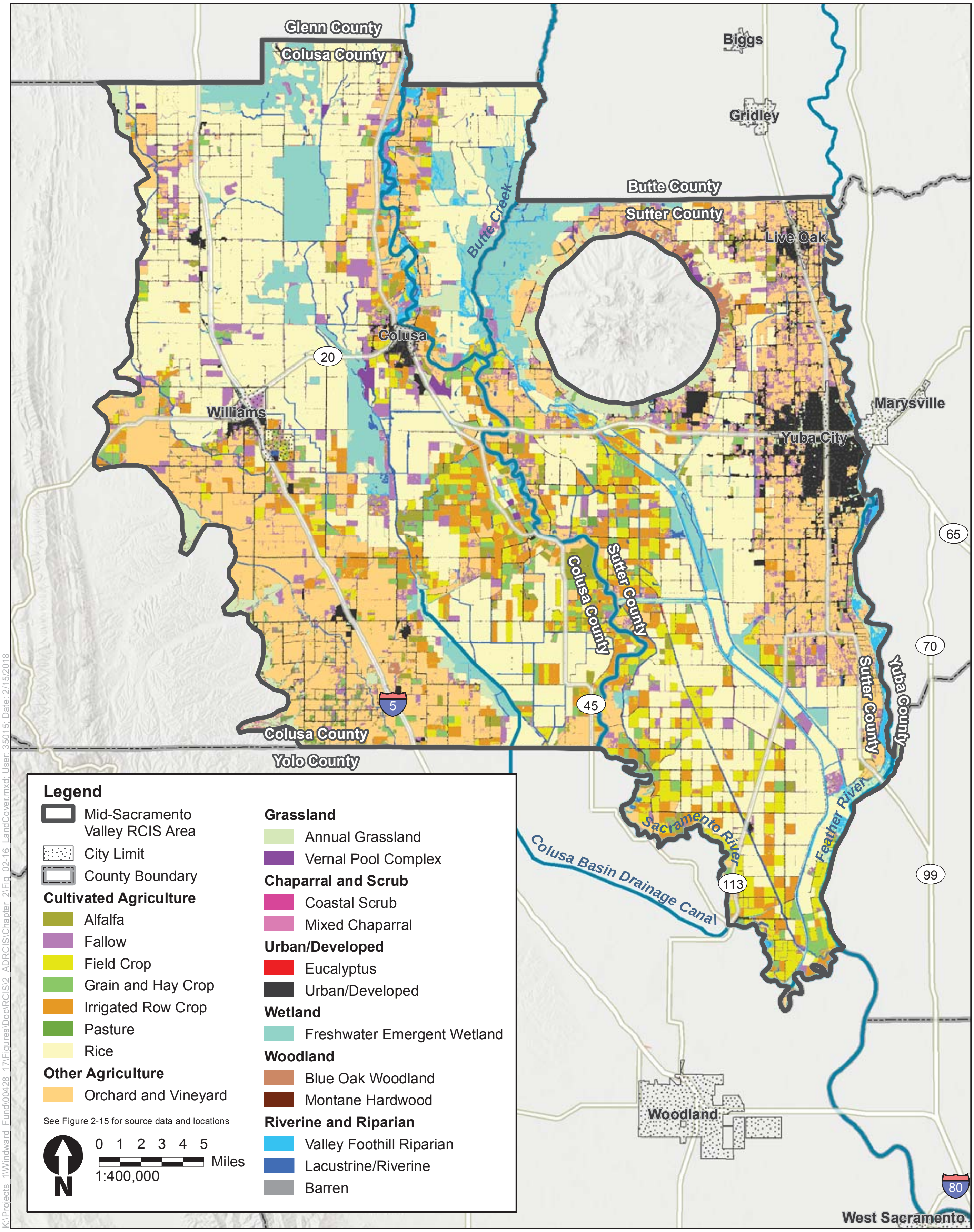

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Figure 2-19
Land Cover Types in the Mid-Sacramento Valley RCIS Area

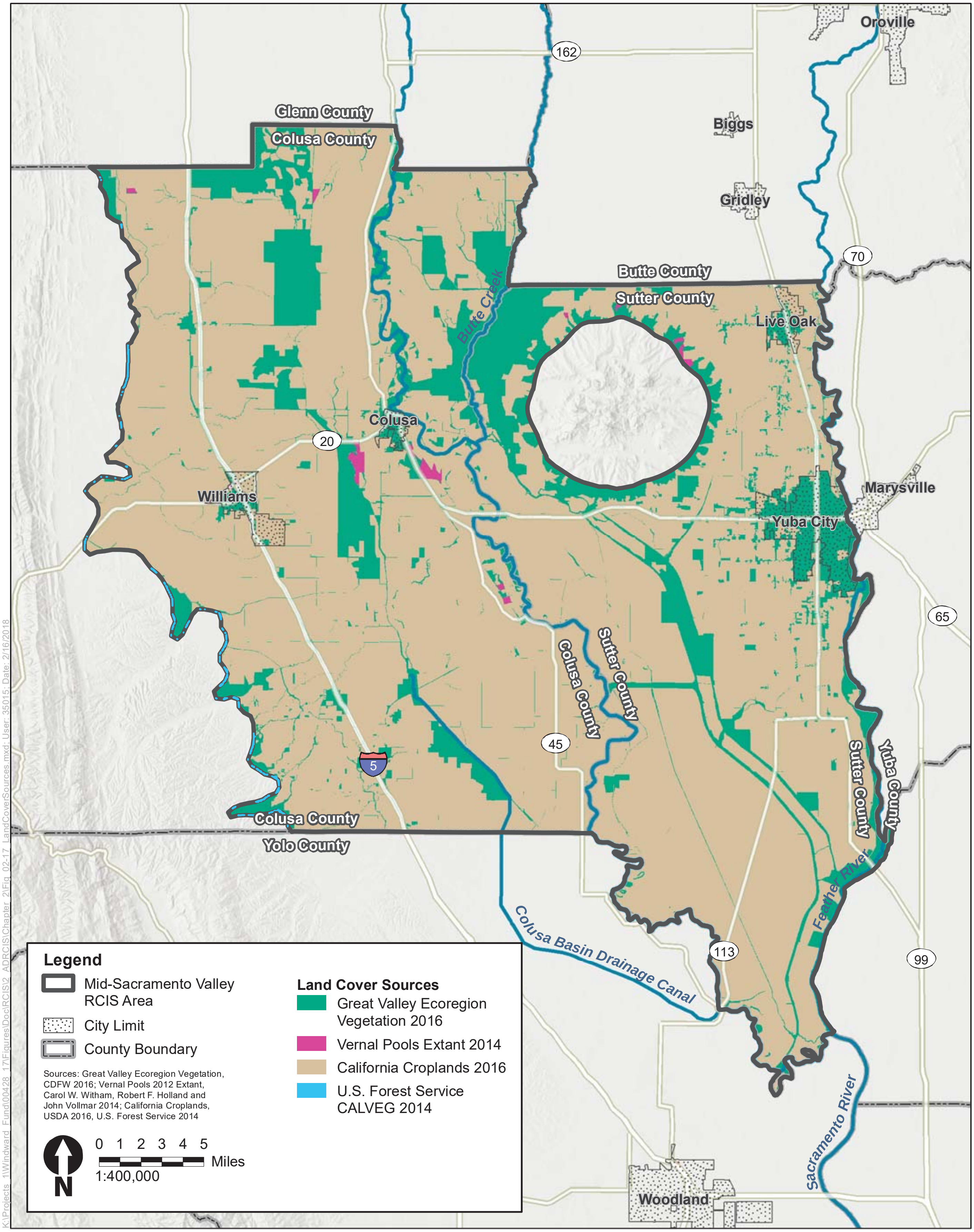

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Figure 2-20
GIS Land Cover Data Sources

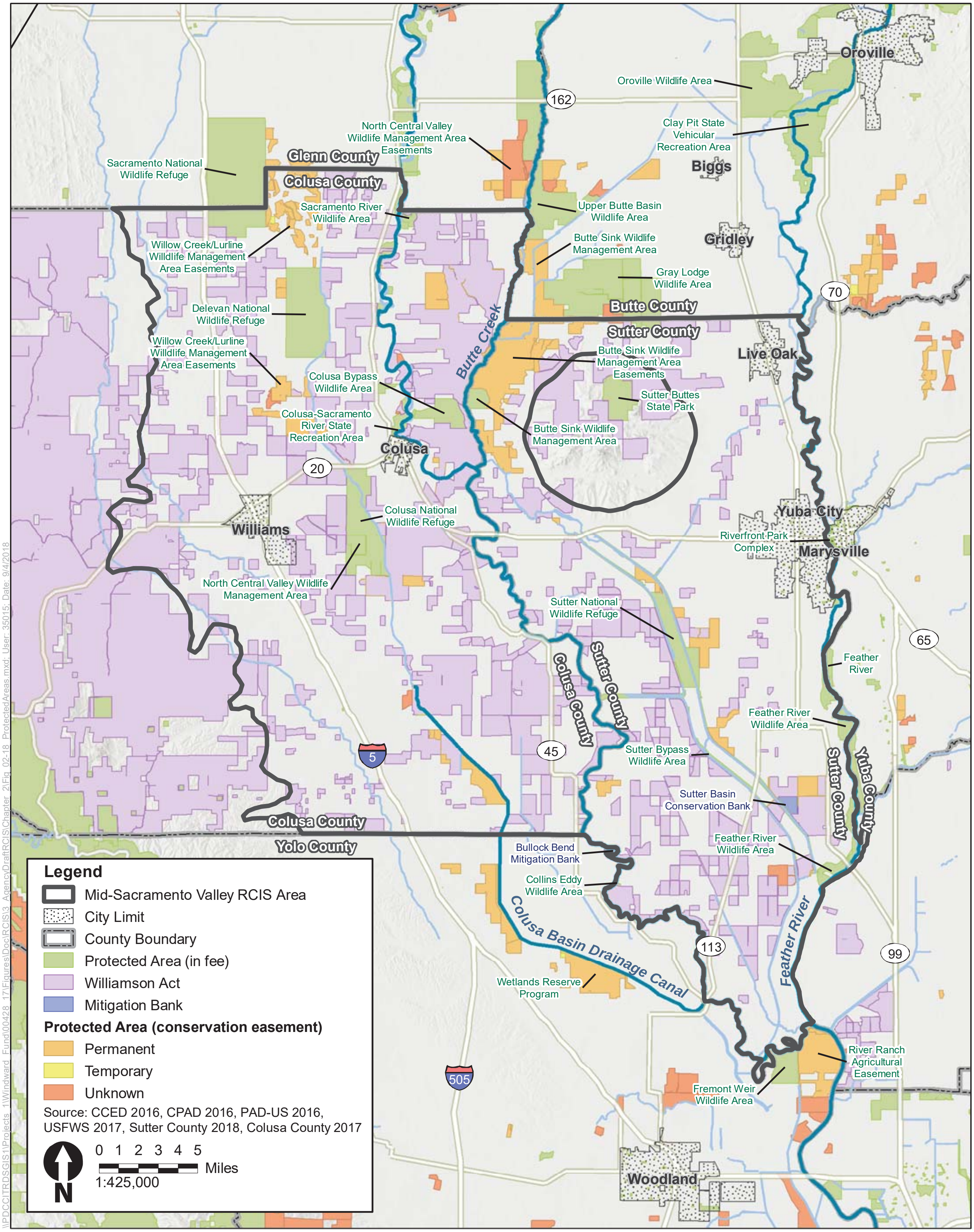

Figure 2-21
Protected Areas in the Mid-Sacramento Valley RCIS Area

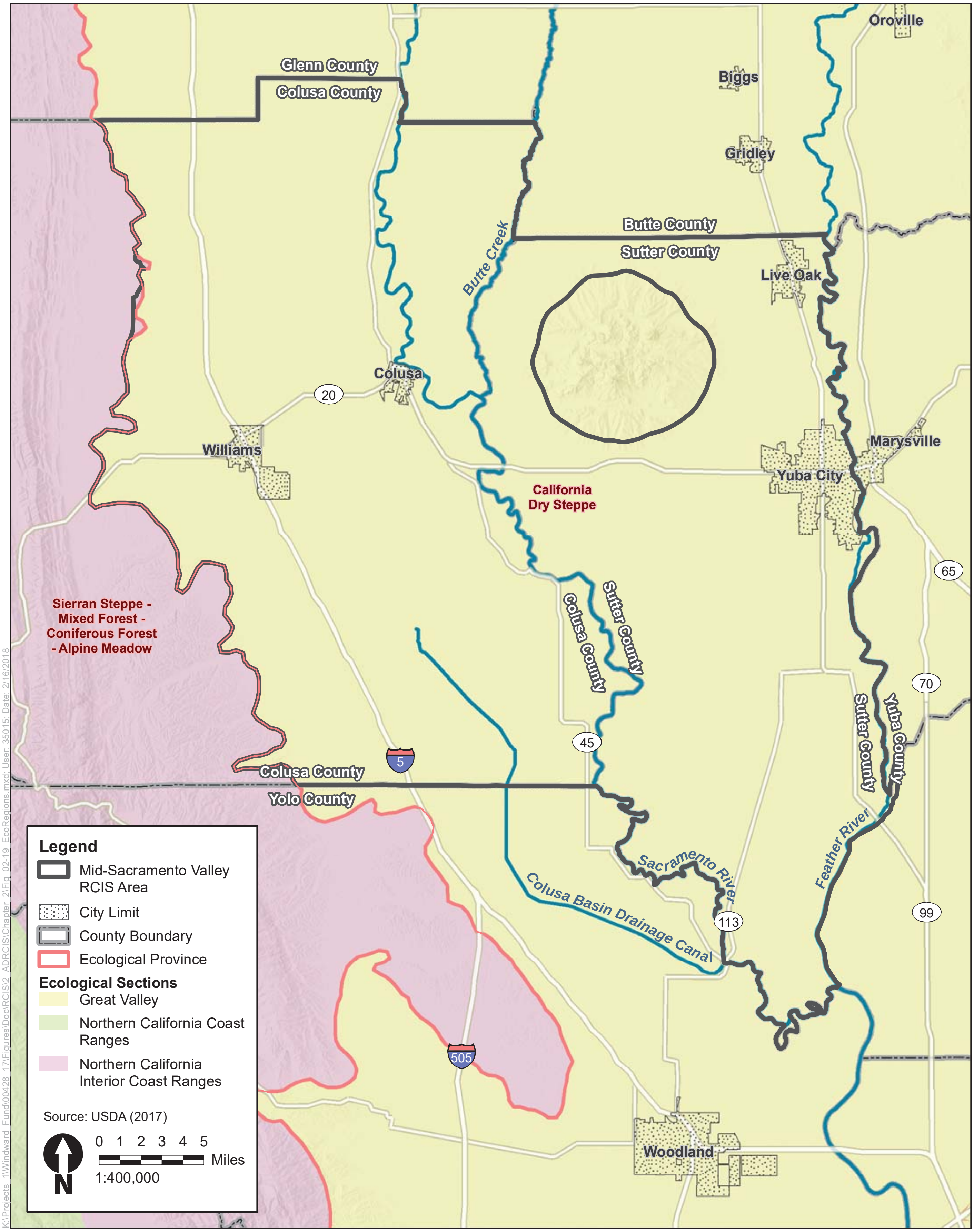

Figure 2-22
Ecoregions within the Mid-Sacramento Valley RCIS Area

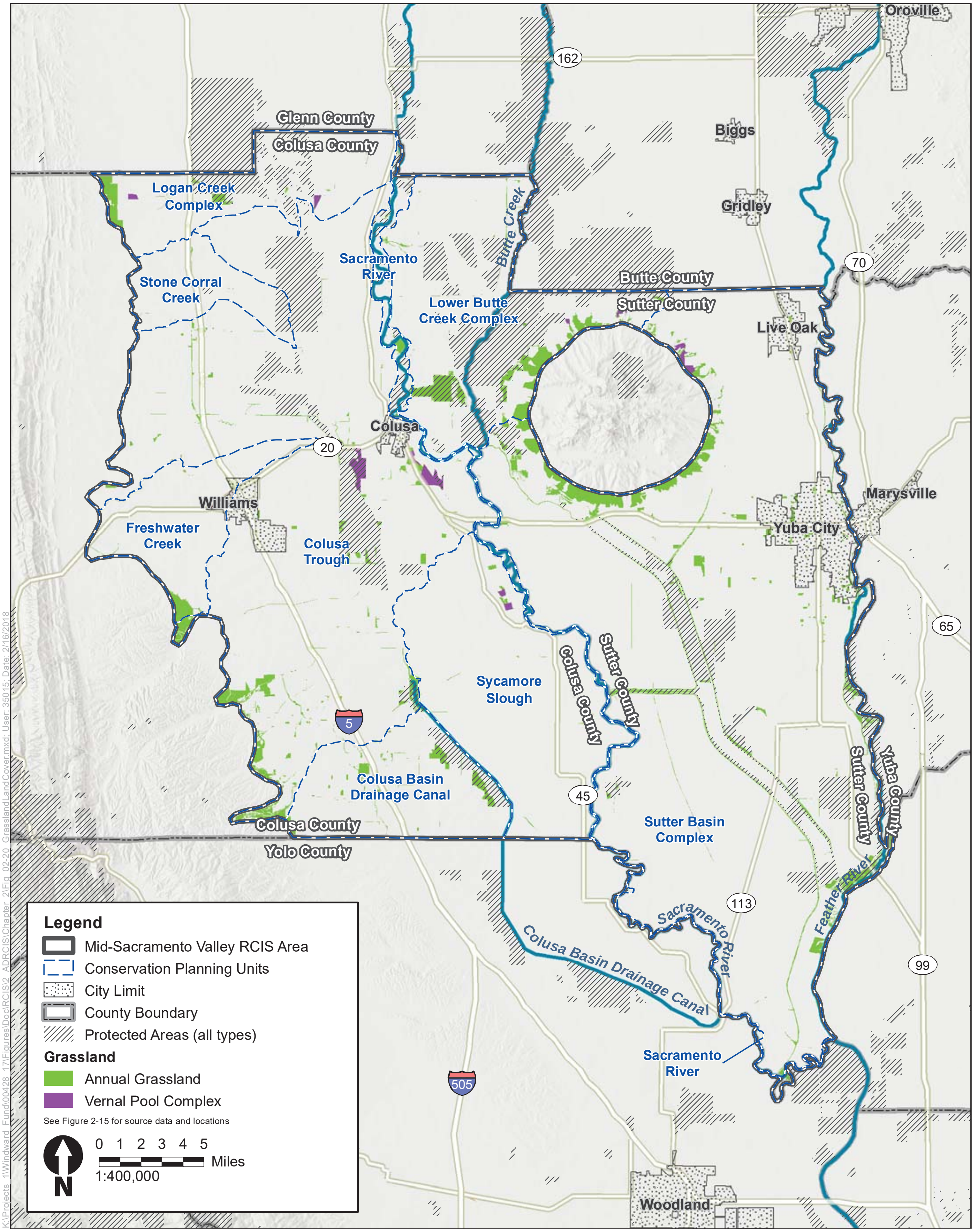

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Figure 2-23
Grassland Land Cover in the Mid-Sacramento Valley RCIS Area

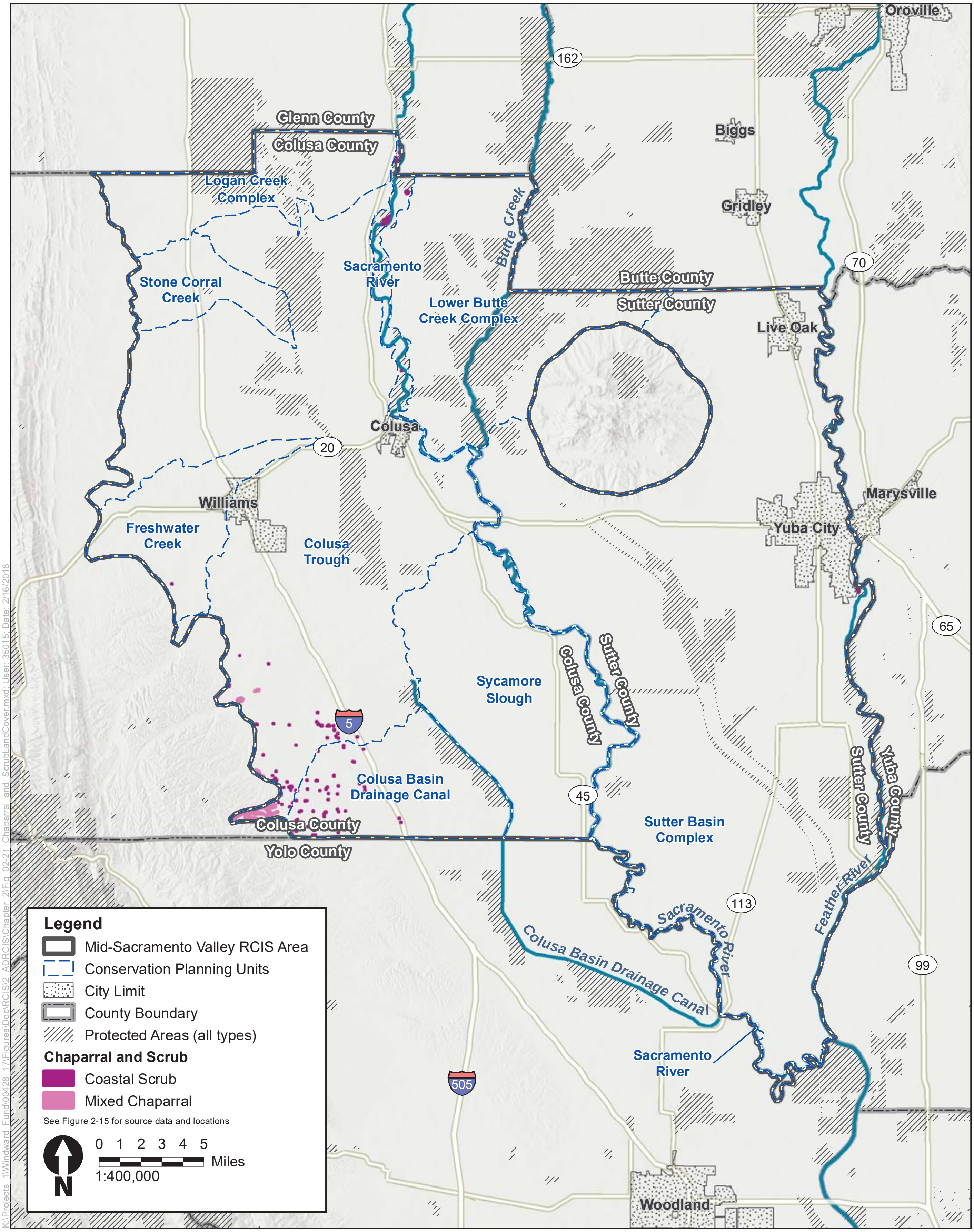

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Figure 2-24
Chaparral and Scrub Land Cover in the Mid-Sacramento Valley RCIS Area

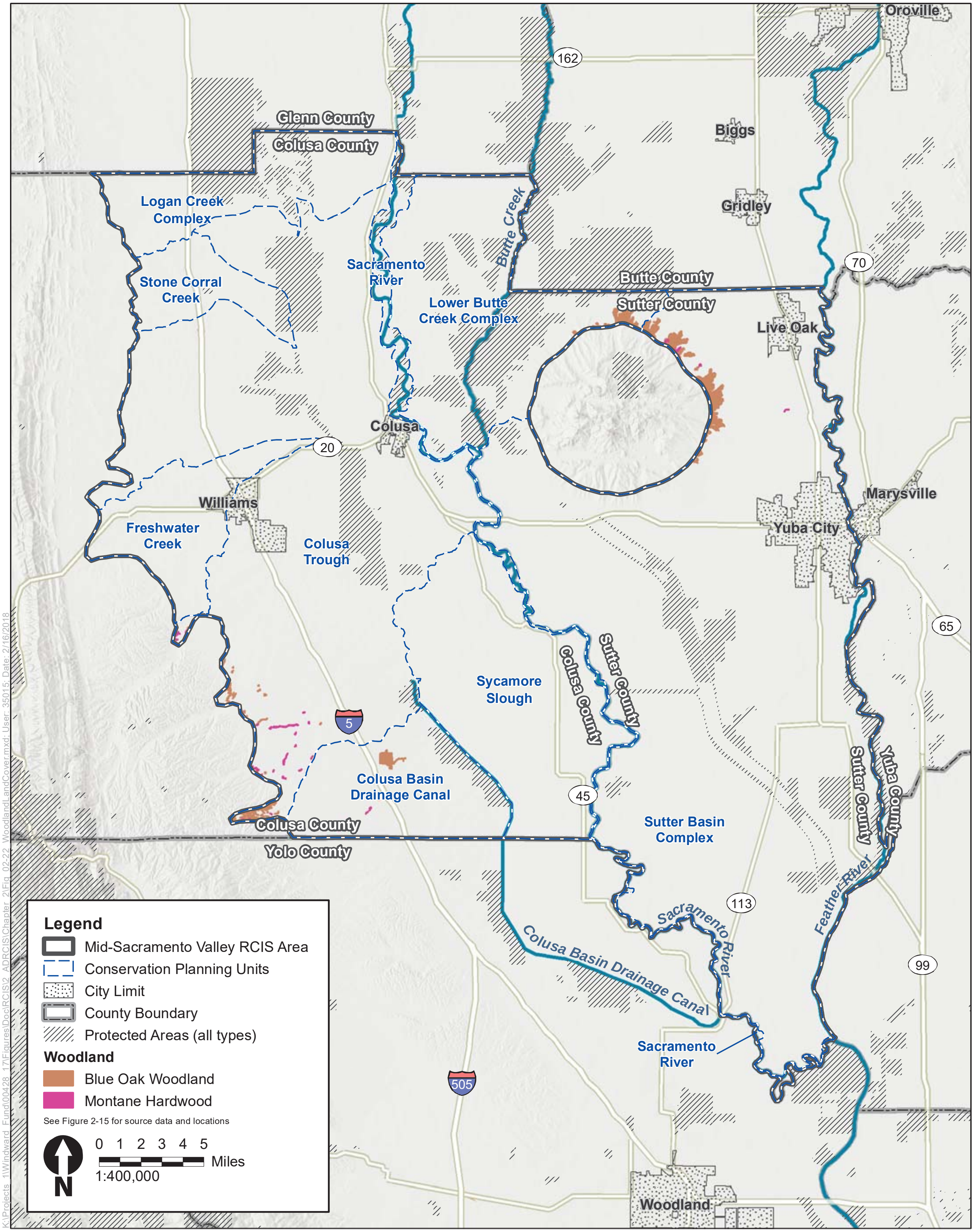

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Figure 2-25
Woodland Land Cover in the Mid-Sacramento Valley RCIS Area

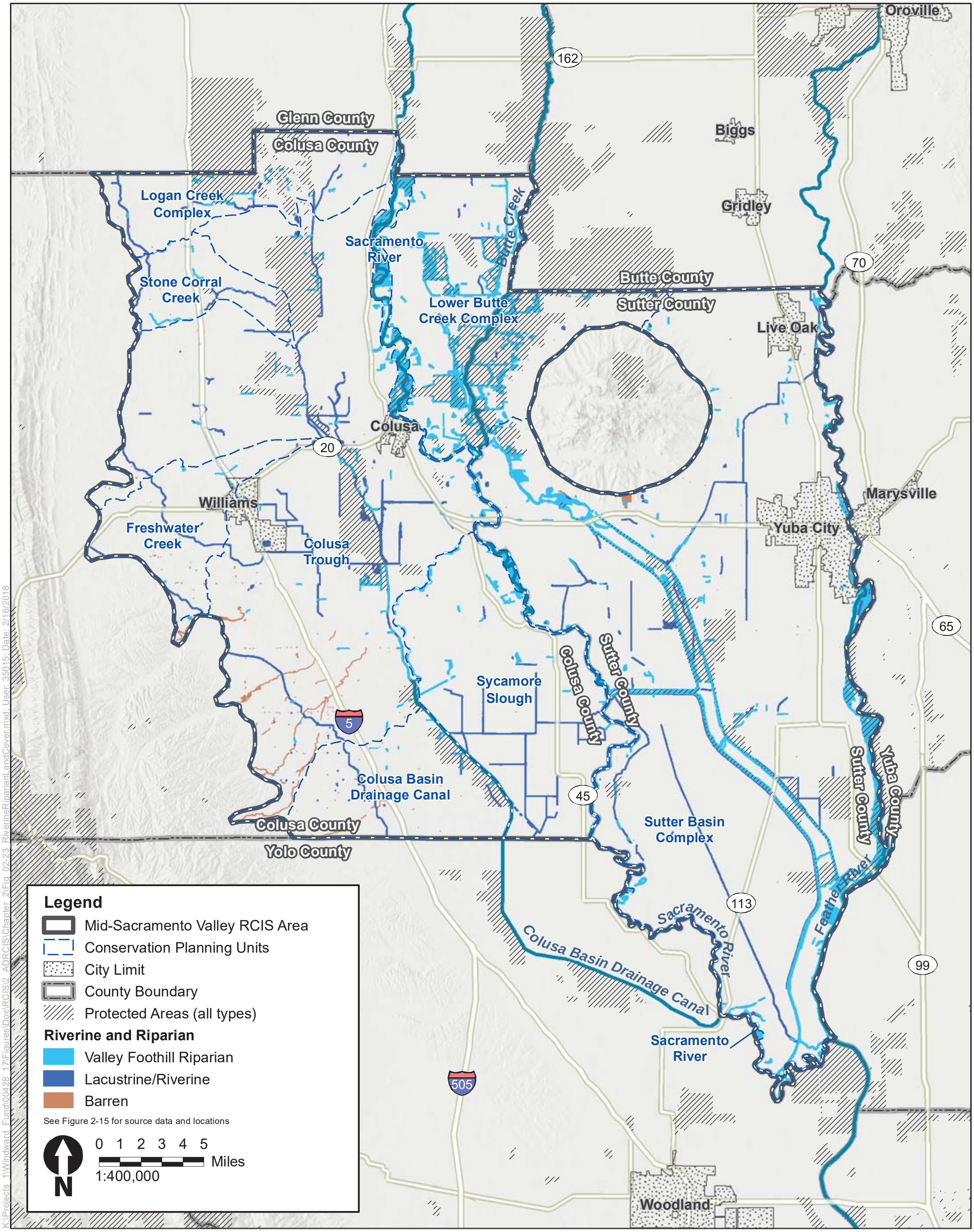

Figure 2-26
Riverine and Riparian Land Cover in the Mid-Sacramento Valley RCIS Area

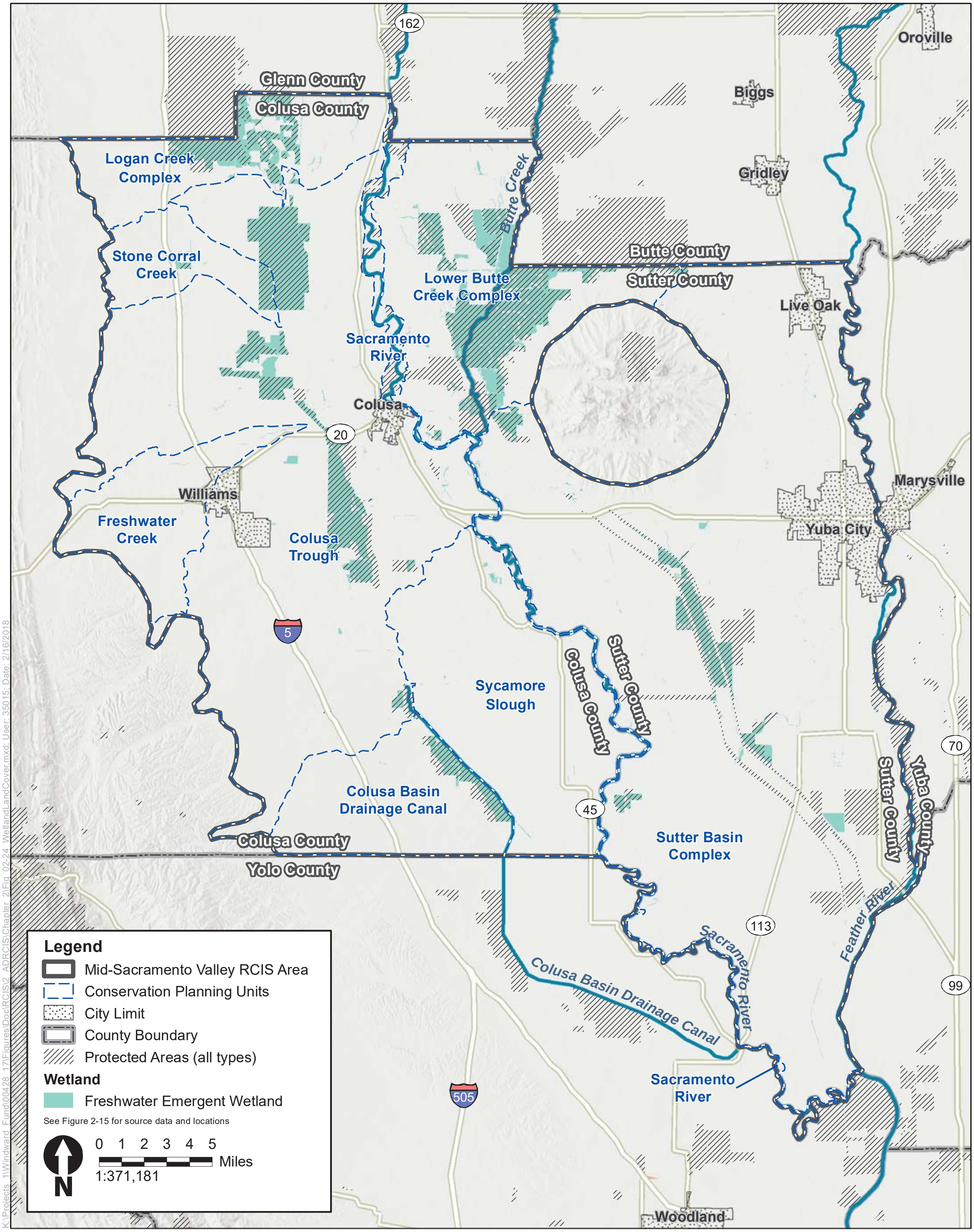

Figure 2-27
Wetland Land Cover in the Mid-Sacramento Valley RCIS Area

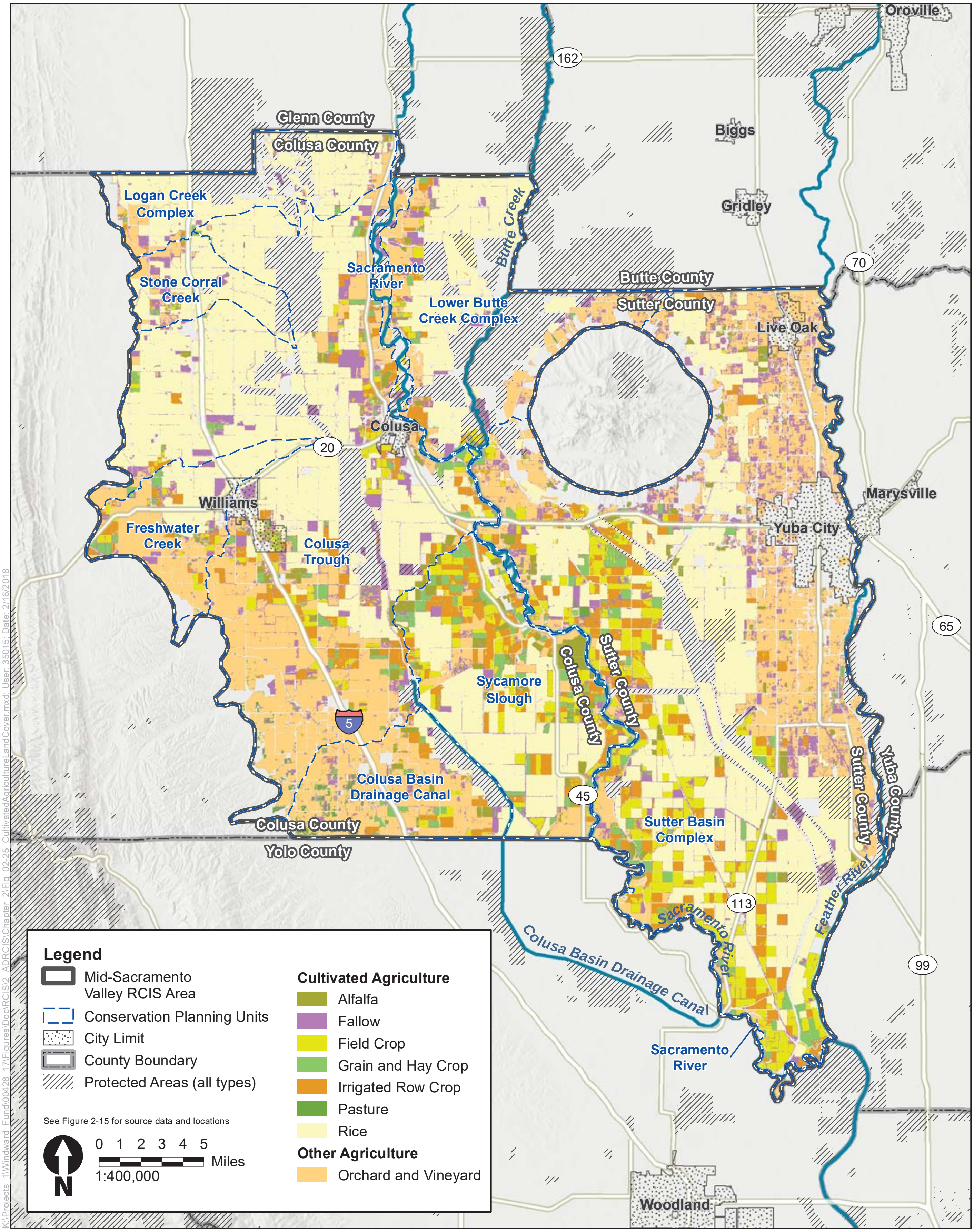

Figure 2-28
Agricultural Land Cover in the Mid-Sacramento Valley RCIS Area

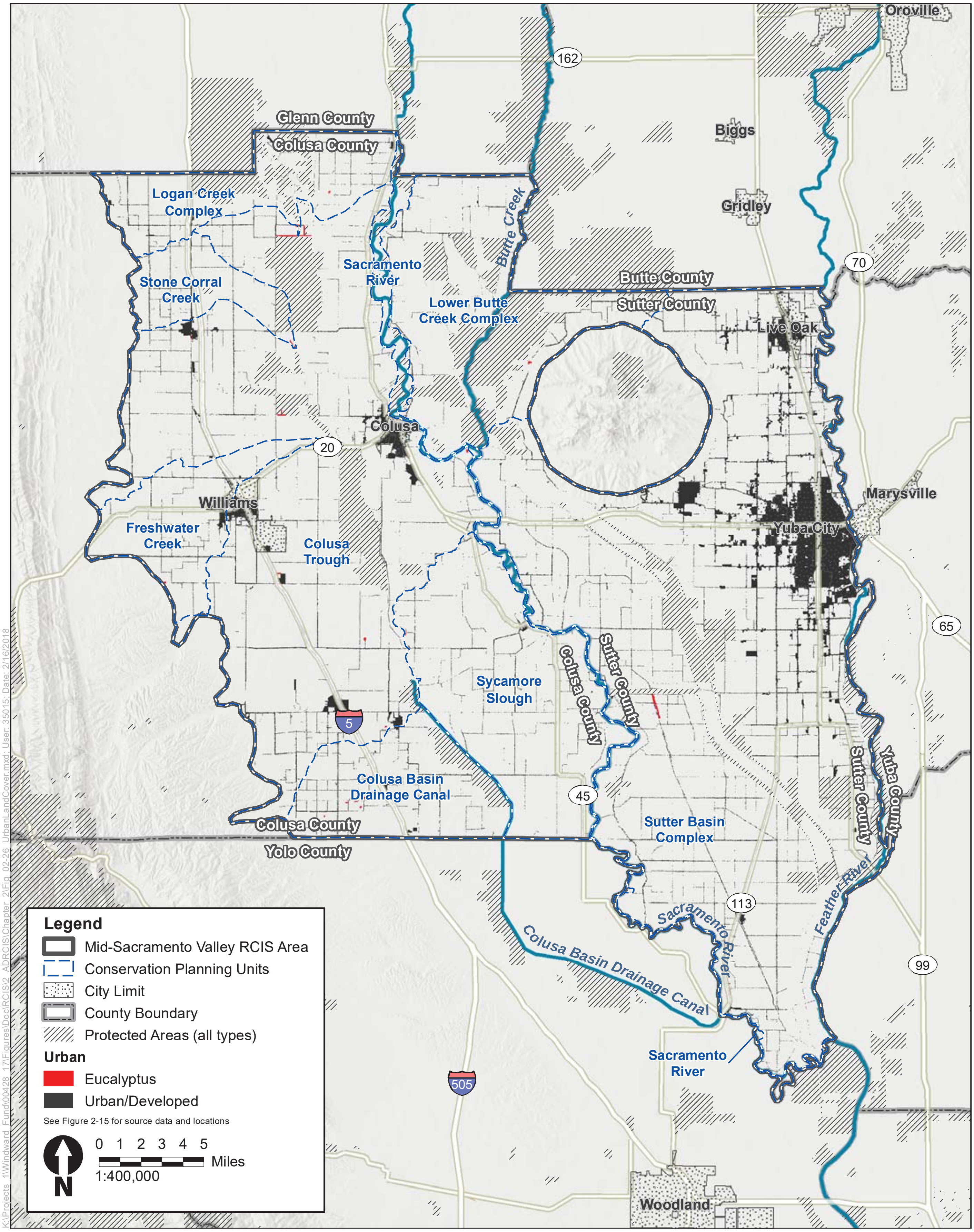

Figure 2-29
Urban/Developed Land Cover in the Mid-Sacramento Valley RCIS Area

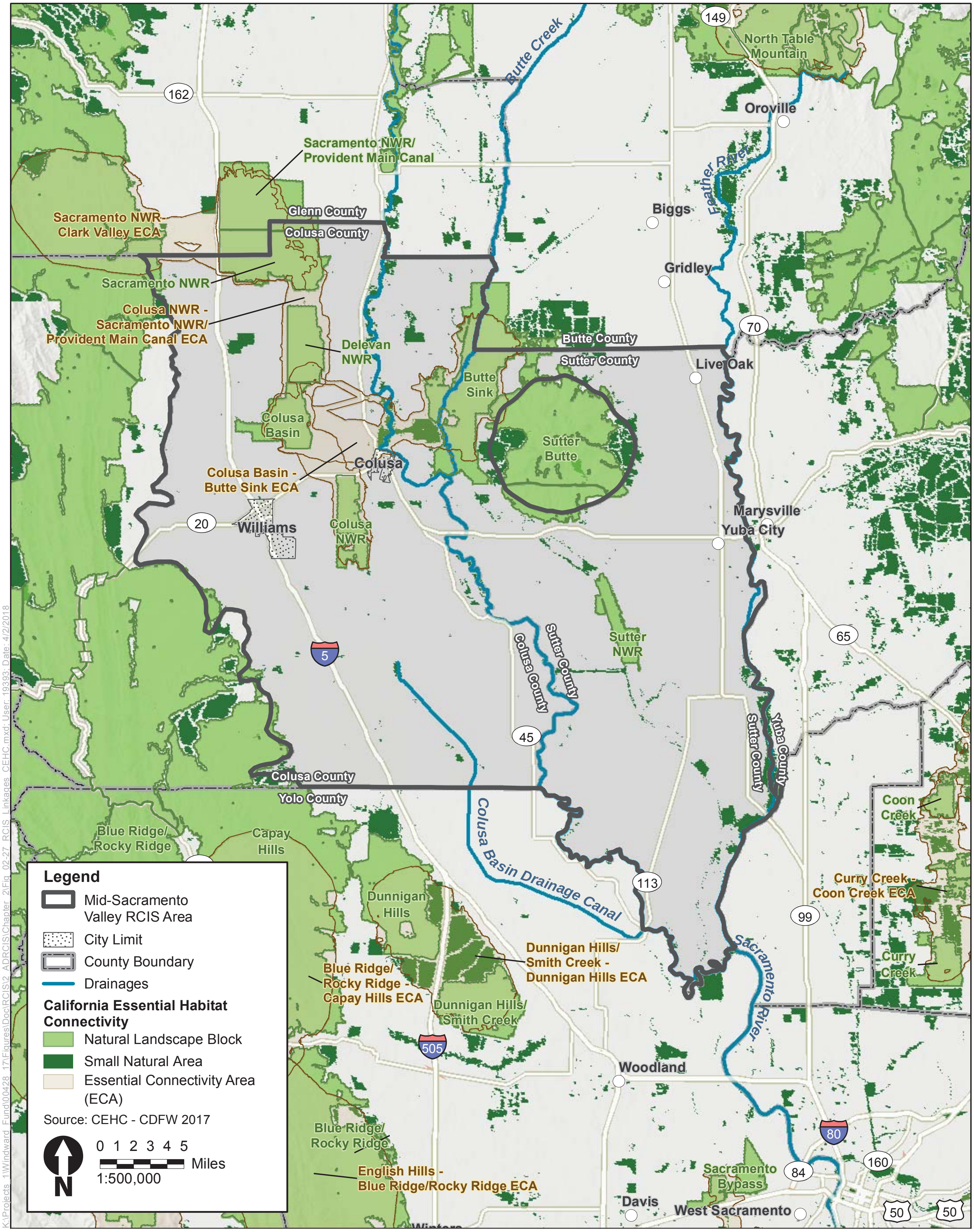

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Figure 2-30a
California Essential Habitat Connectivity within the Mid-Sacramento Valley RCIS Area

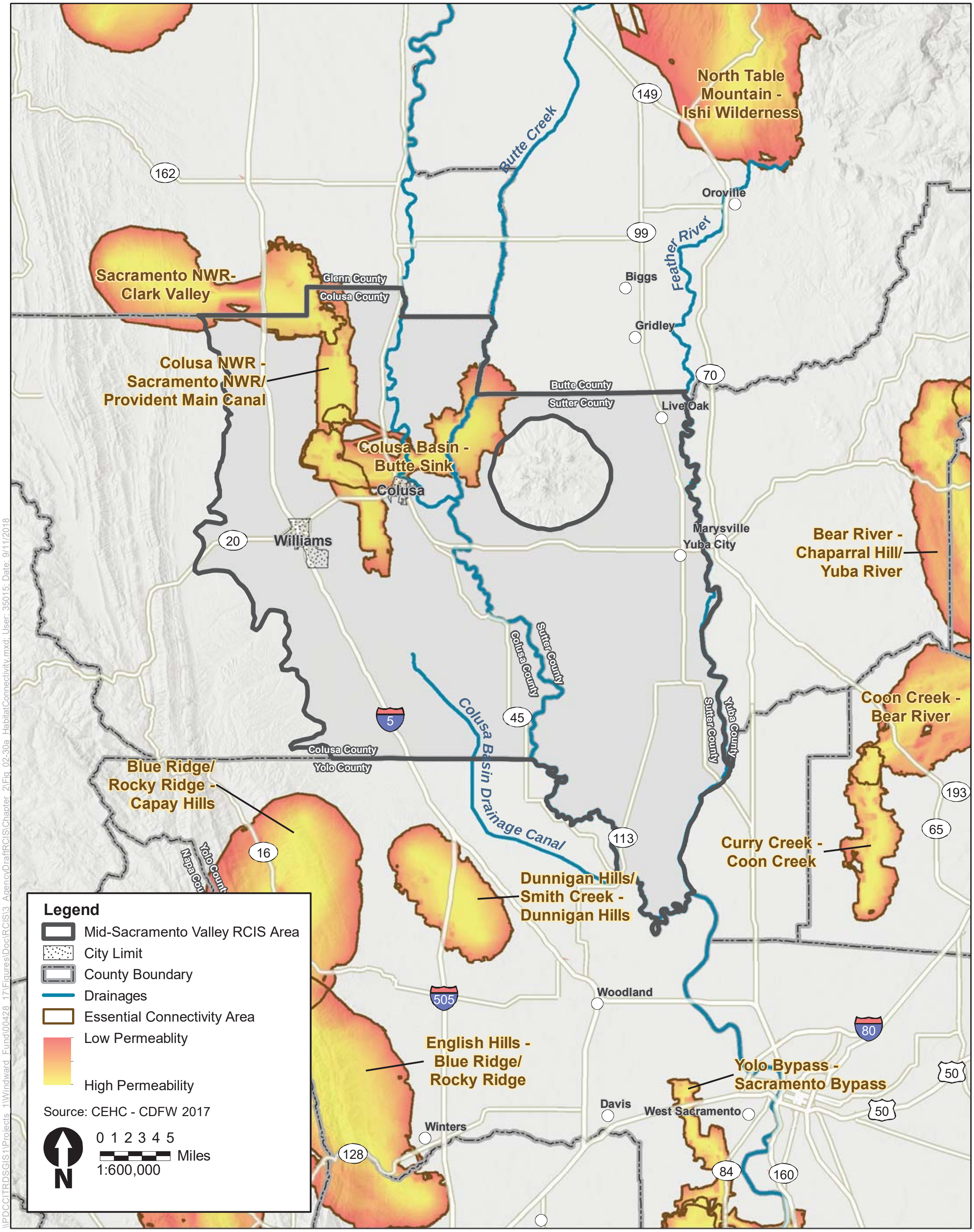

Figure 2-30b
Habitat Connectivity and Permeability within the Mid-Sacramento Valley RCIS Area

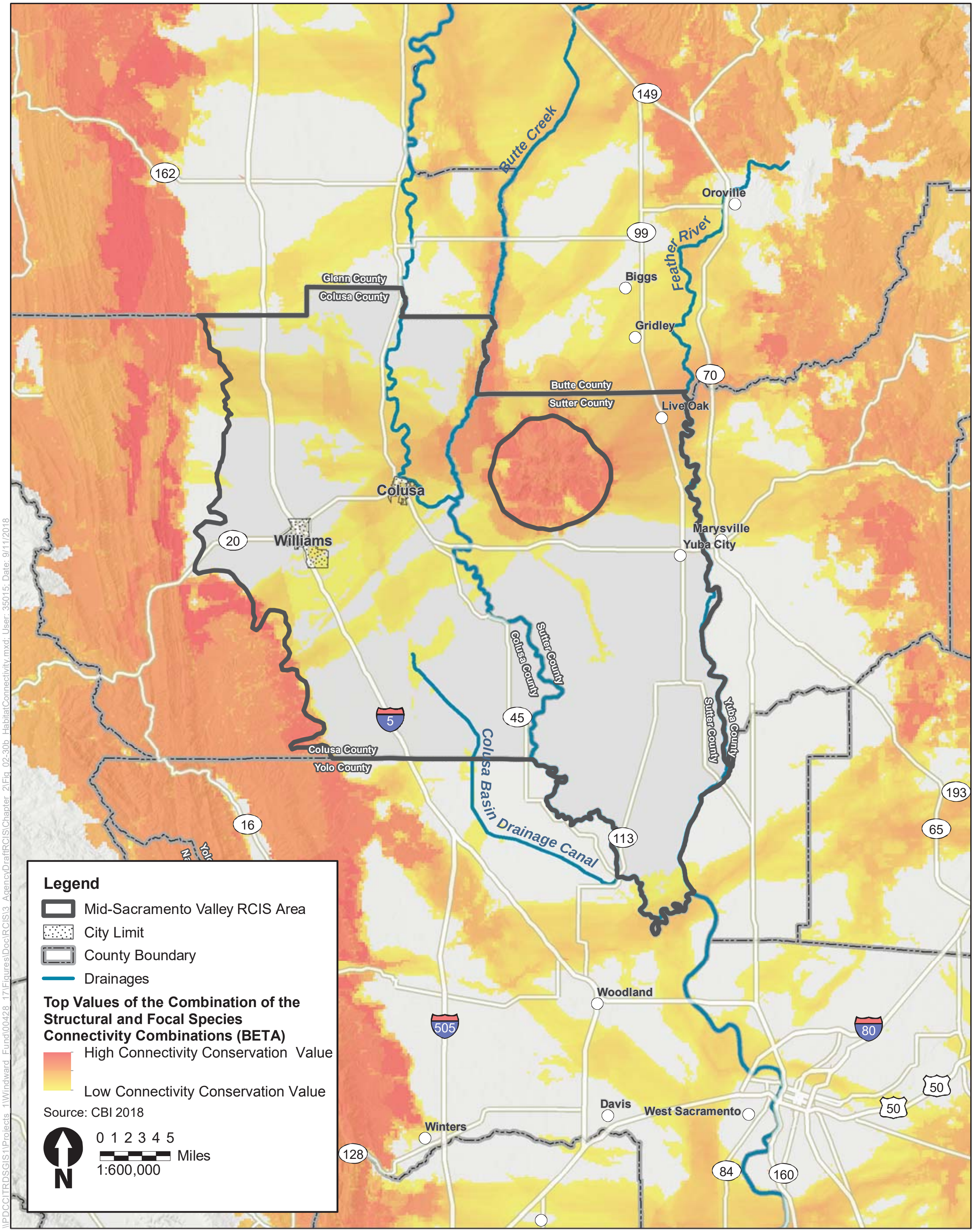

Figure 2-31
Habitat Connectivity within the Mid-Sacramento Valley RCIS Area

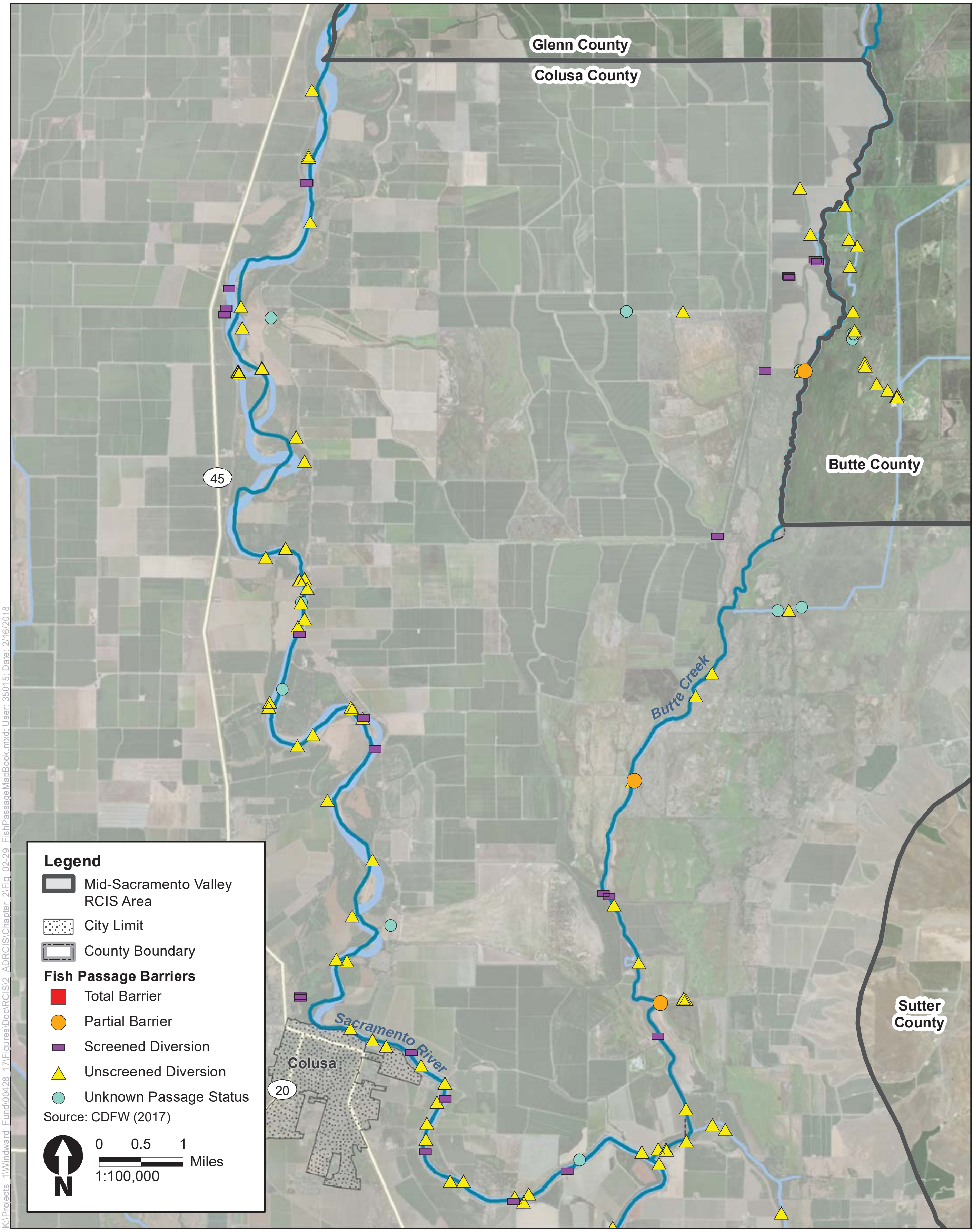

Figure 2-32a
Fish Passage Barriers within the Mid-Sacramento Valley RCIS Area

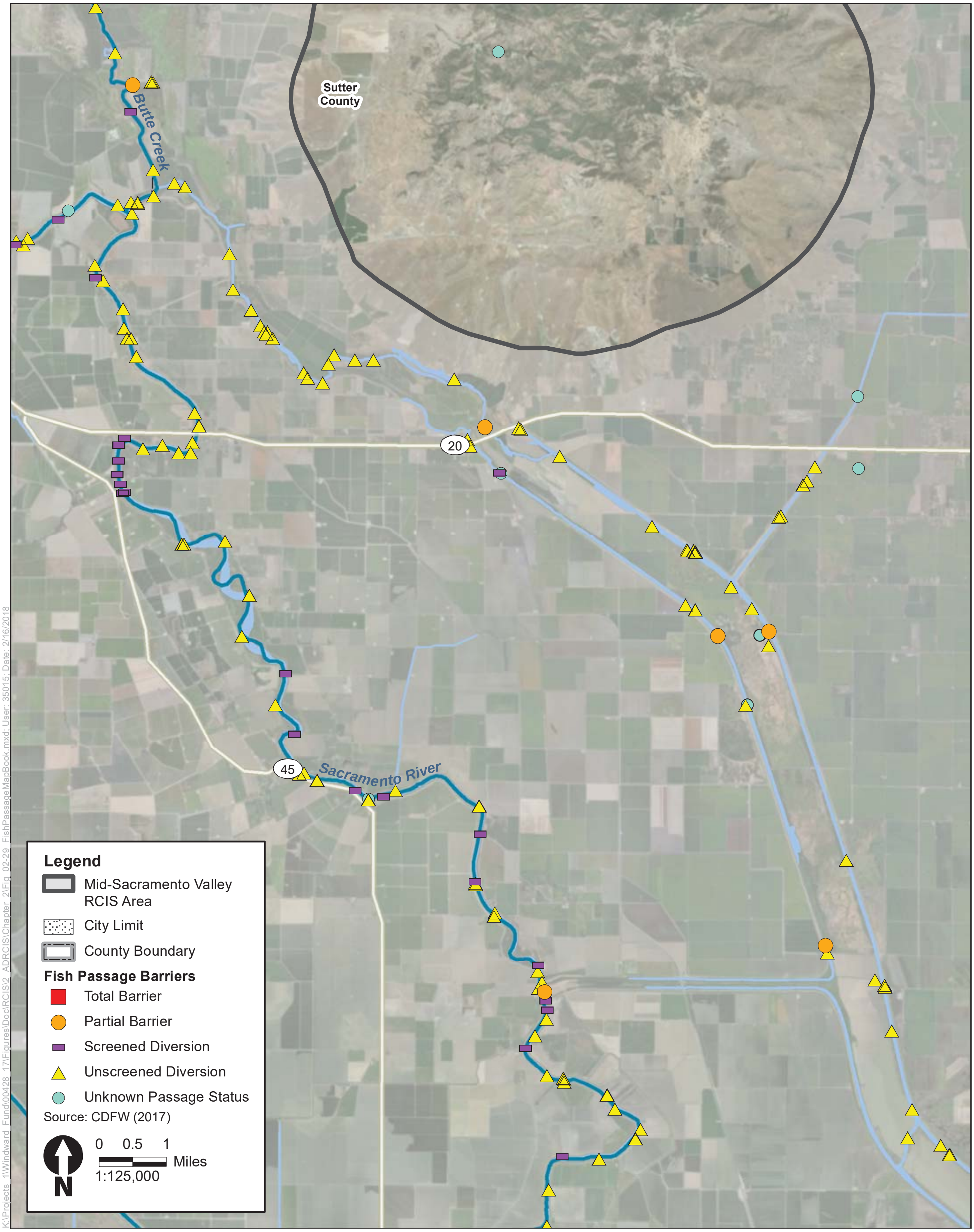

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Figure 2-32b
Fish Passage Barriers within the Mid-Sacramento Valley RCIS Area

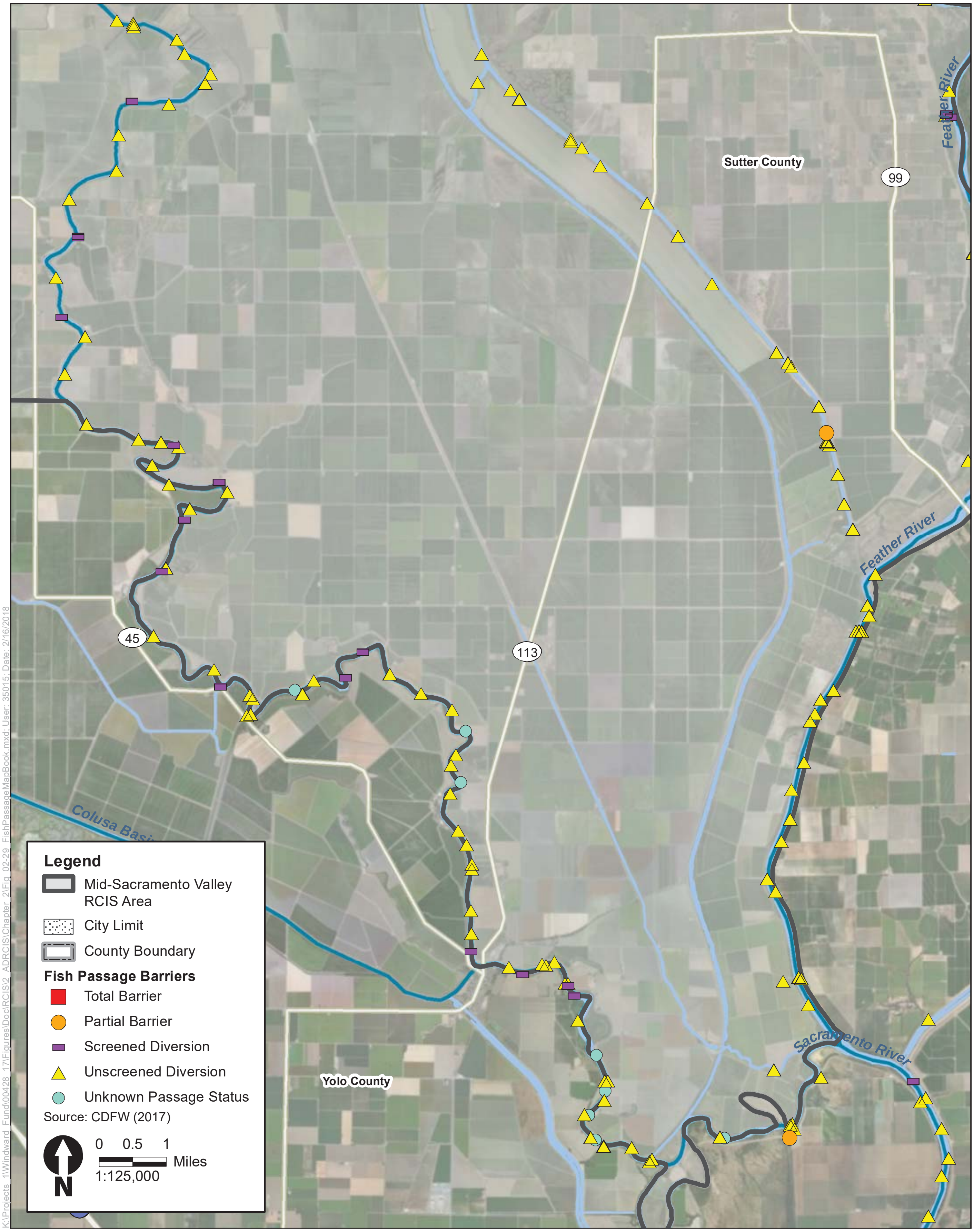

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Figure 2-32c
Fish Passage Barriers within the Mid-Sacramento Valley RCIS Area

Chapter 3
Conservation Strategy

3.1 Overview

This chapter identifies and prioritizes the conservation opportunities in the Mid-Sacramento Valley Regional Conservation Investment Strategy (RCIS) area to guide conservation investments and advance mitigation. This Mid-Sacramento Valley RCIS uses the best available science to identify conservation goals and objectives (Section 3.2.2, *Conservation Goals and Objectives*), and actions and conservation priorities (Section 3.2.3, *Actions and Priorities*) to achieve the conservation goals and objectives by protecting, restoring, and enhancing habitat and other conservation elements.

The Mid-Sacramento Valley RCIS's conservation strategy described in this chapter is intended for implementation in a manner that integrates conservation of native biodiversity, including Mid-Sacramento Valley RCIS's focal species and their habitats, on working agricultural lands, where feasible. This will often require consideration of available means to further multiple conservation objectives through individual "multi-benefit projects." Such multi-benefit projects are defined in the Central Valley Flood Protection Plan (CVFPP) (California Department of Water Resources 2017) as projects "designed to reduce flood risk and enhance fish and wildlife habitat, as well as create additional public benefits such as sustaining agricultural production, improving water quality and water supply reliability, increasing groundwater recharge, supporting commercial fisheries, and providing public recreation and educational opportunities, or any combination thereof."

3.2 Framework

The conservation strategy was designed to meet the requirements of the California Department of Fish and Wildlife (CDFW) Regional Conservation Investment Strategies Program Guidelines (Program Guidelines) (California Department of Fish and Wildlife 2017a, 2018a) to address natural communities and working landscapes, focal species, habitat connectivity, ecological processes, and other conservation elements. Implementing this strategy will help sustain and enhance focal species and their habitats and help populations adapt to climate change and other pressures and stressors such as habitat fragmentation.

The conservation strategy for this Mid-Sacramento Valley RCIS comprises four elements: conservation goals, conservation objectives, actions, and conservation priorities. All four of these elements are presented in the conservation strategies for landscapes (Section 3.6, *Landscape-Level Conservation Strategy*), working landscapes and natural communities (Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities*), and focal species (Section 3.8, *Conservation Strategy for Focal Species*). The conservation strategy provides actions and priorities to accomplish the conservation goals and objectives through the following general concepts.

- Retain working landscapes for the benefit of agricultural uses, focal and other native species, and ecosystem services.
- Protect the diversity of natural communities in the RCIS area to maintain habitats for the native flora and fauna that depend on these habitats.

- Protect populations of focal and other native species and their habitats to enable these species to persist in the RCIS area and adapt to a changing climate.
- Manage and enhance focal and other native species' habitats to maintain and improve habitat quality for these species.
- Restore habitats and natural communities that have been degraded or lost over time.
- Protect, enhance, and restore landscape linkages (including passage by aquatic species within rivers) to facilitate movement through the landscape by fish, wildlife, and plants (e.g., as seeds are dispersed).

This chapter also presents an adaptive management and monitoring strategy (Section 3.10, *Adaptive Management and Monitoring Strategy*), which can be used to inform the development of adaptive management and monitoring plans for mitigation credit agreements (MCAs) under this RCIS (Chapter 4, Section 4.5.1, *Mitigation Credit Agreements*).

3.2.1 Consideration of Development of Major Infrastructure Facilities

The Program Guidelines (California Department of Fish and Wildlife 2018a) require that "[a]n RCIS shall indicate how reasonably foreseeable development of major infrastructure facilities, including, but not limited to, renewable energy and housing, was considered in developing the RCIS and its conservation goals, objectives and actions, and in determining conservation priorities."

The Steering Committee primarily considered agriculture, and operations and maintenance of flood safety, water resources, and transportation infrastructure in the development of this RCIS's conservation goals, objectives, actions, and priorities. The RCIS area may also see the development of major new infrastructure such as the Sites Reservoir Project (Chapter 2, Section 2.3.3.2, *Water*), small community flood risk reduction projects, among others (Chapter 2, Section 2.3.3, *Major Infrastructure*).

The RCIS area is dominated by agriculture (Table 2-2), and the Colusa and Sutter County general plans reflect their respective county's visions to protect their agricultural heritage and to a retain high-quality rural lifestyle (Sections 2.3.1.1, *Colusa County* and 2.3.1.2, *Sutter County*). Because the RCIS area is zoned mostly for agricultural uses (Figures 2-9 and 2-10), the Mid-Sacramento Valley RCIS conservation goals, objectives, actions, and priorities were developed to be compatible with existing land uses on working lands (for example, Section 3.4, *Multi-Benefit Approach*, and Section 3.7.1, *Working Landscapes*) and consistent and compatible with county general plans and zoning code (Chapter 4, Sections 4.5.1.2, *Mitigation Credit Agreements in Colusa County*, and 4.5.1.3, *Mitigation Credit Agreements in Sutter County*).

A large proportion of the RCIS area is in low-lying areas protected from flooding by various flood control infrastructure (Chapter 2, Section 2.3.3.1, *Flood Protection*, and Figure 2-12). As described in Chapter 1, Section 1.3, *Purpose and Intent*, development of this RCIS began as an outgrowth, in part, of the Mid-Upper Sacramento River Regional Flood Management Plan (Mid and Upper Sacramento River Regional Flood Management Plan Partners 2014). This RCIS's conservation goals, objectives, actions and priorities were developed, in part, to aid in the implementation of needed flood risk reduction measures, and to provide incentives for landowners to propose conservation actions or habitat enhancement actions on their properties that would benefit species in need of mitigation offsets from flood management projects.

3.2.2 Conservation Goals and Objectives

This Mid-Sacramento Valley RCIS's *conservation goals* reflect the broad, desired outcomes for the focal species and other conservation elements in the RCIS area, and address the pressures on focal species and important conservation elements identified in Chapter 2, Section 2.13, *Pressures and Stressors on Focal Species and Other Conservation Elements*. Each conservation goal is supported by several conservation objectives. An *objective* is a concise, measurable statement of what is to be achieved in support of a conservation goal. Measureable conservation objectives focus on conserving landscape elements, managing working lands to benefit focal species and native biodiversity, protecting and restoring natural communities and focal species' habitats, managing habitats for the benefit of focal species, and managing and enhancing landscape connectivity in the RCIS area.

Conservation objectives were developed to achieve the conservation goals. Each conservation objective was developed to be fully or partially-achievable through implementation conservation actions and habitat enhancement actions within the next 10 years (California Department of Fish and Wildlife 2017a). Because implementation of this RCIS is voluntary, however, and resources available to the conservation community and others to invest in conservation actions are limited and variable, there is no deadline to achieve these objectives, and it is not expected that all of the conservation goals and objectives will be fully or partially achieved within the next 10 years.

The conservation goals and objectives are organized hierarchically on the basis of the following ecological levels of organization.

- **Landscapes.** The landscape-level conservation goals and objectives form the overarching framework for the conservation strategy and focus on the extent, distribution, and connectivity among working landscapes and natural communities, and improvements to the overall condition of hydrological, physical, chemical, and biological processes (including connectivity and climate change adaptation) in the RCIS area.
- **Working landscapes and natural communities.** The working landscapes and natural community conservation goals and objectives focus on maintaining or enhancing ecological functions and values of working landscapes and certain natural communities. Achieving these goals and objectives will also provide for the conservation of habitats of associated focal species and other native species.
- **Species.** The species-specific conservation goals and objectives address stressors and habitat needs specific to individual focal species (or a group of species [i.e., fish] with similar needs in the RCIS area) that are not addressed under the landscape or working landscapes and natural community goals and objectives. The conservation strategies for focal species rely primarily on the goals and objectives for working lands and natural communities to conserve, enhance, and restore lands that support these species.

Most of the conservation goals and objectives for focal species are designed to maintain or increase the size of their populations. The conservation goals and objectives are also intended to support the long-term persistence of focal species through protection, restoration, and enhancement of habitat.

All conservation goals and objectives are given unique codes so that they can be easily identified and tracked by those implementing conservation actions and habitat enhancement actions.

As required by California Fish & Game Code (FGC) 1852(c)(9) an RCIS shall include "[c]onservation actions, including a description of the general amounts and types of habitat that, if preserved or restored and permanently protected, could achieve the conservation goals and objectives…"

Each natural community- and focal species-level objective in this RCIS that will be achieved through permanent protection or restoration includes a general amount that would contribute to achieving the corresponding conservation goal. The general amounts are set as a five percent increase in natural community or habitat or the condition of a natural community or habitat improved through management actions. The general amounts may be refined over time, using the adaptive management process, as described in Section 3.10, *Adaptive Management and Monitoring Strategy*, as more information about natural communities, focal species, and other conservation elements become available, and consistent with the RCIS amendment process described in Chapter 4, *Implementation*, Section 4.6, *Amending this RCIS*. This Mid-Sacramento Valley RCIS adopts this approach to be consistent with the goal-setting approach in the State Wildlife Action Plan (SWAP) (California Department of Fish and Wildlife 2015) (i.e., setting goals initially as a five percent improvement in condition, and to be refined over time using an adaptive management process) and to contribute towards achieving the goals of the SWAP.

Many landscape-level objectives that will be achieved through permanent protection or restoration will be achieved largely by implementing working landscapes, natural communities, and focal species actions in targeted ways to improve landscape-level processes. For example, actions to protect or restore grasslands to achieve Objective GL1-1, *Functional Grassland*, can also be implemented to achieve Objective HC1-1, *Reestablish Landscape Connectivity*, if grasslands are protected or restored within important connectivity areas (Section 3.6.1, *Conservation Strategy for Habitat Connectivity*). Therefore, the general amounts to achieve landscape-level objectives are included in relevant natural community and focal species-level objectives.

The objectives in this RCIS include a metric to measure the net change resulting from the implementation of conservation and habitat enhancement actions, as required by FGC 1854(e). Examples include accounting for acres managed to provide habitat for a focal species, or stream miles where stream enhancement actions have been implemented. The metrics provided in this RCIS may be refined as more is learned about the conservation elements through the adaptive management process, and as new metrics and techniques to measure the outcomes of conservation and habitat enhancement actions are developed.

The conservation strategy was developed to be consistent with the Yolo RCIS, to facilitate MCAs that can be used for mitigation by projects within the Yolo RCIS area, and vice versa (i.e., through an MCA with an extended service area). As described in Chapter 4, Section 4.5.1, *Mitigation Credit Agreements*, mitigation credits through an MCA can be established for a conservation action or habitat enhancement action that contributes to the achievement of an RCIS's conservation goals and objectives. An extended service area can be defined if the conservation goals and objectives in each RCIS are the same or very similar to (e.g., intended to achieve similar conservation outcomes) and compatible with respect to the extended service area of the MCA for the applicable focal and other species, habitat, and other natural resources. The Mid-Sacramento Valley RCIS conservation goals and objectives are modeled off of the Yolo RCIS's conservation goals and objectives for landscapes, working lands and natural communities, and focal species to ensure consistency between the two RCISs.

Development of this Mid-Sacramento Valley RCIS conservation strategy was also informed by recovery plans for focal species and communities (i.e., grassland–vernal pool complex), and other conservation strategies that overlap the RCIS area (e.g., Bank Swallow Conservation Strategy; CVFPP Conservation Strategy [California Department of Water Resources 2016]) (Chapter 2, Section 2.2, *Regional Conservation Planning Environment*, and Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*). The Mid-Sacramento Valley RCIS conservation strategy is consistent with previously approved recovery plans that overlap the RCIS area (Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*).

3.2.3 Actions and Priorities

This Mid-Sacramento Valley RCIS's actions and priorities are the strategies that are intended to be employed to accomplish the conservation goals and objectives for landscapes, working lands, natural communities, and focal species. Actions include both conservation actions and habitat enhancement actions, and are defined by CDFW's RCIS Program Guidelines (California Department of Fish and Wildlife 2018a) as follows.

> *Conservation action* is an action identified in an RCIS that, when implemented, would permanently protect or restore, and perpetually manage, conservation elements, including focal species and their habitats, natural communities, ecological processes, and wildlife corridors. In contrast, a habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat – see *habitat enhancement action*. A conservation action is developed to achieve one or more conservation objectives. A conservation action may be implemented through a variety of conservation investments or MCAs. A conservation action that is implemented through an MCA would create conservation credits to be used as compensatory mitigation.
>
> *Habitat enhancement action* is an action identified in an RCIS that, when implemented, is intended to improve the quality of wildlife habitat, or to address risks or stressors to wildlife. A habitat enhancement action is developed to achieve one or more conservation objectives. A habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. In contrast, a conservation action would permanently protect or restore, and perpetually manage, conservation elements – see Conservation Action. Examples of habitat enhancement actions include improving in-stream flows to benefit fish species, enhancing habitat connectivity, and controlling or eradicating invasive species. A habitat enhancement action may be implemented through a variety of conservation investments or MCAs. A habitat enhancement action that is implemented through an MCA would create habitat enhancement credits intended for use as compensatory mitigation for temporary impacts.[1]

[1] FGC 1856(d) states that "…the habitat enhancement action shall remain in effect at least until the site of the environmental impact is returned to pre-impact ecological conditions."

The actions described in the conservation strategies in this chapter are not identified as either conservation actions or habitat enhancement actions to retain flexibility in how the action may be implemented under an MCA, as many of the actions can be implemented on land or water permanently protected under a conservation easement (i.e., conservation action), or on land or water protected under a species- or habitat-appropriate durability agreement that is not permanently protected (i.e., habitat enhancement action). For example, an action to grow crops that provide high-quality foraging habitat for Swainson's hawk may be implemented on permanently protected land, with the land managed in perpetuity to provide foraging habitat for Swainson's hawk, or on land protected under an appropriate durability agreement that is not permanently protected. MCAs may include habitat enhancement actions on lands that are already protected, as well as lands that the MCA commits to protect. Conservation actions and habitat enhancement actions are intended to achieve conservation goals and objectives through multiple-implementation efforts, across the RCIS area landscapes, rather than as part of a single conservation project (see the CDFW MCA Guidelines[2] for more details).

A conservation priority is defined by the Program Guidelines as follows.

> *Conservation priority* is a conservation or habitat enhancement action (e.g., land acquisition, restoration, or habitat enhancement) that is identified based on its importance for benefiting and contributing to the conservation of focal species and their habitats, or other conservation elements within an RCIS area.

Conservation priorities are used to highlight important conservation actions and habitat enhancement actions that should be implemented within the next 10 years. If additional actions or new priorities emerge, the RCIS can be amended to include them, as necessary (Chapter 4, Section 4.6, *Amending the RCIS*), or they can be added to the RCIS when extending the approval period (Chapter 4, Section 4.3.1, *Updating and Extending this RCIS*).

This RCIS includes a toolbox of actions and conservation priorities that can be implemented to achieve this RCIS's conservation goals and objectives. Because this is a volunteer conservation strategy, and because resources available for the conservation community and others to invest in conservation actions are limited and variable, it is not expected that all of the actions and priority actions will be implemented over the next 10 years.

3.2.3.1 Criteria for Identifying Conservation Priorities

The Mid-Sacramento Valley RCIS uses recovery plans and other conservation strategies (e.g., CVFPP Conservation Strategy [California Department of Water Resources 2016]) to identify conservation priorities. The following conservation factors were considered in combination when identifying conservation priorities.

- Locations of working lands and natural communities and land cover types using this RCIS' land cover dataset (Chapter 2, Section 2.5, *Land Cover Mapping*), to identify where in the RCIS area these conservation elements occur, and to focus conservation priorities on conservation planning units (CPUs) (Section 3.2.4, *Geographic Units of Conservation*) that support these conservation elements.
- Documented and recent species occurrences (Chapter 2, Section 2.9.2, *Focal Species Profiles*), as this RCIS prioritizes the protection of habitat occupied by focal species.

[2] https://www.wildlife.ca.gov/conservation/planning/regional-conservation

- Designated critical habitat (for focal species and that have designated critical habitat in the RCIS area) (Chapter 2, Section 2.9.2, *Focal Species Profiles*), to inform where priority actions should be implemented.
- Recovery plans and recovery areas for federally listed species (Chapter 2, Section 2.9.2, *Focal Species Profiles*), to identify priority actions and where they should be implemented.
- Locations of Essential Connectivity Areas and other areas important for landscape connectivity (Chapter 2, Section 2.10, *Habitat Connectivity*) to identify where priority actions should be implemented to improve landscape connectivity in the RCIS area and to habitats adjacent to the RCIS area.
- Adjacency to protected areas (Chapter 2, Section 2.6, *Protected Areas*), to expand and connect protected areas.
- Locations that would, or are expected to, promote climate resilience (Section 3.6.4, *Conservation Strategy to Improve Resilience to Effects of Climate Chang*e), to facilitate adaptations by native biodiversity to a changing climate.

The actions and priorities in this RCIS for landscapes, working lands and natural communities, and focal species were identified based on their importance for alleviating pressures and stressors and contributing to the conservation and recovery of the focal species and their habitats within the RCIS area.

3.2.4 Geographic Units of Conservation

The RCIS area was subdivided into nine discrete CPUs where actions could be implemented (Figure 3-1). The geographic units of conservation, which are based on the watershed boundaries in the RCIS area, provide a biologically meaningful way to identify the locations where conservation actions and habitat enhancement actions may be implemented without identifying specific parcels. This approach focuses the actions into general priority areas where actions can help meet the conservation goals and objectives while maintaining the flexibility to conduct many of these actions on different sites or parcels in order to meet the same conservation goals and objectives.

The CPUs were developed using hydrologic unit code (HUC)-10 watershed boundaries (Chapter 2, Section 2.4.3, *Watersheds*). Watershed boundaries were selected because wetland and other aquatic mitigation is often defined in terms of location within watersheds. All but the Sutter Basin watershed extends beyond the RCIS area, and some watersheds have only small portions extending into the RCIS area (Figure 2-16). In such cases, these small portions of HUC-10 watersheds were merged with neighboring watersheds to avoid having any CPUs that are too small. The nine CPUs are named after the largest watershed in that CPU: Colusa Basin Drainage Canal, Stone Corral Creek, Sacramento River, Lower Butte Creek Complex, Freshwater Creek, Colusa Trough, Sycamore Slough, Logan Creek Complex, and Sutter Basin Complex. Table 2-3 in Chapter 2, *Environmental Setting,* provides information on the size of these watersheds and the major creeks that run through them. Table 3-1 identifies the HUC-10 watersheds and natural communities that comprise each CPU, as shown in Figure 3-1.

Table 3-1. HUC-10 Watersheds and Working Lands and Natural Communities in Conservation Planning Units

CPU	HUC-10 watershed	Natural Community	Size (Acres)
Colusa Basin Drainage Canal	Colusa Basin Drainage Canal	Chaparral and Scrub	15
		Cultivated Agriculture	8,009
		Grassland	1,523
		Riverine and Riparian	362
		Urban/Developed	1,424
		Wetland	1,827
		Woodland	205
		Other Agriculture	15,718
		Subtotal	**29,081**
Stone Corral Creek	Stone Corral Creek	Cultivated Agriculture	10,393
		Grassland	80
		Riverine and Riparian	140
		Urban/Developed	617
		Wetland	1,031
		Other Agriculture	1,568
		Subtotal	**13,829**
Sacramento River	Sacramento River	Chaparral and Scrub	41
		Cultivated Agriculture	1,134
		Grassland	1,231
		Riverine and Riparian	6,543
		Urban/Developed	187
		Wetland	148
		Other Agriculture	1,204
		Subtotal	**10,488**

CPU	HUC-10 watershed	Natural Community	Size (Acres)
Lower Butte Creek Complex	Lower Butte Creek, Angel Slough, Middle Butte Creek	Cultivated Agriculture	26,878
		Grassland	3,925
		Riverine and Riparian	3,190
		Urban/Developed	1,038
		Wetland	14,517
		Woodland	326
		Other Agriculture	7,496
		Subtotal	**57,369**
Freshwater Creek	Freshwater Creek	Chaparral and Scrub	1
		Cultivated Agriculture	11,882
		Grassland	911
		Riverine and Riparian	153
		Urban/Developed	1,209
		Wetland	60
		Other Agriculture	8,186
		Subtotal	**22,401**
Colusa Trough	Colusa Trough	Chaparral and Scrub	207
		Cultivated Agriculture	98,966
		Grassland	76,888
		Riverine and Riparian	1,975
		Urban/Developed	9,418
		Wetland	13,867
		Woodland	320
		Other Agriculture	35,891
		Subtotal	**167,532**
Sycamore Slough	Sycamore Slough	Cultivated Agriculture	48,154
		Grassland	632
		Riverine and Riparian	628
		Urban/Developed	1,839
		Wetland	142
		Other Agriculture	4,815
		Subtotal	**56,210**
Logan Creek Complex	Logan Creek, Willow Creek, Colusa Drain	Cultivated Agriculture	17,030
		Grassland	1,543
		Riverine and Riparian	219
		Urban/Developed	1,145
		Wetland	6,179
		Other Agriculture	2,100
		Subtotal	**28,216**

CPU	HUC-10 watershed	Natural Community	Size (Acres)
Sutter Basin Complex	Sutter Basin, Gilsizer Slough-Snake River,	Chaparral and Scrub	3
		Cultivated Agriculture	147,598
		Grassland	11,484
		Riverine and Riparian	10,440
		Urban/Developed	25,319
		Wetland	5,906
		Woodland	1,370
		Other Agriculture	48,378
		Subtotal	**250,498**
		Grand Total	**635,626**

CPU = conservation planning unit; HUC = hydrologic unit code

3.3 Gap Analysis

A gap analysis was conducted to estimate the amount of working lands, natural communities, and focal species' habitat that is protected in the RCIS area, either by fee title, Williamson Act contract, or conservation easement. The results of this analysis were used to provide context for this RCIS's conservation strategy and to inform the development of conservation goals and objectives. For example, conservation goals and objectives for relatively well-protected natural communities and focal species focus on restoration or improving habitat quality in existing protected areas, rather than prioritizing protection of the remaining natural community or habitat in the RCIS area. Similarly, users of this RCIS may decide to focus conservation efforts on natural communities that are relatively less protected (e.g., grasslands) over natural communities that are relatively well protected (e.g., wetlands) in the RCIS area.

The gap analysis also serves as a baseline to assess progress in the protection of working lands, natural communities, and focal species' habitat through the implementation of conservation actions and habitat enhancement actions identified in this RCIS (Chapter 4, Section 4.3.2, *Assessing Progress*). For example, the RCIS proponent or other users of this RCIS can assess the progress towards achieving this RCIS's goals and objectives by comparing current levels of protection of land cover types and habitat to the baseline estimated by the gap analysis.

3.3.1 Data Sources

To identify gaps in protection for the natural communities and constituent land cover types (Chapter 2, Section 2.5, *Land Cover Mapping*) and focal species habitat in the RCIS area, the following Mid-Sacramento Valley RCIS geographic information system (GIS) data layers were used (see the corresponding sections in Chapter 2 for the sources and methods used to develop each of the following data layers).

- Land cover (Chapter 2, Section 2.5, *Land Cover Mapping*).
- Species habitat distribution models (Chapter 2, Section 2.9.1, *Habitat Distribution Models*, and Appendix E, *Focal Species Habitat Models*).

- Mid-Sacramento Valley RCIS protected lands dataset (see Chapter 2, Section 2.6, *Protected Areas*, for the sources used to compile this RCIS's protected lands dataset; and Figure 2-21).

3.3.2 Land Cover Gap Analysis

This RCIS uses land cover types as the basic unit of analysis for the working land and natural community- and focal species-level gap analysis. Working lands and natural communities are comprised of one or more land cover types (Chapter 2, Section 2.5.1, *Natural Communities* and Table 2-4, and Section 2.8.6, *Cultivated Agriculture*), so the amount of a land cover type (or types) corresponds directly to the amount of working lands or natural community. Similarly, land cover types are the spatial data used to develop habitat models for focal species, and the amount of land cover captured within the parameters defined for a habitat model is an estimate of the amount of suitable habitat (Chapter 2, Section 2.9.1, *Habitat Distribution Models*).

The following steps were used in the gap analysis for each land cover type.

- Calculate the total area of each land cover type in the RCIS area.
- Calculate the area of each land cover type protected: in fee[3]; through a Williamson Act contract; as a mitigation or conservation bank; or through a conservation easement[4]. Land cover types protected through conservation easements were further broken down into land cover types protected through permanent, temporary, and unknown duration, as identified in the California Conservation Easement Database (California Conservation Easement Database 2016). See Chapter 2, Section 2.6.1, *Types of Protected Areas* for information about the sources for data on protected areas.

Table 3-2 shows the results of the land cover gap analysis. Land cover types that are well protected in the RCIS area (i.e., a high percentage of the land cover type in the RCIS area is protected) are those that have a relatively low conservation gap. Freshwater emergent wetland and vernal pool complex (87% and 73% protected in the RCIS area, respectively) have a relatively low conservation gap when compared to annual grasslands (31% protected in the RCIS area). Approximately 35% of all of working lands (i.e., cultivated agriculture land cover types) are protected in the RCIS area, with most (96%) protected under Williamson Act contracts.

[3] The California Protected Areas Database (2016) classifies land in "fee" as lands that are owned outright and protected for open spaces purposes.

[4] Many lands are owned by public agencies or private entities for conservation or recreation purposes, but these lands are not necessarily protected by a conservation easement.

Table 3-2. Land Cover Gap Analysis (All Values in Acres, Except for Percent Protected)[a]

Natural Community and Land Cover Type	Total Land Cover	Total Protected		Protected-Fee[b]		Williamson Act		Mitigation Bank		Permanent Easement[c]	
	Area	Area	%	Area	%[d]	Area	%[d]	Area	%[d]	Area	%[d]
Grassland	28,216	9,481	34	4,548	48	3,835	40	35	<1	988	10
Annual Grassland	26,463	8,201	31	4,025	49	3,079	38	35	<1	987	12
Vernal Pool Complex	1,753	1,280	73	524	41	756	59	--	--	1	<1
Chaparral and Scrub	266	45	17	36	80	9	20	--	--	--	--
Coastal scrub	67	43	64	36	84	7	16	--	--	--	--
Mixed Chaparral	199	2	1	--	--	2	100	--	--	--	--
Woodland	2,221	632	28	--	--	632	100	--	--	--	--
Blue Oak Woodland	2,116	589	28	--	--	589	100	--	--	--	--
Montane Hardwood	105	43	41	--	--	43	100	--	--	--	--
Riverine and riparian	23,650	9,467	40	5,041	53	3,006	32	6	<1	1,300	14
Lacustrine, riverine	7,983	1,815	23	858	47	794	44	4	<1	128	7
Valley Foothill Riparian	14,666	7,488	51	4,130	55	2,129	28	2	<1	1,144	15
Barren	1,001	164	16	53	32	83	51	--	--	28	17
Wetland	43,676	38,038	87	14,743	39	6811	18	361	1	15,756	41
Freshwater Emergent Wetland	43,676	38,038	87	14,743	39	6,811	18	361	1	15,756	41
Cultivated agriculture	370,042	129,480	35	945	1	124,447	96	2	<1	3,468	3
Alfalfa	12,510	1,965	16	6	--	1,941	99	--	--	18	1
Fallow	52,187	12,492	24	772	6	10,319	83	1	<1	1,377	11
Field crop	35,274	10,926	31	12	--	10,908	100	--	--	5	<1
Grain and hay Crop	16,452	4,646	28	1	--	4,636	100	--	--	8	<1
Irrigated Row Crop	36,153	13,161	36	35	--	13,113	100	--	--	13	<1
Pasture	1,844	226	12	<1	--	225	100	--	--	1	<1
Rice	215,622	86,064	40	119	--	83,305	97	1	--	2,046	2
Other Agriculture	125,356	25,059	20	200	1	24,817	99	--	--	40	<1
Orchard and Vineyard	125,356	25,059	20	200	1	24,817	99	--	--	40	<1

Natural Community and Land Cover Type	Total Land Cover	Total Protected		Protected-Fee[b]		Williamson Act		Mitigation Bank		Permanent Easement[c]	
	Area	Area	%	Area	%[d]	Area	%[d]	Area	%[d]	Area	%[d]
Urban/Developed	42,197	--	--	337	--	3,405	--	--	--	133	--
Eucalyptus	91	--	--	<1	--	7	--	--	0.0	8	<1
Urban	42,106	--	--	337	--	3,398	--	--	0.0	125	<1
Grand total	635,626	216,083	34	25,851	12	166,961	77	405	<1	21,684	3

[a] Protected areas in the RCIS vary according to the mechanism by which the land is protected. Lands may be permanently protected (protected in perpetuity), by restricting it for open space, recreation, wildlife habitat, or agricultural production. Lands may be temporary protected with restrictions on conversion of land use or development for a set timeframe, such as 10 year term contract. See Section 2.6.1, *Types of Protected Areas*.

[b] The California Protected Areas Database (2016) classifies land in “fee” as lands that are owned outright and protected for open spaces purposes.

[c] Amounts of land cover types protected under temporary easements and easements protected under unknown terms, as identified in the California Conservation Easement Database (2016) total to less than one percent of the protected areas and are not included in this table; therefore, the amounts in the “total protected” column does not always equal the sum of the protected categories in the table..

[d] Percent is the percent of the total protected in the RCIS area for that natural community, agricultural community, or land cover type.

3.3.3 Focal Species Gap Analysis

The focal species gap analysis uses the results of the land cover gap analysis to calculate the amount of focal species' habitat in the RCIS area that is already protected; the amount that remains unprotected is the "gap" in protection for each species. The focal species gap analysis is based on the habitat distribution models for each of the focal species, described in Chapter 2, Section 2.9.1, *Habitat Distribution Models*, and illustrated in Appendix E, *Focal Species Habitat Models*. The gap analysis was performed for each type of modeled habitat (e.g., aquatic, upland, foraging), and the total for the species. The following steps were used for each type of modeled habitat.

- Calculate the total area of each type of modeled habitat in the RCIS area.
- Calculate the area of each modeled habitat type protected: in fee; through a Williamson Act contract; as a mitigation or conservation bank; or through a conservation easement[5]. Land cover types protected through conservation easements were further broken down into land cover types protected through permanent, temporary, and unknown duration, as identified in the California Conservation Easement Database (California Conservation Easement Database 2016).

Table 3-3 shows the results of the focal species gap analysis. Wildlife refuges, wildlife areas, wildlife management areas, and other lands managed for the protection of fish and wildlife form the backbone of a network of primarily natural community habitats protected and managed for wildlife in the RCIS area (Table 3-2; Figure 2-21). These are primarily protected permanently, through fee titles and conservation easements. Williamson Act contracts[6] are an important complement to these protected natural areas, protecting working lands and their habitat values across over a third of the RCIS area (35%). Williamson Act contracts protect a large amount of working land habitat values that provide habitat for a number of focal species, including giant garter snake, western pond turtle, Swainson's hawk, and tricolored blackbird (Table 3-3). The conservation strategies for these and other focal species that rely on the habitat values of working lands include suites of actions that can be implemented on lands under Williamson Act contracts and other working lands to enhance their habitat values.

[5] Many lands are owned by public agencies or private entities for conservation or recreation purposes, but these lands are not necessarily protected by a conservation easement.

[6] Agricultural lands under Williamson Act contracts are protected from conversion to non-agricultural uses under voluntary contracts between landowners and local governments to restrict development on parcels used for agriculture and related open space functions for a minimum of 10 years.

Table 3-3. Focal Species Conservation Gap Analysis (All Values in Acres, Except for Percent Protected)[a]

	Total Modeled Habitat	Total Protected		Protected-Fee[b]		Williamson Act		Mitigation Bank		Permanent Easement[c]	
Modeled Habitat for Focal Species	**Area**	**Area**	**%[d]**	**Area**	**%[d]**	**Area**	**%**	**Area**	**%[d]**	**Area**	**%[d]**
Valley elderberry longhorn beetle	21,440	10,621	50	6,443	61	2,756	26	3	<1	1,314	12
Non-riparian habitat	6,773	3,133	46	2,313	74	627	20	<1	<1	170	5
Riparian habitat	14,667	7,488	51	4,130	55	2,129	28	2	<1	1,143	15
Giant garter snake	295,674	139,321	47	22,778	16	95,077	68	404	<1	19,923	14
Overwinter	11,867	5,409	46	3,138	58	1,562	29	1	<1	637	12
Rice habitat	215,622	86,064	40	119	0	83,305	97	1	<1	2,046	2
Upland movement	16,508	7,971	48	3,901	49	2,606	33	36	1	1,351	17
Wetland habitat	51,677	39,877	77	15,619	39	7,605	19	365	1	15,888	40
Western pond turtle	305,869	142,282	47	24,315	17	96,352	68	404	--	20,063	14
Aquatic habitat (non-rice)	66,599	47,425	71	19,741	42	9,806	21	367	1	17,029	36
Aquatic habitat (rice)	215,528	86,022	40	119	0	83,264	97	1	<1	2,046	2
Potentially suitable Nesting/wintering	1,850	463	25	127	28	331	72	--	--	4	1
Suitable nesting/wintering	21,892	8,372	38	4,328	52	2,951	35	35	<1	984	12
Swainson's hawk	147,428	48,539	33	8,733	18	37,426	77	37	<1	2,184	5
Foraging (agriculture)	102,234	30,923	30	54	0	30,823	100	--	--	45	0
Foraging (natural)	28,216	9,481	34	4,549	48	3,834	40	35	<1	988	10
Nesting	16,979	8,135	48	4,130	51	2,768	34	2	<1	1,151	14
Tricolored blackbird	316,568	139,139	44	18,894	14	99,998	72	397	<1	18,816	14
Foraging	272,892	101,101	37	4,151	4	93,187	92	36	<1	3,060	3
Nesting	43,676	38,038	87	14,743	39	6,811	18	361	1	15,756	41
Western yellow-billed cuckoo	10,221	5,316	52	3,299	62	1,318	25	--	--	622	12
Bank Swallow	54	7	13	2	32	1	12	<1	2	4	53

a Protected areas in the RCIS vary according to the mechanism by which the land is protected. Lands may be permanently protected (protected in perpetuity), by restricting it for open space, recreation, wildlife habitat, or agricultural production. Lands may be temporary protected with restrictions on conversion of land use or development for a set timeframe, such as 10 year term contract. See Section 2.6.1, *Types of Protected Areas.*

b The California Protected Areas Database (2016) classifies land in "fee" as lands that are owned outright and protected for open spaces purposes.

c Amounts of land cover types protected under temporary easements and easements protected under unknown terms, as identified in the California Conservation Easement Database (2016) total to less than one percent of the protected areas and are not included in this table.

d Percent is the percent of the total protected in the RCIS area for that natural community, agricultural community, or land cover type.

3.4 Multi-Benefit Approach

The Mid-Sacramento Valley RCIS encourages the application of a multi-benefit approach. This includes implementation of *multi-benefit projects*, defined in the CVFPP as projects "designed to reduce flood risk and enhance fish and wildlife habitat, as well as create additional public benefits such as sustaining agricultural production, improving water quality and water supply reliability, increasing groundwater recharge, supporting commercial fisheries, and providing public recreation and educational opportunities, or any combination thereof" (California Department of Water Resources 2017). The Mid-Sacramento Valley RCIS expands on CVFPP's definition to include any type of infrastructure project (i.e., not limited to flood risk reduction projects) that also enhances fish and wildlife habitat, as well as creates additional public benefits such as sustaining agricultural production, improving water quality and water supply reliability, increasing groundwater recharge, supporting commercial fisheries, and providing public recreation and educational opportunities, or any combination thereof.

This conservation strategy should be implemented in a manner that achieves its objectives on working agricultural lands, where feasible. The CVFPP Conservation Strategy (California Department of Water Resources 2016) identifies strategies for implementing multi-benefit projects on working agricultural lands to achieve solutions that do the following.

- Keep farmers on the land.
- Maintain agricultural and economic viability in the project area.
- Provide environmental and habitat benefits.
- Are consistent with state, regional, and county policies.
- Support the stability of local governments and special districts.

The multi-benefit approach is consistent with Colusa County and Sutter County general plan goals and policies to preserve and protect agricultural lands and natural resources, while encouraging wildlife-friendly agricultural practices (Colusa County 2012, Sutter County 2011) (Chapter 2, Sections 2.3.1.1, *Colusa County*, and 2.3.1.2, *Sutter County*). The strategies listed above and county general plans provide an appropriate framework for evaluating projects proposed to be implemented through this RCIS. Many of the conservation opportunities identified in this chapter directly account for the habitat values of cultivated land and promote activities that complement continued farming. In other cases, the conservation opportunities identified in this chapter may include restoration or other activities on farmed land that could conflict with farming or other existing land uses. These potential conflicts should be given careful attention during restoration project siting and design, and conflicts should be reduced or avoided whenever feasible. Actions proposed to implement this RCIS should demonstrate careful consideration of potential effects on agriculture and other existing land uses, together with opportunities to provide multiple public benefits, and other aspects of the land use and regulatory setting relevant to this RCIS. MCA sponsors seeking credit for conservation actions or habitat enhancement actions such as habitat protection or restoration on a large portion of a parcel zoned for agriculture in both counties are encouraged to consult the zoning code and contact the planning department of the county or counties where the conservation actions or habitat enhancement actions will be implemented. See Chapter 4, *Implementation*, Sections 4.5.1.2, *Mitigation Credit Agreements in Colusa County*, and

4.5.1.3, *Mitigation Credit Agreements in Sutter County*, for guidance on developing MCAs on land zoned for agricultural uses.

3.5 Adaptations against the Effects of Climate Change

California Fish and Game Code 1852(c)(13) states that an RCIS shall include "a description of how the strategy's conservation goals and objectives provide for adaptation opportunities against the effects of climate change for the strategy's focal species." Climate change is expected to increase the frequency of extreme events such as floods and fires, increase temperatures, increase drying, change precipitation patterns, and contribute to sea-level rise (Goals Project 2015) (Chapter 2, Section 2.13.3, *Climate Change*). Using various tools, such as CDFW's Areas of Conservation Emphasis Terrestrial Climate Change Resilience dataset (California Department of Fish and Wildlife 2018b), the conservation strategy's conservation goals and objectives are designed to provide adaptation opportunities against the effects of climate change for this RCIS's focal species. This RCIS incorporates strategies to provide resilience to the effects of climate change by recommending the protection of large blocks of interconnected habitat that support focal species, and managing the landscape matrix to increase habitat values within it. The conservation strategy also identifies vegetation community types that are predicted to show some resiliency to the effects of climate change. Increasing the amount of protected habitats and lands managed to provide habitat for focal species, and retaining wildlife corridors will facilitate movement by focal species to future, shifting habitats. The conservation strategy also recommends actions to improve the quality of habitats along a range of environmental gradients (e.g., riparian at increasing distance from river channels, east to west, north to south) in the RCIS area. This RCIS also identifies management actions to simulate historic disturbance regimes (e.g., grazing, wildfire) that can be used to create a diversity of microhabitats across landscapes. Diverse native plant and animal communities that retain important ecological functions have a greater chance for persistence and change in response to climate shifts. In turn, these persistent communities will allow the focal species to move to favorable habitats if their current locations become unsuitable (Beller et al. 2015). Specific discussions about how conservation goals and objectives for each focal species allow for adaptation to climate change can be found following the goals, objectives, actions, and priorities for each focal species.

3.6 Landscape-Level Conservation Strategy

3.6.1 Conservation Strategy for Habitat Connectivity

3.6.1.1 Context for a Regional Conservation Strategy

Large landscape blocks are essential for the focal species and other native wildlife. For example, large landscape blocks (or multiple interconnected blocks) may be necessary to provide enough habitat to support populations of wildlife and plants that are large enough to be viable in the long term. Large landscapes can also provide the diversity of habitats necessary to support multiple stages of a species' life cycle (e.g., breeding, upland/foraging, refugia, dispersal), and can support species with large home ranges (e.g., Swainson's hawk). Large landscape blocks are better buffered from adjacent land uses (e.g., developed uses), and vice versa, than small, or narrow landscape blocks, minimizing potential conflicts between habitat management activities and adjacent land uses.

Generally, large, interconnected blocks of land are preferred for conservation. In landscapes dominated by working lands, such as the RCIS area, where broader connections are infeasible or constrained due to incompatible land uses, landscape connectivity can be provided by smaller habitat patches or corridors that provide "stepping stones" from one habitat patch to the next. The Program Guidelines define *habitat connectivity* as "[t]he capacity of habitat to facilitate the movement of species and ecological functions" (California Department of Fish and Wildlife 2018a). This RCIS seeks to conserve interconnected landscapes composed of terrestrial and aquatic habitats and working lands that provide habitat functions for focal species and other native wildlife. An agricultural matrix that includes natural lands helps support native biodiversity and ecological resilience, and facilitates movement between patches of natural lands, both within and outside protected areas (Rouget et al. 2006, Vandermeer and Perfecto 2007, Green et al. 2005, Fischer et al. 2008, Lawler et al. 2015).

The California Essential Habitat Connectivity Project (Spencer et al. 2010) evaluates the connectivity of landscapes in the RCIS area (Chapter 2, Section 2.10, *Habitat Connectivity*; Figures 2-30a and 2-30b). The California Essential Habitat Connectivity Project identifies essential connectivity areas between the natural landscape blocks and small natural areas of the interior foothills to the west of the RCIS area, and the Sutter Butte natural landscape block to the east. The Conservation Biology Institute, additionally, identifies a connectivity area from the Sutter Buttes to the Sierra foothills (Conservation Biology Institute 2018, Gallo and Greene 2018, Gallo et al. in press; Figure 2-31). Protection and restoration of natural community habitats, and management of working lands to provide habitat values for focal species and other native wildlife within these essential connectivity areas can provide important stepping stones between natural landscape blocks and small natural areas.

The major highways that crisscross the landscape are potential barriers to movement for wildlife. Roadways fragment natural habitats and affect the distribution of individual animals. Animals are killed more often as the volume of traffic increases and the proportion of animals that are repelled and abandon their attempt to cross a road increases until this eventually becomes the predominant response to a very busy road (Washington State Department of Transportation, no date). The most significant barrier to wildlife movement in the RCIS area is Interstate 5 (I-5), which runs the length of the RCIS area from north to south, and creates a barrier between the east and west side of the RCIS area where natural habitat remains. The California Roadkill Observation System (University of California, Davis 2017) identifies one hotspot of roadkill in the RCIS area, along I-5 near Williams, which is the longest stretch with higher levels of wildlife-vehicle collisions. Other major highways in the RCIS area have low incidents of reported wildlife-vehicle collisions (Chapter 2, Section 2.13.7, *Roads and Railroads; Utilities and Service Lines*), though this could be due to lack of reported observations along these highways by the public. These potential roadway barriers include California State Route (SR) 20, SR 113, SR 45 and Princeton Road.

The Sacramento River, Feather River, Sutter Bypass, and Butte Creek are critical habitat corridors that provide passage for adult fish migrating to upstream spawning areas and juveniles migrating downstream to the ocean. Associated riparian corridors are essential for connecting landscape blocks, small natural areas, and protected lands (Figure 2-30a). Riparian areas are transitional habitats between terrestrial and aquatic ecosystems and provide important habitat for most of the focal species in the RCIS area. Riparian corridors allow wildlife and fish to move through the heavily fragmented landscapes of the RCIS area and between protected lands within and outside of the RCIS area. The CVFPP Conservation Strategy emphasizes floodplain connectivity and the need to maintain more frequent and longer inundation of the Sutter Bypass to provide more productive rearing habitat for juvenile salmonids and other native fish (California Department of Water Resources 2016). Floodplain connectivity is addressed under Section 3.6.2, *Conservation Strategy for Ecological Processes and Conditions*.

3.6.1.2 Conservation Goals and Objectives

Goal HC-1. Large interconnected landscapes. Maintain interconnected working landscapes and natural communities in the RCIS area with the range of physical and biological attributes (e.g., soils, hydrology, and plant associations) that support the distribution and abundance of focal species and their habitats, provide for the movement and genetic interchange among populations of focal species, support adaptive adjustments in species distributions in response to climate change, and sustain native biodiversity.

*Objective HC1-1. Reestablish Landscape Connectivity***.** Reestablish landscape connections within and between natural communities, natural landscape blocks, and small natural blocks in and adjacent to the RCIS area (e.g., to the Sutter Buttes, Sierra Nevada foothills, and interior Coastal Range) where connectivity is currently poorly developed or lacking. Maintain connectivity where it currently exists and/or is well developed, and avoid fragmentation. Measure progress towards achieving this objective in acres of habitats managed to improve connectivity.

- ***Action HC1.1-1.*** Work with willing landowners to provide and maintain connectivity among natural communities, natural landscape blocks, and small natural blocks in and adjacent to the RCIS area by protecting and restoring natural communities by implementing the actions to achieve Objectives GL1-1, *Functional Grassland*, and GL2-1, *Functional Vernal Pool Complexes*, Objectives RR1-1, *Protect and Restore Riparian and Floodplains*, and RR2-2, *Establish Native Vegetation*, and Objective FW1-1, *Enhance, Restore, and Protect Freshwater Emergent Wetlands*.
- ***Action HC1.1-2.*** Work with willing landowners to manage working lands to provide habitat values within Essential Connectivity Areas (the Sacramento National Wildlife Refuge (NWR)–Clark Valley, the Colusa NWR–Sacramento NWR/Provident Main Canal, and the Colusa Basin–Butte Sink) (Figure 2-30a) by implementing the actions to achieve Objectives CA1-1, *Encourage Habitat Values Incorporated with Agricultural Uses*, and CA1-2, *Incorporate Habitat Features*.
- ***Action HC1.1-3.*** Increase habitat connectivity between transitional habitats (e.g., between channels and uplands) along the Sacramento River, Butte Creek, the Feather River and the Tisdale and Sutter Bypasses through land protection and management by implementing actions to achieve Objective RR1-1, *Protect and Restore Riparian and Floodplains*.
- ***Action HC1.1-4.*** Increase aquatic habitat connectivity between the Sacramento River, Feather River, and Butte Creek and the Sutter Bypass, and Tisdale Bypass in the RCIS area by implementing the actions to achieve Objectives Fish1-2, *Passage Barriers*, and Fish1-4, *Improve Sutter Bypass Habitat for Fish*.
- ***Action HC1.1-5.*** Provide and maintain connectivity between the Sutter Buttes to the Sierra Nevada foothills east of the RCIS area (Figure 2-31; Conservation Biology Institute 2018).

*Objective HC1-2. Maintain or Increase Natural Communities***.** Protect, enhance, and restore natural communities to improve permeability through RCIS area landscapes.

- ***Action HC1.2-1.*** Work with willing landowners to protect land adjacent to protected lands.

*Objective HC1-3. Enhance Wildlife Permeability***.** Enhance wildlife permeability across linear structures like roads, canals, and power lines, that may be impeding or prevent movement of wildlife in the RCIS area. Measure progress towards achieving this objective in the number of barriers modified or removed.

- ***Action HC1.3-1***. Identify known or potential road crossings (i.e., areas with high mortality or other observable measure) with suitable habitat on both sides of the roadway for focal species or other native species
- ***Action HC1.3-2***. Remove or modify barriers to increase or improve permeability to wildlife, and, where possible, install or repair crossings to increase or improve permeability across roads, canals, and power lines in the RCIS area for focal species and other wildlife.
- ***Action HC1.3-3.*** Retrofit or design culverts and bridges to allow or improve safe animal passage through or under them.
- ***Action HC1.3-4***. Implement a public education campaign aimed at informing the public of the benefits of wildlife corridors and what can be done to improve permeability for wildlife.

*Objective HC1-4. Maintain Heterogeneity within Agricultural Lands***.** Maintain a heterogeneous landscape of agricultural and natural lands throughout the RCIS area, with large and structurally complex patches of native vegetation connected by corridors and habitat stepping stones, situated within a matrix of agricultural lands that, where possible, provides structural characteristics similar to those of native vegetation. Measure progress towards achieving this objective in acres of corridors and habitat stepping stones within agricultural landscapes.

- ***Action HC1.4-1.*** Work with willing landowners to maintain or create “stepping-stone” patches (small areas of natural vegetation distributed throughout the landscape) and corridors (elongated strips of vegetation that link patches of native vegetation) of natural lands within the agricultural matrix by implementing the actions to achieve Objectives CA1-1, *Encourage Habitat Values Incorporated with Agricultural Uses*, and CA1-2, *Incorporate Habitat Features*.
- ***Action HC1.4-2.*** Work with willing landowners to incorporate and maintain structural complexity, including trees, snags, and other structural elements, in the landscape of agricultural and grazed lands to provide cover, shade, basking, nesting, perching, and roosting opportunities for native wildlife (California Department of Water Resources 2016).
- ***Action HC1.4-3.*** Work with willing landowners to create or maintain buffers between sensitive areas and agricultural lands and by implementing the actions to achieve Objectives CA1-1, *Encourage Habitat Values Incorporated with Agricultural Uses*, and CA1-2, *Incorporate Habitat Features*.
- ***Action HC1.4-4.*** Work with willing landowners to maintain buffers along waterways and adjacent to natural vegetation to diminish the adverse effects of agricultural practices on those habitats and to provide complementary habitat features (e.g., upland refugia and hibernacula for giant garter snake) (California Department of Water Resources 2016) and by implementing the actions to achieve Objectives CA1-2, *Incorporate Habitat Features*, and RR1-1, *Protect and Restore Riparian and Floodplains*.

3.6.1.3 Conservation Priorities

- Increase aquatic habitat connectivity in the Sutter Bypass and Tisdale Bypass, especially in the context of providing suitable conditions for anadromous fish, to expand access to habitat (Chapter 2, Section 2.10.2, *Riverine and Riparian Connectivity*) (CDFW identified the Tisdale Weir as a fish passage priority in 2012 [California Department of Fish and Wildlife 2017b]).
- Improve fish passage through the Feather River at the Sunset Pumps Diversion Dam, a California Department of Fish and Wildlife fish passage priority (California Department of Fish and Wildlife 2017b).
- Work with willing landowners to protect habitat and improve landscape permeability within Essential Connectivity Areas (Spencer et al. 2010) in the RCIS area (the Sacramento NWR–Clark Valley, the Colusa NWR–Sacramento NWR/Provident Main Canal, and the Colusa Basin–Butte Sink) (Figure 2-30a) (Section 2.10, *Habitat Connectivity*).
- Work with willing landowners to protect, enhance, and restore large blocks of riparian habitat along the Sacramento River, Feather River, Butte Creek, and Sutter Bypass in the Sacramento River and Sutter Basin Complex CPUs to improve landscape connectivity along riparian corridors (Section 2.10, *Habitat Connectivity*).
- Prioritize projects that improve or incorporate improvements for wildlife permeability (e.g., roadway overpasses, underpasses, or other structural modification) to improve permeability across the landscape (Section 2.13.7, *Roads and Railroads; Utilities and Service Lines*).

3.6.2 Conservation Strategy for Ecological Processes and Conditions

3.6.2.1 Context for a Regional Conservation Strategy

The ability to maintain, reestablish, or mimic natural disturbance, and the landscape's or natural community's ability to resist damage and recover is important to maintaining biological diversity and habitat conditions for focal species, particularly those that rely on dynamic river process such as bank swallow. Important hydrogeomorphic processes in riverine and riparian areas include lateral channel migration, channel cutoff and formation of multiple channels, bed mobility, and fine and coarse sediment transport. These processes influence floodplain dynamics such as channel, bank, and floodplain formation (California Department of Water Resources 2016). Sediment scouring, erosion and deposition, and prolonged inundation disturb existing vegetation. These disturbances create opportunities for cottonwoods, willows, and other early successional riparian species to establish from seed, thus promoting establishment of riparian vegetation (California Department of Water Resources 2016). All of these processes influence habitat conditions for fish and other aquatic and riparian species. As described in the CVFPP Conservation Strategy (California Department of Water Resources 2016), natural, eroding banks often have cavities, depressions, and vertical faces that support bank-dwelling species such as bank swallow, northern rough-winged swallow, belted kingfisher, mink, and river otter, and that provide cover and shelter for fish. Bank-dwelling species may use these banks and their cavities to access water or for nesting. Natural fluvial processes also result in diverse substrate sizes and irregular banks that provide habitat complexity for fish and wildlife, and can support a high diversity and abundance of invertebrate and fish species.

The targeted CVFPP Conservation Strategy ecosystem processes in this RCIS are floodplain inundation and riverine geomorphic processes (California Department of Water Resources 2016). Floodplain inundation occurs when river flows exceed channel capacity and water overflows onto adjacent land. The ecosystem responses to floodplain inundation depend on flow timing, frequency, magnitude, and duration. Floodplain inundation helps create side channels, sloughs, and oxbow lakes through erosion and deposition of fluvial sediments. Sustained overbank flows also generate food for downstream aquatic wildlife. Floodplain inundation for 1 to 2 weeks or longer allows for the growth of microorganisms and the animals that feed on them (Opperman 2012, as cited in California Department of Water Resources 2016), including anadromous fish and other native aquatic species. These ecosystem processes, however, have been altered by the construction of flood protection systems, including dams and levees, which have altered natural flows and depositions. Most levees were constructed close to channels to facilitate scour of hydraulic mining debris and protect commercial navigation, effectively separating rivers from their floodplains (California Department of Water Resources 2012, in California Department of Water Resources 2016). These levees limit the restoration of natural geomorphic processes in the RCIS area.

The ability to maintain, reestablish, or mimic natural disturbance is important to maintaining biological diversity and habitat conditions for specific species. Fire, for example, is a potential source of natural disturbance in grasslands. Disagreement over the natural role and frequency of fire is the main impediment to the application of prescribed fire regimes. The use of prescribed fire for ecosystem management is also constrained by the presence of human assets, such as adjacent development, low-density homesteads, and agricultural crops and development, which increase the risk of loss and the cost of protection during prescribed fire. For certain natural communities such as grasslands, controlled burning may be used as a tool to manage invasive vegetation, to a limited extent.

Ecological processes are also driven by biotic forces. Two processes that are important in the RCIS area, amongst many, are the role of livestock as herbivores, and the ecosystem services provided by pollinators. The relevance of herbivory as a disturbance factor has changed since precolonial conditions. Increased intensity and duration of grazing by domestic livestock contributed to a higher proportion of grazing-adapted non-native species in grassland communities. When properly managed, grazing can be a useful tool to control undesirable non-native species, and maintain grassland structure (e.g., height and density of vegetation) suitable for a diversity of species (e.g., Swainson's hawk).

Pollinators provide vital ecosystem services in natural communities and agricultural lands. Many vernal plants, for example, are pollinated by native solitary bees that nest in holes in the ground of grassland surrounding pools (Thorp and Leong 1998). Natural habitats within agricultural landscapes protect populations of pollinators and enhance pollination services (Kremen et al. 2007, Morandin and Kremen 2013). Protecting and managing landscapes that support native pollinators is critical for maintaining this essential ecosystem service. The conservation goals, objectives, and actions designed to benefit pollinators, below, are based on the Yolo Natural Heritage Program (Habitat Conservation Plan/Natural Community Conservation Plan) Pollinator Conservation Strategy (Black et al. 2009), similar to the pollinator conservation strategy in the Yolo RCIS (ICF 2018).

3.6.2.2 Conservation Goals and Objectives

Goal EP&C-1. Maintain, improve, or restore ecological processes and conditions in RCIS area landscapes that sustain natural communities, native species, and landscape connectivity.

*Objective EP&C1-1. Improve Hydrologic and Geomorphic Processes***.** Improve dynamic hydrologic and geomorphic processes in watercourses and floodplains, working with cooperative landowners in a way that avoids or minimizes impacts on terrestrial species' habitat and agricultural land. Allow floods to promote fluvial processes, such that bare mineral soils are available for natural recolonization of vegetation, desirable natural community vegetation is regenerated, and structural diversity is promoted, or implement management actions that mimic those natural disturbances. Measure progress towards achieving this objective in the amount, in acres, of floodplain and side channels improved or protected, and the amount, in linear feet, of non-critical bank protection features removed.

- ***Action EP&C1.1-1.*** Restore riverine geomorphic process on the Sacramento River, Feather River, Sutter Bypass, Butte Creek and other watercourses in the RCIS area through the following actions.
    - Create riparian management corridors that can accommodate natural lateral channel migration.
    - When feasible, and without affecting flood safety, relocate levees away from watercourses to reduce the physical forces acting on them, and to allow natural lateral channel migration.
    - Create or improve secondary channels and overflow swales that add riverine and floodplain habitat values (e.g., resting or rearing areas for fish migrating downstream) and provide escape routes for fish during receding flows.
    - Remove non-critical bank protection features to allow channels to meander naturally within the floodplain.
    - Where feasible, and without affecting flood safety, lower riverside ground elevations to create floodplain inundate are varying frequencies.
- ***Action EP&C1.1-2.*** Work with willing landowners to increase natural floodplains in the RCIS area through the following actions.
    - Protect floodplains around watercourses, where possible.
    - Where feasible, and without affecting flood safety, setback levees to widen floodplains and expand available in-stream, secondary channel, or floodplain habitat.
    - Modify floodplain topography to provide sustained inundation for 14 days or longer between late November and late April.
- ***Action EP&C1.1-3.*** Work with willing landowners to modify floodplains to improve function and support focal species in the RCIS area, and to provide food for fish downstream, through the following actions.
    - Modify floodplains in locations where higher ground impedes flow connectivity or capacity, to increase the hydrologic connectivity and capacity of the active floodplain, improve fish migration, reduce stranding potential, and allow additional riparian vegetation to establish without causing significant hydraulic impacts.

- Modify floodplains to provide greater topographic and hydrologic diversity, and to eliminate depressional features (such as isolated gravel pits or deep borrow pits) that strand fish when water recedes.
- Create higher ground in floodplains that can serve as refugia from floodwaters for wildlife species, such as giant garter snake and western pond turtle.

*Objective EP&C1-2. Maintain Fire Regime***.** Allow or mimic natural fire regimes in areas where fires naturally occur and are a key component of the ecosystem. Measure progress towards achieving this objective in the amount, in acres, of natural communities managed with prescribed wildfire.

- ***Action EP&C1.2-1.*** Incorporate prescribed fire and managed wildfire into management programs in areas where fires occur naturally (e.g., grasslands), where feasible.

*Objective EP&C1-3. Cultivated Land Pollinators***.** Maintain pollinators in the agricultural landscape. Measure progress towards achieving this objective in the amount, in acres, managed to maintain and enhance populations of pollinator habitat.

- ***Action EP&C1.3-1.*** Work with willing landowners to protect existing natural habitat (e.g., grasslands, and riparian areas associated with major streams) that occurs in the vicinity of agricultural areas near wildlands as described in Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities*.
- ***Action EP&C1.3-2.*** Work with willing landowners to identify and protect existing pollinator habitat in agricultural landscapes, such as the following.
  - Areas of natural habitat such as riparian areas, wetlands, and species-rich grasslands.
  - Areas supporting flowers, such as buffer areas, forest edges, hedgerows, roadsides, ditchsides, and fallowed fields.
  - Potential bee-nesting sites such as areas of untilled bare soil, snags, and pithy-stemmed shrubs.
- ***Action EP&C1.3-3.*** Work with willing landowners to incorporate pollinator habitat within working lands to increase habitat for pollinators, such as the following.
  - Hedgerows, pollinator meadows (“bee pastures”), orchard understory plantings, riparian and rangeland revegetation, and flowering cover crops.
  - Have at least three plants blooming each season (spring, summer, and fall).
  - Use native plants wherever possible.
  - Non-native plants may be suitable on disturbed sites and for specialty uses such as cover cropping.
  - Include bee nest sites in habitat patches.
  - Restored patches should be 0.5 acre or more in size.
  - If crop pollination is the focus, habitat patches should be no more than 1969 feet (600 meters) from the crop (or from each other); shorter distances—820 to 984 feet (250 to 300 meters)—would be optimal.
  - Create linear habitats along roads and tracks, ditches, and field margins to increase connectivity across the landscape.

- ***Action EP&C1.3-4.*** Work with willing landowners to minimize pesticide use, especially adjacent to natural areas or known pollinator habitat.
  - Integrated Pest Management principles should be followed when planning pest management.
  - If possible, apply pesticides in fall or winter, or at night, or when bees are not actively foraging on flowers.
  - Select the formulation and application method that will minimize overspray or drift into wildland pollinator habitat.
  - Reduce spraying near field margins and adjacent patches of natural communities.
- ***Action EP&C1.3-5.*** Work with local and State road owners to find opportunities to include pollinator habitat in road landscape areas, such as road verges and shoulders.

Objective EP&C1-4. Pollinators in Natural Communities. Maintain and enhance pollinators within the grassland and vernal pool complex landscapes of the RCIS area. Measure progress towards achieving this objective in acres managed to maintain and enhance populations of pollinators.

- ***Action EP&C1.4-1.*** Work with willing landowners to identify and protect, restore, and enhance existing pollinator habitat, as described in Objectives *GL1-1, Functional Grassland,* GL2-1, *Functional Vernal Pool Complexes,* and as follows.
  - Protect specialist bees with a buffer of 500 feet around vernal pools and use a wider buffer of buffer 0.6 mile for aerial spraying of insecticides, especially during the active flight period of specialist bees (which coincides with blooms of the plants).
  - Areas of grassland that support a diverse native flora.
  - Potential bee-nesting sites such as areas of bare soil, snags, and pithy-stemmed shrubs.
  - Using native forbs to enhance diversity of grasslands.
- ***Action EP&C1.4-2.*** Use grazing, mowing, or fire carefully to avoid harming pollinators.
  - Treat only part of the area in 1 year.
  - Leave areas untreated as refugia for pollinators.
  - Time grazing to avoid periods of major bloom.
  - Do not mow while flowers are in bloom, except as required pursuant to flood infrastructure maintenance laws and requirements.
  - Use burning to suppress shrubs and trees, where safe and ecologically appropriate, except as required pursuant to flood maintenance laws and requirements.
  - Allow habitat to recover fully between burns.

3.6.2.3 Conservation Priorities

- Where feasible, work with cooperative landowners to improve hydrologic and geomorphic processes in the Sacramento River, Lower Butte Creek Complex, and Sutter Basin CPUs and the Tisdale and Sutter Bypasses (California Department of Water Resources 2016) (Chapter 2, Section 2.2.4.1, *Central Valley Flood Protection Plan Conservation Strategy*).

3.6.3 Conservation Strategy for Invasive Species

3.6.3.1 Context for a Regional Conservation Strategy

The SWAP (California Department of Fish and Wildlife 2015) identifies invasive plants and animals as significant threats to ecosystems in California (Chapter 2, Section 2.13.5, *Invasive Plants and Animals*). The SWAP recognizes that the Great Valley ecoregion of the Central Valley and Sierra Nevada province is threatened by many different invasive terrestrial and aquatic species. Species of great concern include those that prey upon native species or limit the ability of native species to use their habitat. For example, non-native fish prey upon salmonids and other native fishes. Invasive plants can also be extremely problematic where they displace native vegetation and monopolize habitats, changing vegetation structure, hydrology, channel morphology, and habitat quality for species whose life history needs are closely tied to the species composition and/or structure of native vegetation. Invasive species can reduce the diversity and abundance of focal species and other native biodiversity in the RCIS area. This RCIS includes conservation goals, objectives, and actions to control the presence of invasive species in the RCIS area.

3.6.3.2 Conservation Goals and Objectives

Goal IS-1. Reduce the distribution and extent of invasive species in the RCIS area.

*Objective IS1-1. Control Invasive Species***.** Control or eradicate invasive species that may reduce habitat quality for desired native species, biological diversity, and degraded ecosystem processes. Measure progress towards achieving this objective in the amount, in acres, of terrestrial and aquatic habitats where invasive species control actions are implemented.

- ***Action IS1.1-1.*** Implement applicable elements of the Invasive Plant Management Plan (Appendix E of the CVFPP Conservation Strategy [California Department of Water Resources 2016]) within the CVFPP Conservation Planning Areas.
- ***Action IS1.1-2.*** Find and eliminate seed/propagule sources of invasive plant species in restoration projects.
- ***Action IS1.1-3.*** Work with willing landowners to identify and implement suitable control programs, including appropriate use of herbicides, grazing, flooding, and fire, as well as other proven methods to manage invasive vegetation (including, but not limited to, invasive species such as barbed goat grass, yellow starthistle, perennial pepperweed, tamarisk, and giant reed).
- ***Action IS1.1-4.*** Work with willing landowners to identify and implement suitable control programs, including the appropriate use of chemical agents, trapping, and controlled hunting, as well as other proven methods for invasive animals (e.g., feral or free-roaming dogs, cats, rats, wild pig, bass, sunfish, European starling, and bullfrog).
- ***Action IS1.1-5.*** Work with willing landowners to reduce the use of herbicides, fungicides, insecticides, pesticides, rodenticides, and other chemical poisons near ecologically sensitive areas generally and to the extent practicable in flood-control areas in accordance with state and federal operation and maintenance laws and requirements.
- ***Action IS1.1-6***. Work with willing landowners to establish buffer zones around established habitat reserve areas at sufficient distance to avoid or limit over-spray or wind drift from agricultural operations adjacent to or near habitat reserve areas.

3.6.3.3 Conservation Priorities

- Survey protected lands to identify infestations of invasive species to target for control efforts.
- Prioritize invasive species for control, based on level of threat to natural communities, native biodiversity, and ecosystem processes (Chapter 2, Section 2.13.5, *Invasive Plants and Animals*).
- Where feasible, apply principals of integrated pest management on lands managed for focal species.

3.6.4 Conservation Strategy to Improve Resilience to Effects of Climate Change

3.6.4.1 Context for a Regional Conservation Strategy

The SWAP identifies increases in temperatures, decreases in precipitation and snowpack, and changes to freshwater hydrologic ecosystems as anticipated components of climate change that could strongly affect native biodiversity and natural communities in the Great Valley ecoregion of the Central Valley and Sierra Nevada province (Chapter 2, Section 2.13.3, *Climate Change*) (California Department of Fish and Wildlife 2015). Precipitation is expected to increase in winter, causing flooding and erosion, and decrease in summer. These changes will have a significant effect on aquatic systems in the RCIS area, including the rivers, streams, and freshwater emergent wetland habitats essential to many of the RCIS's focal species. Climate change may also alter the types and localities of native vegetation communities in the RCIS area, as different vegetation communities exhibit differing sensitivities and adaptive capabilities to the impacts of climate change. For example, natural communities may decrease in extent or shift in distribution. This is expected to change landscape connectivity and permeability for wildlife movements and ecological processes (Thorne et al. 2016). An adaptive strategy for providing landscape, natural community, and species-level conservation benefits is needed to provide landscape-level resilience, as changes to the landscape are dynamic (e.g., changes in cropping pattern will affect the distribution and amount of habitat provided by working lands), and an understanding of how the conservation elements respond to climate change will evolve over time (Wiens et al. 2011, Lawler et al. 2015, Theobald et al. 2015).

The Areas of Conservation Emphasis (California Department of Fish and Wildlife 2018c) identifies areas that are expected to be relatively buffered from the impacts of climate change, and may aid in developing a regional conservation strategy to buffer the effects of changing climate. The Terrestrial Climate Change Resilience dataset (California Department of Fish and Wildlife 2018b) is based primarily on the California Vegetation Climate Vulnerability Assessment (Thorne et al. 2016). Thorne et al. used spatially explicit models of exposure of vegetation to eight future climate change scenarios under different combinations of global climate models, emissions scenarios, and time horizons to identify areas that are relatively buffered from the impacts of climate change. The models provide probabilities that a given location (displayed as hexagons) will provide refugia from effects of climate change, where refugia is defined as an area with low exposure to the effects of climate change. In these refugia, climate conditions are predicted to likely remain suitable for the current array of plants and wildlife that reside within a given location, and where ecological functions are more likely to remain intact. The hexagons were scored for their capacity to provide refugia under each model climate change scenario. An area-weighted climate refugia score was then converted into Areas of Conservation Emphasis Climate Resilience Ranks to indicate where potential climate refugia are more likely to occur within landscapes. Climate resilience ranks range from 1 to 5, where 1 is low and 5 is high (California Department of Fish and Wildlife 2018d); for example, a rank of 1 indicates that an area has a low probability of providing refugia under climate projections.

Overall, the RCIS area is not expected to provide significant resilience to the effects of climate change. The majority of the RCIS area scored a Climate Resilience Rank of 2 or lower (Figure 3-2). Areas that show a Climate Resilience Rank of 2 generally occur along the length of I-5, the Sacramento River floodplain, the eastern Butte Sink, and in agricultural lands west of the Feather River in the southern part of the RCIS area. Of the area that scored a Climate Resilience Rank of 2 (278,968 acres), 61% is cultivated agricultural land, 20% is orchard or vineyard, 7% urban/developed, and the remaining 12% is a mix of natural land types. Only 6.1% of the RCIS area (38,687 acres) has a Climate Resilience Rank of 3 or higher. Lands that show the highest climate resilience occur in the southwestern portion of the RCIS and are associated with agricultural lands adjacent to Hunter's Creek, Freshwater Creek, Salt Creek, Spring Creek, Cortina Creek, and Elk Creek. Additionally, an area surrounding the Colusa County Airport has a Climate Resilience Rank of 3. This area overlaps one of the two Dolan Vernal Pool Core Areas and vernal pool tadpole shrimp critical habitat. Many of the land cover types that scored a Climate Resilience Rank of 3 are in agricultural production (cultivated, orchard, or vineyard) and lands that ranked 4 are grassland, woodland, and chaparral. Areas that ranked 3 or higher may potentially provide refuge for Swainson's hawk, tricolored blackbird, and western pond turtle.

The RCIS establishes a framework for conservation based on existing conditions and climate. The regional conservation strategy seeks to reduce the effects of climate change through habitat protection, restoration, adaptive management and monitoring, and increasing landscape resilience by providing multiple protected areas within the landscape framework to create a more resilient landscape. With additional habitat functions provided by the matrix, the integrity of the protected areas will be augmented by a matrix that is permeable to mobile species, and also provides additional habitat values. Reestablishing landscape connectivity will help to facilitate movement by organisms to new habitats in response to climate change.

3.6.4.2 Conservation Goals and Objectives

Goal CC-1. Maintain landscape elements and processes that are resilient to climate change to support a full range of biological diversity in the RCIS area under changing climatic conditions.

*Objective CC1-1. Increase Landscape Resilience to Climate Change***.** Promote the continued capability of the landscape, natural community, and species' habitat elements in the RCIS area to provide conservation benefits under conditions resulting from climate change. Measure progress towards achieving this objective in acres of terrestrial or aquatic habitats where actions to promote resilience to climate change are implemented. This may include, for example, conservation and habitat enhancement actions implemented within areas identified by Areas of Conservation Emphasis (California Department of Fish and Wildlife 2018c) as having a Climate Resilience Rank of 3 or higher.

- ***Action CC1.1-1.*** Incorporate resilience into natural resource management actions recommended by this RCIS by adapting to landscape changes likely to result from climate change, based on best available science. An adaptive strategy to offset landscape changes resulting from effects of climate change may include, but is not limited to, the following.

- Protect natural communities and habitat for focal species, as describe in Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities*, and Section 3.8, *Conservation Strategy for Focal Species*, in areas anticipated to provide resilience to the effects of climate change.
- Address the effects of increased temperatures, altered precipitation patterns, and drought on natural communities and habitats in the RCIS area where possible, based on the best available scientific and technical information.
- Address the effects of increased disturbance (e.g., flood, wind) frequency and severity where possible, based on the best available scientific and technical information.
- Identify practices to offset climate-related changes, possibly including introducing selected plant species not currently present (i.e., identify functional roles and select species to fill them should natural habitat be significantly altered), provided there is a high degree of certainty the ecological benefits will outweigh ecological risks.

- ***Action CC1.1-2.*** Survey natural communities to identify sensitive vegetation associations and alliances (California Department of Fish and Wildlife 2018e) to protect and adaptively manage remaining unique patches of vegetation that may be particularly threatened by climate change.
- ***Action CC1.1-3.*** Incorporate principles of Climate Smart Conservation (Stein et al. 2014) into the management of protected lands in the RCIS area, including the following.
  - Assess climate impacts and vulnerabilities, identifying specific components of vulnerability (exposure, sensitivity, and adaptive capacity) to provide a useful framework for linking actions to impacts.
  - Review/revise conservation goals and objectives, which should be climate-informed, as needed, to address new information about climate change and changing conditions.
  - Identify possible adaptation options for reducing key climate-related vulnerabilities or taking advantage of newly emerging opportunities, with particular attention given to crafting possible management actions.
  - Evaluate and select adaptation actions to determine which are likely to be most effective from an ecological perspective, and most feasible from social, technical, and financial viewpoints.
  - Implement priority adaptation actions, engaging diverse partners and emphasizing benefits to multiple sectors of society.
  - Track action effectiveness and ecological responses, using monitoring approaches designed to ensure that they are capable of guiding needed adjustments in strategies and actions, to inform adaptive management.

3.6.4.3 Conservation Priorities

- Prioritize climate change resilience actions in the connectivity area from the Sutter Buttes to the Sierra foothills (Figure 2-31; Conservation Biology Institute 2018, Gallo and Greene 2018, Gallo et al. in press) and in Essential Habitat Connectivity Areas (Figure 2-30a; Spencer et al. 2010), to improve permeability through connectivity areas and access to shifting habitats (Chapter 2, Section 2.10, *Habitat Connectivity*).

- Prioritize climate change resilience conservation and habitat enhancement actions within areas identified by Areas of Conservation Emphasis (California Department of Fish and Wildlife 2018c) as having a Climate Resilience Rank of 3 or higher in the Freshwater Creek, Colusa Trough, and Colusa Basin Drainage Canal CPUs.

3.7 Conservation Strategy for Working Landscapes and Natural Communities

The conservation strategy for natural communities and working lands is designed to protect, enhance, and restore native biodiversity and ecological processes that maintain representative working landscapes and natural communities of the RCIS area. The working landscapes and natural communities conservation strategy follows a step down approach that builds upon the conservation goals, objectives, and actions at the landscape level. The landscape level conservation strategy is intended to address large-scale conservation issues that cross multiple natural communities and working landscapes, such as ecosystem processes, shifts in natural community distribution, invasive plant and animal distribution, and the integrity of landscape linkages; whereas the working landscapes and natural communities conservation strategy is intended to address the composition and function of working landscapes and natural communities and important habitat features for focal species. In turn, the conservation strategy for focal species (Section 3.8, *Conservation Strategy for Focal Species*) builds upon the working landscapes and natural communities conservation strategy to address specific habitat requirements of focal species, such as planting trees for Swainson's hawk or increasing basking substrates for western pond turtle.

This working landscapes and natural community conservation strategy recommends voluntary conservation actions and habitat enhancement actions to protect, enhance, and restore natural communities and habitat elements, and manage working lands that are critical for the focal species, such as enhancing native riparian vegetation, growing certain types of crops in ways that are beneficial to focal and native species while being economically viable, or increasing the size of patches of native habitat to provide larger blocks of intact habitat and to improve connectivity in the landscape.

The working landscapes and natural communities conservation strategy addresses working lands, grassland, riverine and riparian, and wetlands. This RCIS does not include conservation strategies for the chaparral and scrub and woodland natural communities, because there are very limited conservation opportunities for these natural communities in the RCIS area, and they are common outside of the RCIS area. Furthermore, none of the focal species rely solely on these natural communities for habitat. Combined, these natural communities comprise approximately 0.2% of the RCIS area (286 acres of chaparral and scrub, and 562 acres of woodland).

3.7.1 Working Landscapes

3.7.1.1 Context for a Regional Conservation Strategy

With much of the native natural communities and habitats in the Central Valley converted to agriculture, and to a much lesser extent urban and suburban development, the habitat values provided by agricultural lands in working landscapes are increasingly important for the conservation of native wildlife. Because agriculture is the dominant land use in the RCIS area

(Chapter 2, Section 2.3.2, *Land Use*), voluntary partnerships with private landowners to maintain existing land use practices and integrate approaches to managing working lands to benefit focal species and other native wildlife is vital to the success of this RCIS's conservation strategy.

Although the conversion of natural vegetation to cultivated lands has eliminated large areas of native habitats, many agricultural systems in the RCIS area continue to support wildlife with compatible habitat needs, and provide important breeding, foraging, and roosting habitat for some resident and migrant wildlife species. Upland and seasonally flooded cultivated lands and wetlands in the RCIS area, for example, support waterfowl populations that annually winter in California (CALFED 1998, Central Valley Joint Venture 2006, Shuford and Dybala 2017). Focal species that use cultivated lands include Swainson's hawk, giant garter snake, western pond turtle, tricolored blackbird, and juvenile salmon (e.g., when agricultural fields are flooded and connected to floodplains). These species have come to rely on the habitat values of certain cultivated lands, farming practices, and crop types. Cultivated lands, however, support a less diverse and less dense community of wildlife compared with natural communities (Fleskes et al. 2005, EDAW 2007, U.S. Fish and Wildlife Service 2007, Kleinschmidt Associates 2008), so remaining patches of natural communities in the RCIS area should be protected, and expanded through restoration, where feasible.

Working lands can be managed to increase their suitability for focal wildlife species and other native wildlife, plants, and invertebrates (e.g., native pollinators). Natural habitat elements add resilience to the agricultural landscape by enhancing habitat values and ecological functions of the landscape matrix. The RCIS defines a *landscape matrix* as the dominant land cover type in any defined (or bounded) land area (Forman 1995). With elements of these habitat functions provided by the matrix, the integrity of natural lands is augmented by a matrix that is permeable to mobile species, and the matrix can also provide additional habitat values. These features include incorporating habitat enhancements such as hedgerows along field edges, broadening areas of natural vegetation (for example, widening riparian vegetation areas along rivers, creeks, and irrigation canals and drainages), and incorporating other natural habitat elements into areas where connections have been weakened.

The dynamic cropping patterns in the RCIS area may result in changes in habitat values at the site level for cultivated land-associated focal species. These dynamic cropping patterns can be compatible with wildlife use as long as the overall amount of crops and types of agricultural practices that provide high-value habitat for focal species and native wildlife remains relatively constant at the regional level. Major regional shifts in crop types or agricultural practices may diminish wildlife habitat values within a region. Changes in crop production can have substantial effects on the habitat values of cultivated lands for wildlife, particularly birds. Hay, grain, row crops, and irrigated pastures support abundant rodent populations, providing a prey base for many wildlife species. Conversion of these cultivated lands to orchards and vineyards affects native wildlife, including raptors such as Swainson's hawk (Estep Environmental Consulting 2008). Orchards and vineyards develop a dense overstory canopy that generally precludes access to ground-dwelling prey by foraging Swainson's hawks and other raptors.

This RCIS's conservation strategy for working landscapes focuses on increasing the extent and distribution of natural habitat elements within working landscapes, through tools such as incorporating hedgerows along field edges, and broadening areas of natural vegetation (e.g., expanding riparian habitats). This conservation strategy also identifies agricultural practices that can be implemented to provide or improve habitat values for focal species and other native wildlife (e.g., water and flooded field management). Working land management tools that benefit specific focal species are also presented within the relevant focal species' conservation strategy (Section 3.8, *Conservation Strategy for Focal Species*).

Landscape-level objectives that contribute to the conservation of working landscapes include the following.

- *Objectives HC-1-1, Reestablish Landscape Connectivity*, and *HC1-4, Maintain Heterogeneity within Agriculture Lands*, provide for the conservation of large interconnected areas across in the RCIS area to support sustainable working lands.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change*, will further provide for adaptive management and monitoring to address threats to working lands from climate change.

3.7.1.2 Conservation Goals and Objectives

Goal CA-1. Conserve cultivated land and working landscapes and the habitat values they provide for focal species, native wildlife, and natural communities.

*Objective CA1-1. Encourage Habitat Values Incorporated with Agricultural Uses***.** Encourage a mix of agricultural uses in working lands that provide for the needs of species that use working lands as habitat. Measure progress towards achieving this objective by estimating the amount, in acres, of working lands that provide habitats for focal species.

- ***Action CA1.1-1.*** Work with willing landowners to improve working land habitats to manage a diversity of cultivated agriculture crop types to provide habitat for focal species (e.g., foraging habitat for Swainson's hawk and tricolored blackbird) and other native wildlife.
- ***Action CA1.1-2.*** Assess trends in cropping patterns in the RCIS area, so that any desired intervention (such as incentives to grow particular crop types, or purchasing of conservation easements) can be based on sound information.
- ***Action CA1.1-3.*** Enter into voluntary contracts to pay farmers to grow crop types that benefit focal species.
- ***Action CA1.1-4.*** Purchase easements from willing sellers to prevent conversion to crops that do not provide suitable habitat benefits.

*Objective CA1-2. Incorporate Habitat Features***.** Encourage voluntary farming practices that increase habitat values on working lands, including habitat features such as hedgerows and patches of natural habitat (e.g., riparian patches) within the agricultural matrix. Measure progress towards meeting this objective by estimating the amount, in acres, of habitat features and patches of natural habitat on working lands that provide habitats for focal species.

- ***Action CA1.2-1.*** Work with willing landowners to add hedgerows and buffers to farm edges, along waterways, and adjacent to natural vegetation to reduce adverse effects of agricultural practices on those habitats and to provide cover and foraging habitat for focal species and native wildlife (California Department of Water Resources 2016).
- ***Action CA1.2-2.*** Work with resource conservation districts, the Natural Resources Conservation Service, and University of California Cooperative Extension to provide incentives for voluntary, wildlife-friendly management practices, such as fencing, hedgerows, tailwater ponds, timing of operations, and weed control.

- ***Action CA1.2-3***. Work with willing landowners to manage grazing of floodways in a manner that sustains habitat for focal species (e.g., Swainson's hawk) (California Department of Water Resources 2016).
- ***Action CA1.2-4***. Work with willing landowners to flood harvested fields during winter and spring to provide rearing habitat for juvenile salmonids and food and nutrients to fish downstream (California Department of Water Resources 2016).
- ***Action CA1.2-5.*** Work with willing landowners to provide and enhance habitat values associated with interconnected aquatic areas in the agricultural landscape, including major canals and other water-supply infrastructure elements, and ditches throughout the landscape matrix, creating a regional conservation lattice supporting habitat while also providing corridors for wildlife movement. For example, maintain water in canals and ditches during the active period of sensitive species (e.g., giant garter snake), and maintain ditch vegetation to provide cover for sensitive species (California Department of Water Resources 2016).
- ***Action CA1.2-6***. Develop and maintain dynamic channel zones for watercourses that allow streamflow access to floodplains and movement of eroded materials through floodplains.
- ***Action CA1.2-7.*** Work with willing landowners to conduct agriculture practices in a way that minimizes impacts on focal species (e.g., conduct canal grading during giant garter snake's active period; if tricolored blackbirds are nesting in a crop field, delay crop harvest until after fledglings have dispersed).
- ***Action CA1.2-8.*** Work with willing landowners to enhance riparian areas on agricultural properties.
- ***Action CA1.2-9.*** Work with willing landowners to synchronize rice management and annual waterbird cycles (Migratory Bird Conservation Partnership 2014) as follows.
    - In the winter, replace boards in water-control structures and perform light tillage.
    - In late winter/spring, stagger rice field drainage using variable drawdown.
    - In spring and summer, install islands and widen berms.
    - In early fall, flood rice fields (July through September) (California Department of Water Resources 2016).

Objective CA1-3. Reduce Impacts from Adjacent Land Uses. Reduce impacts from adjacent human land uses, such as roads, that negatively affect the sustainability of natural communities and focal species.

- ***Action CA1.3-1.*** Implement best management practices for operations and maintenance programs and for flood-control activities that minimize adverse effects on natural communities, biological diversity, and ecosystem processes, and focal species to the extent that such best management practices do not violate state and federal operation and maintenance laws and requirements for flood-control projects (California Department of Water Resources 2016).

3.7.1.3 Conservation Priorities

- Work with willing landowners to manage working lands to provide conservation lift for focal species and other native species.

- Conduct outreach with willing landowners to integrate voluntary conservation and habitat enhancement actions with agricultural practices to benefit focal species and other native species on working lands.
- Create tools to reward landowners for implementing voluntary conservation actions and habitat enhancement actions on working lands, such as MCAs (Chapter 4, Section 4.5.1, *Mitigation Credit Agreements*).
- Work with willing landowners to delay the draining of flooded fields to provide a range of water depth for waterbirds through later winter (i.e., through February) (Migratory Bird Conservation Partnership 2014) (Chapter 2, Section 2.8.6.7, *Rice*).

3.7.2 Grassland

3.7.2.1 Context for a Regional Conservation Strategy

The grassland[7] natural community includes annual grasslands and vernal pool complex land cover types (Chapter 2, Section 2.8.1, *Grassland*). Grasslands are patchily distributed throughout the RCIS area, with larger patches located along the western and eastern borders of the RCIS area, as well as encircling the Sutter Buttes (Figure 2-23). There are also small patches of grassland within the agricultural matrix in the center of the RCIS area. Vernal pool complexes are more sparsely distributed than annual grasslands, with the two largest patches located southeast and southwest of the city of Colusa.

Although dominated by non-native species, annual grasslands provide important habitat for wildlife and plants, foraging habitat for focal species such as Swainson's hawk and tricolored blackbird, and nesting habitat for western pond turtle, when adjacent to aquatic habitat. Large tracts of grassland are permeable to wildlife movement, and are a functional component of the Colusa Basin–Butte Sink Essential Connectivity Area connecting the Colusa Basin with the Butte Sink natural landscape blocks (Figure 2-30a).

Colonial (social) burrowing rodents are important engineers in annual grassland and vernal pool ecosystems, and are a key component in maintaining the functional capacity and resilience of grasslands (Davidson et al. 2012). Habitat functions provided by social burrowing rodents in grasslands include providing food, thermal and predator cover, and nesting/seasonal habitat for native wildlife species (e.g., rodents, burrowing owl, and insects, including native pollinator species).

Grazing is the primary tool used to manage grasslands. Grazing can be used to reduce cover of invasive plants, increase native biodiversity, and remove dense thatch in grassland to maintain their health and function for focal and other native species. Grasslands may have evolved with intense levels of grazing and browsing. In the last 10,000 years, tule elk, black-tailed deer, and pronghorn antelope grazed California grasslands in large numbers. With the decline in native grazers such as tule elk and pronghorn antelope, cattle and sheep now often fulfill the grazing role of native ungulates.

The Vernal Pool Recovery Plan (U.S. Fish and Wildlife Service 2005) identifies two core areas in the RCIS area: the Dolan and Sacramento NWR core areas (Figure 2-2). Core areas are the specific sites

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[7] The Mid-Sacramento Valley RCIS refers to this community as grassland to reflect its current composition dominated by non-native, annual grasses. Areas dominated by grasslands, however, have historically been more dominated by forbs than by grasses, and are also referred to as California prairie (Holstein 2011).

that the recovery plan deems necessary to recover or conserve endangered or threatened vernal pool species addressed by the recovery plan. Preservation and enhancement of each core area is important to maintain and possibly expand the distribution of the vernal pool species range-wide. The recovery plan specifies a protection target of 85% for the two core areas. In the RCIS area, 583 acres (99%) of the Sacramento NWR Core Area are protected (most of the Sacramento NWR core area is in Glenn County, outside of the RCIS area), whereas 97 acres (28%) of the Dolan Core Area are protected. Currently, most of the western unit of the Dolan Core Area is cultivated agriculture (primarily rice), and only approximately 14% of the Dolan Core Area is mapped by this RCIS as vernal pool complex. Rather than prioritizing the western unit of the Dolan Core Area for protection, enhancement, and restoration of vernal pool complexes, this RCIS prioritizes the protection and enhancement of existing vernal pool complex, as mapped for California's Great Central Valley (Witham et al. 2014) and used in this RCIS (Figure 2-23).

Landscape-level objectives that contribute to the conservation of grasslands are as follows.

- *Objectives HC-1-1, Reestablish Landscape Connectivity*, *HC1-2, Maintain or Increase Natural Communities*, *HC1-3, Enhance Wildlife Permeability*, and *HC1-4, Maintain Heterogeneity with Agriculture Lands*, provide for the conservation of large interconnected areas across the RCIS area to support sustainable working lands.
- *Objective EP&C1-2, Maintain Fire Regime*, will be used as an enhancement tool in the grassland natural community.
- *Objective IS1-1, Control Invasive Species*, provides for control of invasive plant species that threaten the grassland natural community.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change*, will further provide for adaptive management and monitoring to address threats to working lands from climate change.

3.7.2.2 Conservation Goals and Objectives

Goal GL-1. Maintain and restore large contiguous patches of grassland to sustain and enhance the distribution and abundance of associated focal and other native species in the RCIS area.

Objective GL1-1. Functional Grassland. Increase the amount of functional grasslands protected in the RCIS area by 5% by protecting (either permanently, or through a term agreement), enhancing, or restoring grassland communities. Measure progress towards achieving this objective in acres.

- ***Action GL1.1-1.*** Work with willing landowners to protect grasslands and vernal pool complexes in the RCIS area.
- ***Action GL1.1-2.*** Enhance and restore grassland and vernal pool complex. Vernal pool complex should be restored on suitable soil to create hydrologic conditions that support native vernal pool flora and fauna, using nearby natural vernal pools as reference sites.
- ***Action GL1.1-3.*** Vegetate flood-management features (i.e., levees, seepage berms, operations and maintenance areas) with native grasses and forbs.
- ***Action GL1.1-4.*** Work with willing landowners to adjust grazing regimes to enhance habitat for native species and maintain grasslands (e.g., reduce encroachment of shrubs such as coyote bush).

- ***Action GL1.1-5.*** Work with willing landowners to restore grasslands by planting and establishing large areas of native grasses and forbs, or planting native species as components of projects that have temporary ground disturbance or that create features on the landscape (e.g., levees) that require vegetation.

Objective GL1-2. Burrowing Rodents. Maintain and enhance the functions of grasslands and vernal pool complexes as habitat for focal and other native species by maintaining areas with burrowing rodents such as ground squirrels and gophers. Measure progress towards achieving this objective by estimating the amount, in acres, of grasslands and vernal pool complexes managed to maintain populations of burrowing rodents (e.g., where land management does not include control of burrowing rodent populations).

- ***Action GL1.2-1.*** Work with willing landowners to identify and implement management practices that support habitat for burrowing rodents, but do not encourage use on or near flood-control facilities.

Objective GL1-3. Grazing Regimes. Maintain and enhance the functions of grasslands and vernal pool complexes as habitat for focal and other native species by implementing appropriate grazing regimes. Measure progress towards achieving this objective by estimating the amount, in acres, where grazing regimes are managed to maintain or enhance grassland and vernal pool functions.

- ***Action GL1.3-1.*** Integrate grazing management into management plans for protected lands.
- ***Action GL1.3-2.*** Apply adaptive management and monitoring to grazing regimes, adjusting grazing as needed to minimize cover of invasive species, maximize cover of native biodiversity, and provide the necessary habitat for focal and other native species.

Goal GL-2. Maintain and restore large, contiguous patches of vernal pool complex to sustain and enhance the distribution and abundance of native vernal pool species in the RCIS area.

Objective GL2-1. Functional Vernal Pool Complexes. Increase the amount of functional vernal pool complex protected in the RCIS area by 5% by protecting (either permanently, or through a term agreement) or restoring vernal pool complex. Measure progress towards achieving this objective in acres.

- Implement actions GL1.1-1 and GL1.1-2 under Objective *GL1-1*, *Functional Grasslands*.
- Enhance upland grasslands as described for Objective GL1.2, *Burrowing Rodents*, and Objective GL1.3, *Grazing Regimes*.
- ***Action GL2.1-1.*** Carefully manage grazing to help maintain native plant communities and retain longer flooding periods in vernal pools.
- ***Action GL2.1-2.*** Work with willing landowners to restore vernal pool complexes and individual vernal pools on suitable soils within a matrix of upland grasslands to create hydrologic conditions that support native vernal pool flora and fauna, using nearby natural vernal pools as reference sites.

3.7.2.3 Conservation Priorities

- Because little grassland and vernal pool complex remains in the RCIS (Table 3-2), prioritize the protection of remaining large, contiguous patches of grassland and vernal pool complex, particularly those with remnant components of native grasslands, and the restoration of grassland and vernal pool complex to expand and connect existing patches of grassland, vernal pool complex, and other natural communities, including those within the Dolan Core Area, vernal poll tadpole shrimp critical habitat (Figure 2-2), and the Lower Butte Creek Complex and Colusa Trough CPUs (Chapter 2, Section 2.2.5.2, *Vernal Pools*).

- Survey the Dolan Core Area (particularly in the western area) and Sacramento NWR Core Area to identify locations where vernal pools could be enhanced, restored, or created (Chapter 2, Section 2.2.5.2, *Vernal Pools*).

3.7.3 Riverine and Riparian

3.7.3.1 Context for a Regional Conservation Strategy

The riverine and riparian natural community includes valley foothill riparian, lacustrine/riverine, and barren land cover types (Chapter 2, Section 2.8.4, *Riverine and Riparian*). Riverine and riparian habitat occurs throughout the RCIS area, with the largest stretches along the Sacramento River, Feather River, and Butte Creek (Figure 2-26). Long, winding channels and associated riparian habitat span much of the RCIS area from the north to south. Smaller stretches of riparian habitat also occur within the agriculture matrix, in floodplains along major rivers, and adjacent to freshwater wetlands.

Riparian habitats associated with rivers and other waterways throughout the RCIS area are among the most significant natural communities in the region, and provide essential habitat for many of the focal species, including salmonids, green sturgeon, valley elderberry longhorn beetle, western pond turtle, Swainson's hawk, and yellow-billed cuckoo. The SWAP identifies *American Southwest Riparian Forest and Woodland* as one of the two primary priority conservation targets for the Great Valley Ecoregion (California Department of Fish and Wildlife 2015). Riparian associated with the Sacramento River, Feather River, and Butte Creek are essential to connecting habitats along these waterways within and beyond the RCIS area and laterally away from channels into floodplains. Riverine and riparian habitats are also critical migratory corridors and rearing habitat for anadromous fish, including green sturgeon and salmonids traveling to and from spawning habitat upstream of the RCIS area. Riparian areas are an important element in maintaining fluvial processes in watersheds (e.g., Stanley et al. 1991, Huff and Osterkamp 1996).

This RCIS includes conservation objectives intended to increase structural complexity of riparian habitats, and the amount of native vegetation along rivers and streams. This will provide a diversity of habitats for wildlife species, including valley elderberry longhorn beetle, yellow-billed cuckoo, and Swainson's hawk. Functional riparian habitat values are directly related to the structure and continuity of the habitat (Hilty and Merenlender 2004, Hilty et al. 2006, Merritt and Bateman 2012). The functional utility of riparian habitat associated with a watercourse is directly related to 1) the height and structural complexity of the riparian vegetation, 2) the extent of the riparian vegetation corridor extending laterally from the watercourse, and 3) the continuity of the riparian vegetation corridor along the length of the watercourse. Vegetation shades and cools streams, maintains streambanks and channel forms, and provides organic material that maintains in-stream ecological dynamic processes. Different bird species nest and forage at different vegetation heights, provided by multiple vegetation layers. Low shrubs provide cover for many wildlife species, tall trees provide foraging and perching habitat, and canopy cover provides shading. For example, yellow-billed cuckoo is more likely to occur in a relatively dense, mature cottonwood/willow forest with light gaps and a heavy shrub component (Efseaff et al. 2008). Multiple vegetation layers also enhance hydrologic functions, including rainfall interception, filtration of floodwaters, and flood-stage desynchronization (Collins et al. 2006).

Climate change may further fragment residual habitat values for native species in the Central Valley by altering habitat functions of remnant riparian patches (California Climate Adaptation Strategy 2009). Riparian habitat associated with watercourses is naturally resilient to climate change impacts owing to readily available water, the ecological interactions between the aquatic environment and the terrestrial environment that characterize riparian habitats, and its functions as a thermal refugium for wildlife (Seavy et al. 2009). Riparian areas provide a framework for uniting ecosystems at landscape scales, enhancing regional ecological resilience (Fremier et al. 2015).

The goals and objectives for this natural community are designed to protect, restore, and enhance the ecosystem services that these habitats provide for focal species and native biodiversity. Some of these ecosystems services are addressed in the landscape-level conservation strategy (Section 3.6, *Landscape Level Conservation Strategy*) but will benefit the natural communities. Protection and expansion of riparian habitat and riverine systems in the RCIS area will secure habitat connectivity and enhance their functional utility for wildlife. In addition, habitat protection and enhancement will help to support habitat functions on adjacent agricultural lands.

The following landscape-level objectives contribute to the conservation of riverine and riparian systems in the RCIS area.

- *Objectives HC-1-1, Reestablish Landscape Connectivity*, *HC1-2, Maintain or Increase Natural Communities*, and *HC1-3, Enhance Wildlife Permeability* provide for the conservation of large interconnected areas across the RCIS area to support habitat connectivity, including along riparian and riverine corridors.
- *Objective EP&C1-1, Improve Hydrologic and Geomorphic Processes*, will improve the floodplain dynamics and functionality of the riparian and riverine systems in the RCIS area. Ecological benefits of levee and revetment removal can be maximized by conducting activities where removal contributes to larger zones of active river meander and migration and provides benefits for focal species such as bank swallow and salmonids (California Department of Water Resources 2016).
- *Objective IS1-1, Control Invasive Species*, provides for control of invasive plant species that threaten the riverine and riparian natural community.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change*, will further provide for adaptive management and monitoring to address threats to riparian habitats from climate change.

3.7.3.2 Conservation Goals and Objectives

Goal RR-1. Where feasible, maintain and restore functional riverine and riparian habitat and floodplains throughout the RCIS area, including protection of existing, and restoration and enhancement of diminished, riparian habitat values.

Objective RR1-1. Protect and Restore Riparian and Floodplains. Increase the amount of valley foothill riparian and floodplain protected in the RCIS area by 5% by protecting (either permanently, or through a term agreement), enhancing, or restoring valley foothill riparian and floodplains. Measure progress towards achieving this objective in acres.

- ***Action RR1.1-1.*** Work with willing landowners to protect valley foothill riparian and floodplains.
- ***Action RR1.1-2.*** Work with willing landowners to protect riparian habitat associated with interconnected aquatic areas in the agricultural landscape, including irrigation canals and other water-supply infrastructure and drainage elements, throughout the landscape matrix, creating a regional conservation lattice supporting local habitat while also providing corridors for wildlife movement.
- ***Action RR1.1-3.*** Provide private landowners with financial incentives to voluntarily maintain existing riparian areas on private lands, or to allow riparian habitat to naturally establish and be retained on sites with suitable soils and hydrology.
- ***Action RR1.1-4.*** Work with willing landowners to establish riparian corridors by restoring riparian areas to provide continuous lengths of vegetation along drainages and levees. Riparian areas should be as wide as soil, hydrologic, and human-induced constraints will allow, and corridors should be established on the waterside of the levees, where possible.
- ***Action RR1.1-5***. If it is infeasible to provide wide areas of riparian habitat along the entire channel, restore areas to provide wide nodes of riparian habitat along the channel.
- ***Action RR1.1-6.*** Acquire easements from willing landowners to widen riparian corridors on adjacent properties.

Objective RR1-2. Maintain or Enhance Riparian Habitat. Maintain or enhance the functional habitat value of existing riparian habitat by maintaining or increasing the complexity of the riparian vegetation. Measure progress towards achieving this objective in acres of riparian habitat managed to maintain or enhance functional habitat values.

- ***Action RR1.2-1.*** Introduce tall, broad-canopied tree species like valley oak and shorter species such as toyon, which increase the structural complexity of riparian habitat and the complexity of food webs in the habitat.
- ***Action RR1.2-2.*** Work with willing landowners to manage existing riparian habitats to maintain key food resources for breeding and wintering birds. Incorporate plant species that provide food resources for summer and winter migratory species into riparian enhancement and restoration plans.
- ***Action RR1.2-3.*** Work with willing landowners to control or eliminate invasive riparian plant species such as Arundo that would otherwise create large monotypic stands lacking in structural diversity.
- ***Action RR1.2-4.*** Create conditions that provide fluvial processes that periodically disturb riparian areas, thereby promoting various successional stages and increased structural diversity. An example of an action that would provide fluvial processes would be working with cooperative landowners to set back levees to widen the floodplain.

Goal RR-2. Conserve and enhance stream systems in the RCIS area.

Objective RR2-1. Maintain or Enhance Fluvial Equilibrium. Maintain or enhance fluvial equilibrium between erosion and deposition in RCIS area streams. Measure progress towards achieving this objective in stream miles where stream enhancement actions have been implemented.

- ***Action RR2.1-1.*** Avoid stream channelization, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action RR2.1-2.*** Avoid unnecessary vegetation removal, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action RR2.1-3***. Minimize erosion in uplands that contributes to excessive sedimentation in RCIS area streams. Maintain vegetative cover, using native species, as an approach to increase infiltration of precipitation, to stabilize slopes, and to reduce excessive runoff and erosion.
- ***Action RR2.1-4.*** Maintain or enhance (e.g., planting riparian species, removing invasive species) riparian and floodplain vegetation to stabilize and maintain equilibrium between sediment and streamflow in RCIS area stream channels, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action RR2.1-5.*** Maintain a sediment supply in channels below channel obstructions that can contribute sediments to downstream reaches to maintain a dynamic equilibrium between channel erosion and aggradation, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.

Objective RR2-2. Establish Native Vegetation. Promote the establishment and maintenance of native vegetation along natural and constructed waterways. Measure progress towards achieving this objective in miles of streams and waterways where vegetation has been established.

- ***Action RR2.2-1.*** Encourage ecologically sustainable water management practices, including continuous bank vegetation along ditches and other constructed features, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action RR2.2-2.*** Establish native plant species demonstrated to provide ecological and water-quality benefits along waterways, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action RR2.2-3.*** Where possible, conduct ditch/canal maintenance only on one side of each canal or ditch per year.

3.7.3.3 Conservation Priorities

- Work with willing landowners to protect and restore large patches of riparian habitat in the Sacramento River, Lower Butte Creek Complex, and Sutter Basin Complex CPUs.
- Prioritize floodplain restoration from Colusa south to Verona in the Sacramento River CPU, and in the Tisdale and Sutter Bypasses (California Department of Water Resources 2016).
- Prioritize sites for restoration that would expand and connect riparian patches and floodplains. For example, restoration projects should be designed, where feasible, to close gaps in vegetation along the length of drainages, widen riparian zones or provide wide riparian nodes adjacent to drainages, or provide lateral linkage between drainages and adjacent natural communities.

3.7.4 Wetland

3.7.4.1 Context for a Regional Conservation Strategy

The Central Valley, including the RCIS area, historically supported vast areas of freshwater emergent wetlands that were subsequently lost, largely as a result of conversion of wetland areas to uplands to support agriculture and residential development (Frayer et al. 1989). The SWAP identifies freshwater marsh as one of the two primary priority conservation targets for the Great Valley Ecoregion (the corresponding Mid-Sacramento Valley RCIS land cover type is freshwater emergent wetland) (California Department of Fish and Wildlife 2015). Wetlands are now restricted to discrete patches primarily associated with wildlife refuges and other protected areas (38,038 of 43,676 acres [87%] are protected in the RCIS area). Most unprotected patches of wetland in the RCIS area are interspersed within a matrix of protected wetlands (Figure 2-27). Because a large proportion of freshwater emergent wetland in the RCIS area is already protected, the conservation strategy emphasizes management actions to maintain or improve freshwater emergent wetland habitats for focal species. Freshwater emergent wetland actions tailored to the needs of focal species are presented within the focal species conservation strategies for focal species that rely on wetland habitats (Section 3.8, *Conservation Strategy for Focal Species*).

The conservation strategy also seeks to restore wetlands to benefit giant garter snake, western pond turtle, tricolored blackbird, and a diversity of native species that use this natural community. Wetland restoration would generally consist of intensive actions involving grading (e.g., creating depressions, berms, and drainage features) to create topography that supports wetland plants, provides habitat elements for focal species, and allows fish to exit as floodwaters recede. Wetland restoration also involves planting vegetation and constructing water management facilities. Freshwater emergent wetland restoration will occur in coordination with the agencies that own and operate the protected land (e.g., U.S. Fish and Wildlife Service [USFWS]).

The following landscape-level objectives contribute to the conservation of wetlands in the RCIS area.

- *Objectives HC-1-1, Reestablish Landscape Connectivity* and *HC1-2, Maintain or Increase Natural Communities* will restore wetlands that will improve landscape connectivity.
- *Objective EP&C1-1, Improve Hydrologic and Geomorphic Processes*, will improve the quality and ecological functions of wetlands in the RCIS area.
- *Objective IS1-1, Control Invasive Species*, provides for control of invasive plant species that threaten the grassland natural community.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change*, will further provide for adaptive management and monitoring to address threats to working lands from climate change.

3.7.4.2 Conservation Goals and Objectives

Goal FW-1. Maintain, enhance, and restore functional freshwater emergent wetlands in the RCIS area.

Objective FW1-1. Enhance, Restore, and Protect Freshwater Emergent Wetlands. Increase the amount of freshwater emergent wetland managed, enhanced, restored, and protected in the RCIS area by 5% to provide habitat for focal species and support native biodiversity. Measure progress towards achieving this objective in acres.

- ***Action FW1.1-1.*** Implement actions to maintain or enhance freshwater emergent wetlands to benefit giant garter snake, western pond turtle, and tricolored blackbird, as described in each species' conservation strategy in Section 3.8, *Conservation Strategy for Focal Species*.
- ***Action FW1.1-2.*** Work with willing landowners to restore freshwater emergent wetlands in areas that are likely to support RCIS focal species, with restoration design features that contribute to habitat value for focal species.
- ***Action FW1.1-3.*** Work with willing landowners and agencies (e.g., USFWS) to conduct restoration projects on protected land.
- ***Action FW1.1-4.*** Minimize submerged aquatic vegetation in restored marsh habitat (California Department of Water Resources 2016).
- ***Action FW1.1-5.*** Work with willing landowners to protect unprotected freshwater emergent wetlands supporting focal species.

3.7.4.3 Conservation Priorities

- Prioritize restoration, management, enhancement, and protection of wetlands in areas with known or historic occurrences of focal species (Chapter 2, Section 2.2.5.5, *Giant Garter Snake*).
- Prioritize sites with intact natural hydrology or the potential to restore natural processes (Riparian Habitat Joint Venture 2004).

3.8 Conservation Strategy for Focal Species

The conservation strategy for this Mid-Sacramento Valley RCIS's focal species prioritizes the management of habitat, including working lands, for the benefit of focal species, and the protection of occupied habitat to protect existing populations of focal species (Section 3.3, *Gap Analysis*; Appendix E, *Focal Species Habitat Models*). The conservation strategy also emphasizes the enhancement and restoration of focal species' habitat within the working landscapes of the RCIS area.

The landscape, and working lands and natural community conservation strategies are intended to provide for the conservation, restoration, and enhancement of landscapes and working lands and natural communities that will benefit focal species and native biodiversity. This section identifies focal species–specific conservation goals, objectives, actions, and priorities that address species-specific conservation needs that may not be addressed by landscape or working landscapes and natural community actions.

The following general principals of conservation biology (Soule and Wilcox 1980, Soule 1986, Primack 1993, Noss et al. 1997, Margules and Pressey 2000, Groom et al. 2006) should be used to further prioritize habitat protection actions.

- Protect occurrences of focal species.
- Integrate habitat management practices that benefit focal species into the management of working lands.
- Preserve large blocks of intact habitat.

- Focus protection of areas that expand existing protected areas and/or connect existing protected areas within and adjacent to the RCIS area.
- Protect wildlife corridors and linkages.

The conservation objectives, actions, and priorities for each focal species are discussed in this section.

3.8.1 Valley Elderberry Longhorn Beetle

3.8.1.1 Context for a Regional Conservation Strategy

Habitat for valley elderberry longhorn beetle consists of elderberry shrubs (*Sambucus* sp.) in upland riparian woodlands or elderberry savannas adjacent to riparian vegetation (Barr 1991). Valley elderberry longhorn beetle is found most frequently and most abundantly in areas that support significant riparian zones (Talley et al. 2007). Larger populations of beetles have been shown to be associated with higher elderberry density and the presence of larger, more mature plants (Talley et al. 2007). Significant agriculture development and lack of riparian vegetation in the RCIS area prohibits colonization further west than the eastern portion of the RCIS area (Chapter 2, Section 2.9.2.1, *Valley Elderberry Longhorn Beetle* (Desmocerus californicus dimorphus).

Due to the historic reduction of suitable riparian habitat for valley elderberry longhorn beetle, protection and restoration of habitat is important for the species' conservation. As valley elderberry longhorn beetles will often spend their entire life on the same plant, or disperse to nearby elderberry shrubs in the same drainage, protection of occupied plants and connectivity of occupied drainages is of highest priority. This necessitates siting habitat restoration within the vicinity of occupied drainages, to increase likelihood of colonization of restored habitat. Landscape-scale studies, however, indicate that large patches of habitat, even when unoccupied, are likely important to maintain the possible metapopulation structure of the beetle (Talley et al. 2007) and could be candidates for reintroduction.

The following landscape and natural community objectives contribute to the conservation of valley elderberry longhorn beetle in the RCIS area.

- *Objective HC1-1, Reestablish Landscape Connectivity,* will establish and maintain landscape connections for valley elderberry longhorn beetle and avoid fragmentation.
- *Objective HC1-2, Maintain or Increase Natural Communities*, will restore natural community ecological function and processes. Restoration will help reduce the stressor of habitat loss and improve habitat quality for valley elderberry longhorn beetle.
- *Objective IS1-1, Control Invasive Species*, will reduce non-native vegetation, thereby increasing habitat quality for valley elderberry longhorn beetle by allowing native vegetation to grow and encouraging natural biological diversity.
- *Objective CC1-1*, *Increase Landscape Resilience to Climate Change*, will promote and enhance habitat for valley elderberry longhorn beetle to facilitate adaptation to changing climate conditions; increase the amount of, and improve the quality of, future suitable habitat for valley elderberry longhorn beetle; and provide connectivity between current occupied habitat and potential suitable unoccupied habitat.

- *Objective RR1-1, Protect and Restore Riparian and Floodplains*, will increase protection and restoration of suitable habitat for valley elderberry longhorn beetle, help to reduce the stressor of habitat loss, and allow for management of beetle colonies.
- *Objective RR1-2, Maintain or Enhance Riparian Habitat*, will prevent degradation of and/or improve the quality of habitat for valley elderberry longhorn beetle.

3.8.1.2 Conservation Goals and Objectives

Goal VELB-1. Increase the distribution and abundance of valley elderberry longhorn beetle in the RCIS area.

Objective VELB1-1. Connectivity and Quality of Valley Elderberry Longhorn Beetle Habitat. Increase the amount of protected valley elderberry longhorn beetle riparian habitat in the RCIS area by 5% by protecting (either permanently, or through a term agreement), enhancing, or restoring riparian communities. Measure progress towards achieving this objective in acres.

- ***Action VELB1.1-1.*** Work with willing landowners to protect populations of valley elderberry longhorn beetle, or suitable habitat that could support a population of valley elderberry longhorn beetle (U.S. Fish and Wildlife Service 1984, California Department of Water Resources 2016).
- ***Action VELB1.1-2.*** Work with willing landowners to restore habitat in areas that connect existing colonies to each other, and to unoccupied habitat (California Department of Water Resources 2016, U.S. Fish and Wildlife Service 2017a).
- ***Action VELB1.1-3.*** Incorporate elderberry shrubs into habitat restored in riparian areas (California Department of Water Resources 2016).
- ***Action VELB1.1-4.*** Monitor and adaptively manage protected populations based on the best available science to maintain or increase population size (California Department of Water Resources 2016).
- ***Action VELB1.1-5.*** Monitor and adaptively manage protected habitat based on the best available science to maintain or increase habitat quality (California Department of Water Resources 2016).

3.8.1.3 Conservation Priorities

- Prioritize the protection and management of unprotected valley elderberry longhorn beetle occurrences/populations and their habitat (Chapter 2, Section 2.2.5.1 *Valley Elderberry Longhorn Beetle*).
- Prioritize habitat restoration projects and planting of elderberry shrubs along the Sacramento River floodplain within valley elderberry longhorn beetle occupied habitat (California Department of Water Resources 2016) (Chapter 2, Section 2.2.5.1, *Valley Elderberry Longhorn Beetle*).

3.8.1.4 Opportunities for Adaptation to Climate Change

The valley elderberry longhorn beetle is reliant on the availability of its host plants, blue elderberry (*Sambucus nigra* ssp. *caerulea*) and red elderberry (*Sambucus racemosa*), for its survival and reproduction. Like any insect-host plant relationship, the persistence of this species requires not only healthy populations but also accessible, high-quality habitat. At the natural community level, riparian ecosystems, and the elderberry shrubs therein, are dependent upon the ecological processes supported by climate conditions. Climate change is predicted to change the hydrological patterns in the Central Valley due to changes in temperature and precipitation. Snowpack and snowmelt, which drives water availability in California, are expected to decline, and the frequency and duration of drought conditions is expected to increase. As the intensity of both wet and dry periods change, streamflow patterns and flow regimes (in volume and timing) in riverine systems will be altered, with a consequent effect on riparian habitat. As the groundwater and surface water level inputs to riparian systems are modified, shifts in location and species composition of riparian vegetation can occur, including the distribution and abundance of elderberry host plants (U.S. Fish and Wildlife Service 2014).

The overall intent of the conservation strategy for valley elderberry longhorn beetle is to protect known populations, expand and connect habitat, and improve habitat quality. Protecting and enhancing existing occurrences will protect populations that can respond to a changing climate. Shifts in habitat are expected to occur, and valley elderberry long beetle may need to shift in response to shifting habitats, provided they are protected and accessible. Expanding and connecting riparian habitat will improve landscape connectivity, and facilitate dispersal to shifting habitats. Objective EP& C1-1, *Improve Hydrologic and Geomorphic Processes*, provides for the improvement of floodplain dynamics and functionality of riverine systems, which will help to counter the effects of climate change on hydrological processes in the RCIS area. Objective CC1-1, *Increase Landscape Resilience to Climate Change*, provides for the adaptive management of landscapes in response to changing climate conditions to maintain suitable habitat and sustainable valley elderberry longhorn beetle populations in the RCIS area.

3.8.2 Focal Fish Species—Green Sturgeon – Southern Distinct Population Segment, Central Valley Steelhead, Central Valley Chinook Salmon (Winter-Run, Spring-Run, and Fall/Late Fall-Run)

3.8.2.1 Context for a Regional Conservation Strategy

Green sturgeon and steelhead and Chinook salmon are discussed together in this section because they use similar habitats in the RCIS area, and are subject to similar pressures and stressors. Green sturgeon use the Sacramento River, Feather River, and Sutter Bypass as rearing and migration habitat. Steelhead and all runs of Chinook salmon use the mainstem Sacramento and Feather Rivers, and Butte Creek as adult and juvenile migratory habitat and juvenile rearing habitat. Sutter Bypass is used during and after high-flow events from the Sacramento River (which causes the Sutter Bypass to flood, and enables fish to access the area) as a rearing and migratory pathway for juvenile salmonids. Spring-run and winter-run adult Chinook salmon populations primarily use the Sacramento River as their pathway to upstream spawning areas. Spring-run also use the Feather River in the RCIS area as a migratory pathway to spawning areas. A small stretch of the Feather River in the northeastern corner of the RCIS area is used as spawning habitat for steelhead, spring-run Chinook salmon, and possibly green sturgeon (Chapter 2, Section 2.9.2.2, *Green Sturgeon – Southern Distinct Population Segment* [Acipenser medirostris], Section 2.9.2.3, *Central Valley Steelhead – Distinct Population Segment* [Oncorhynchus mykiss], Section 2.9.2.4, *Sacramento River*

Winter-Run Chinook Salmon – Evolutionarily Significant Unit [Oncorhynchus tshawytscha], Section 2.9.2.5, *Central Valley Spring-Run Chinook Salmon – Evolutionarily Significant Unit* [Oncorhynchus tshawytscha], and Section 2.9.2.6, *Central Valley Fall/Late Fall-Run Chinook Salmon* [Oncorhynchus tshawytscha]).

Loss of shaded riverine aquatic habitat affects fish habitat by reducing shade, which moderates water temperatures and is particularly important to salmonids that need cooler water. Riparian vegetation is also a source of plant material that provides in-stream cover for fish (e.g., large woody material). Terrestrial and aquatic invertebrates are associated with overhanging or fallen branches and plant material and provide food for fish. Overhanging and fallen trees and branches provide habitat complexity and support a high diversity and abundance of invertebrate prey. Restoring vegetation along streambanks will help to increase the amount of shaded in-stream habitats, and will, over time, increase input of large woody material to streams.

Reconnecting floodplains to river channels and restoring ecosystem processes to floodplains benefits rearing juvenile Chinook salmon and provides valuable nutrients to habitats downstream (Bellmore et al. 2013, Crain et al. 2004, Katz et al. 2017). Growth and survival of larval and juvenile fish can be higher within the inundated floodplain compared to those rearing in the mainstem Sacramento River (Sommer et al. 2001). During periods when the Bypass is flooded, a relatively high production of zooplankton and macroinvertebrates provides abundant food for many of the focal fish species (Benigno and Sommer 2008, Moyle et al. 2004).

The following landscape and natural community objectives contribute to the conservation of green sturgeon and salmonids in the RCIS area.

- *Objective HC1-1, Reestablish Landscape Connectivity*, will provide a range of environmental gradients to help ensure the long-term persistence of a diversity of floodplain rearing conditions for focal fish species.
- *Objective HC1-2, Maintain or Increase Natural Communities*, will provide for restoration of riparian habitat and that will provide cover, habitat complexity, and food sources for focal fish species.
- *Objective EP&C1-1, Improve Hydrologic and Geomorphic Processes,* will restore natural fluvial processes and increase floodplain rearing habitat in the RCIS area.
- *Objective IS1-1, Control Invasive Species*, will reduce resource competition from invasive aquatic species (e.g., sunfish, bass) and depredation threats from invasive animals (e.g., bullfrog, bass).
- *Objective CC1-1, Increase Landscape Resilience to Climate Change*, provides for adaptive management to address threats to the focal fish species from climate change.
- *Objective CA1-2, Incorporate Habitat Features,* will encourage planting and management of riparian vegetation along waterways and flooding of fields during winter and spring to provide rearing habitat for juvenile salmonids and food and nutrients to fish downstream (California Department of Water Resources 2016).
- *Objectives RR1-1, Protect and Restore Riparian and Floodplains, RR1-2, Maintain or Enhance Riparian Habitat,* will protect, restore, and enhance riparian habitats for focal fish species.
- *Objective RR2-2, Establish Native Vegetation,* will provide shaded cover along waterways that may support focal fish species.

3.8.2.2 Conservation Goals and Objectives

Goal FISH-1. Increase connectivity and quality of focal fish species' rearing and migration habitat in the RCIS area.

Objective FISH1-1. Increase Shaded Riverine Aquatic Habitat. Increase the amount of shaded riverine aquatic habitat, riparian habitat, and floodplain habitat in the RCIS area by 5% that supports focal fish species (see also Section 3.7.3, *Riverine and Riparian*, objectives and actions). Measure progress towards achieving this objective in acres or linear feet of shaded aquatic habitat.

- ***Action FISH1.1-1.*** Work with willing landowners to restore and enhance shaded riverine aquatic habitat, riparian habitat, and floodplain habitat, as described under Objective RR1-1, *Protect and Restore Riparian and Floodplains,* Objective RR1-2, *Maintain or Enhance Riparian Habitat*, and Objective RR2-1, *Maintain and/or Restore Fluvial Equilibrium*.
- ***Action FISH1.1-2.*** Where appropriate, utilize biotechnical techniques for bank stabilization projects (National Marine Fisheries Service 2014).

Objective FISH1-2. Passage Barriers. Remove or modify barriers to passage that prevent access of focal fish species to spawning and rearing habitat, and build or modify barriers to prevent passage into detrimental locations. Measure progress towards achieving this objective in the number of barriers removed or modified, miles of in-stream habitat with improved access, and the number of miles of detrimental areas with access prevented.

- ***Action FISH1.2-1.*** Remove or modify barriers to passage for focal fish species and other aquatic species (Chapter 2, Section 2.10.2, *Riverine and Riparian Connectivity*).
- ***Action FISH1.2-2***. Design new road crossings and crossing upgrades in areas of modeled steelhead habitat following the guidance of the National Marine Fisheries Service Anadromous Salmonid Passage Facility criteria and guidelines (National Marine Fisheries Service 2011), and the California Salmonid Stream Habitat Restoration Manual, Part XII - Fish Passage Design and Implementation (California Department of Fish and Game 2009).
- ***Action FISH1.2-3***. Remediate structures that obstruct fish passage in the Sutter Bypass to improve and/or provide fish passage through the Sutter Bypass for salmonids and green sturgeon and re-entry into the Sacramento River (National Marine Fisheries Service 2014, 2018), including but not limited to the following identified by the CVFPP Conservation Strategy (California Department of Water Resources 2016).
    - Tisdale Weir in Tisdale Bypass.
    - Moulton Weir in the Butte Basin Overflow Area.
    - Butte Slough Outfall Gates.
    - Weir No. 1 (Parks Weir) on the West Canal of Sutter Bypass.
    - Colusa Weir.
- ***Action FISH1.2-4***. Maintain state-of-the-art fish passage facilities at diversions in Butte Creek and California Department of Water Resources Weir No. 2 to meet National Marine Fisheries Service and CDFW fish passage criteria (National Marine Fisheries Service 2014).
- ***Action FISH1.2-5***. Implement projects that consolidate and screen existing diversions in Butte Creek, where feasible.

- ***Action FISH1.2-6.*** Install fish exclusion devices at strategic locations to reduce migration of listed, adult salmonids into the Colusa Basin Drain Complex.

Objective FISH1-3. Increase Large Woody Material. Increase large woody material in focal fish species' habitat to provide complexity and refuges from predators. Measure progress towards achieving this objective in the amount of large woody debris in restored or enhanced stretches of river or stream.

- ***Action FISH1.3-1.*** Work with willing landowners to enhance vegetation along banks to increase input of large woody material to aquatic habitat, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action FISH1.3-2***. Install large woody material directly into streams and along stream banks as a component of restoration or enhancement projects.

Objective FISH1-4. Improve Sutter Bypass Habitat for Fish. Improve habitat for juvenile salmonids and green sturgeon in the Sutter Bypass. Measure progress towards achieving this objective in the relative abundance of juvenile salmonids, steelhead, and green sturgeon.

- ***Action FISH1.4-1.*** Increase focused inundation in the Sutter Bypass so that it reaches an optimized inundation timing, frequency, magnitude, and duration that will maximize the growth and survival of juvenile winter-run Chinook salmon, spring-run Chinook salmon and green sturgeon; and then manage the Bypass to those targets, which compliments flood-control operations and maintenance requirements.
- ***Action FISH1.4-2***. Monitor the Sutter-Butte Basins during winter and spring for adult salmon, and conduct fish rescues as necessary.

Objective FISH1-5. Reduce Non-native Predator Habitat. Identify effects of depredation on juvenile fish and reduce non-native predator habitat by restoring more natural hydrologic and geomorphologic processes in streams. Measure progress towards achieving this objective in the relative abundance of juvenile salmonids, steelhead, and green sturgeon.

- ***Action FISH1.5-1.*** Implement studies designed to quantify the amount of depredation of green sturgeon, fall/late fall-run Chinook salmon, winter-run Chinook salmon, spring-run Chinook salmon, and steelhead by non-native species in the Sacramento River. If the studies identify predator species and/or locations contributing to low salmonid survival, then evaluate whether predator control actions (e.g., fishery management or directed removal programs) can be effective at minimizing depredation of juvenile salmon and steelhead in the Sacramento River; continue implementation if effective.
- ***Action FISH1.5-2.*** Implement projects to minimize predation at weirs, diversions, and related structures in the Sacramento River.
- ***Action FISH1.5-3***. Implement programs and measures designed to control non-native predatory fish in the Sutter Bypass, including harvest management techniques and programs for non-native predators (e.g., striped bass, largemouth bass, and smallmouth bass).

3.8.2.3 Conservation Priorities

- Floodplain restoration or enhancement should be designed to facilitate inundation to support juvenile fishes (period consistent with best available science). Repeated flooding during the months when native fishes use the floodplains (typically spring) produces zooplankton which are prey items for juvenile fishes (Grosholz and Gallo 2006, U.S. Bureau of Reclamation 2012, as cited in California Department of Water Resources 2016) (Chapter 2, Section 2.9.2.3, *Central Valley Steelhead*).

- Work with willing landowners to provide access to flooded agricultural fields during the winter and spring when juvenile salmon are migrating downstream. Juvenile Chinook salmon grow faster on floodplains due to increased food availability in flooded fields (Katz et al 2017) (Chapter 2, Section 2.9.2.4, *Sacramento River Winter-Run Chinook Salmon*).
- Increase in-stream cover in the Sacramento River, Feather River, and Butte Creek, where studies indicate in-stream cover is needed, to minimize predatory opportunities for striped bass and other non-native predators (National Marine Fisheries Service 2014) (Chapter 2, Section 2.13.5, *Invasive Plants and Animals*).
- Improve fish passage and habitat at the Sutter and Tisdale Bypass for juvenile and adult focal fish species (California Department of Water Resources 2016).

3.8.2.4 Opportunities for Adaptation to Climate Change

Moyle et al. (2012) ranked the climate vulnerability of 164 California fish species (121 native fishes and 43 alien [i.e., non-native] fish species). Those rankings were divided into two 10-metric modules which evaluated baseline vulnerability (Module 1) and life history characteristics (Module 2). Module 1 was based on existing environmental changes; that is, species already in decline would be more vulnerable to climate change. Module 2 evaluated those life history characteristics that would make a species more or less vulnerable to climate change.

The combined vulnerability score indicates the degree of vulnerability, with lower values indicating greater vulnerability (Table 3-4); species with scores of 35 or less are considered extremely likely to become extinct in the wild by the year 2,100. The results of the analysis indicate that all of the focal fish species are vulnerable to climate change, with salmon being critically vulnerable.

Table 3-4. Climate Vulnerability Scoring for the Focal Fish Species as Described in Moyle et al. (2012)

Taxa[a]	Module 1 Range	Module 2 Range	Vulnerability
Chinook Fall Run Salmon	17–21	12–17	29–38
Chinook Late-Fall Run Salmon	18–24	11–15	29–39
Chinook Spring-Run Salmon	17–22	11–16	28–38
Chinook Winter-Run Salmon	16–18	10–14	26–32
Green Sturgeon	27–33	15–21	42–54

[a] Moyle et al. (2012) addressed all focal fish species except for Central Valley Steelhead.

When considering climate change, the biggest concern for fish species generally, and anadromous species specifically, is that there will be less precipitation, and thus less stream flow, or that precipitation will fall in patterns different from how it has fallen historically and that river flows will not be adequate during key migration and spawning periods (Moyle et al. 2012). In a drier and warmer climate, in-stream habitat quality for fish will decline, especially fish that require cold water habitats, as water temperatures become warmer (Moyle et al. 2012).

This conservation strategy is intended to improve climate resiliency for Chinook salmon, steelhead, and green sturgeon by recommending the protection, enhancement, and restoration of rearing and migration habitat for the focal fish species to limit future habitat loss, and to improve juvenile survival during out-migration. The conservation strategy provides for the restoration of riparian habitat, particularly along fish-bearing streams, to increase shaded aquatic habitat. This will help to moderate water temperatures, which may help to maintain cooler water temperatures in changing climate conditions.

3.8.3 Giant Garter Snake

3.8.3.1 Context for a Regional Conservation Strategy

Giant garter snake inhabits irrigation and drainage canals, rice fields, marshes, sloughs, ponds, small lakes, low-gradient streams, and adjacent uplands (U.S. Fish and Wildlife Service 1999, 2012, 2017). Features of these habitats important to giant garter snakes include sufficient water during the snake's active season (early spring through mid-fall) to maintain an adequate prey base; emergent vegetation such as cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) for escape cover and foraging habitat; upland habitat with grassy banks and openings to waterside vegetation for basking; and adjacent upland areas for cover and refuge from floodwaters during the snakes' inactive season (Hansen 1980, 1988, Brode and Hansen 1992, Hansen and Brode 1993, U.S. Fish and Wildlife Service 2012). In rice fields and irrigation canals, giant garter snakes bask in openings in vegetation created by riprap placed around water control structures (Chapter 2, Section 2.9.2.7, *Giant Garter Snake* (Thamnophis gigas). Studies suggest that permanent wetlands with emergent vegetation harbor the greatest densities of giant garter snakes, and wetlands that do not provide water during giant garter snakes' active season (April to October) cannot support large populations of the giant garter snake (Wylie et al. 1997).

High densities of giant garter snake occur in the Sutter Bypass and Colusa Basin Drainage Canal and the protected wildlife refuges in the central and northern portion of the RCIS area (California Natural Diversity Database 2017). Agricultural wetlands and associated waterways adjacent to perennial wetland and areas supporting high densities of giant garter snake are of highest conservation priority in the RCIS area (U.S. Fish and Wildlife Service 2017b).

The following landscape and natural community objectives contribute to the conservation of giant garter snake in the RCIS area.

- *Objective HC1-1, Reestablish Landscape Connectivity,* will protect and maintain habitat connectivity within and between suitable habitat and associated uplands, facilitating dispersal between foraging, basking areas, uplands, and refugia, and facilitating genetic exchange within giant garter snake populations (California Department of Water Resources 2016).

- *Objective HC1-2, Maintain or Increase Natural Communities,* will restore freshwater emergent wetlands to maximize the long-term value of the habitat for giant garter snake populations.

- *Objective HC1-4, Maintain Heterogeneity within Agricultural Lands,* will facilitate dispersal and movement between and within agricultural uses, mainly rice fields with irrigation and drainage channels, by encouraging uses that are compatible with giant garter snake habitat (e.g., maintaining water in channels during the snake's active season, maintaining patches of fresh emergent wetland and grassland areas).

- *Objective IS1-1, Control Invasive Species,* will control invasive species to improve habitat suitability for giant garter snake by reducing non-native wildlife that could prey upon young giant garter snake, such as largemouth bass and American bullfrog. Invasive aquatic plants (e.g., water primrose), while providing cover for garter snake, can also impede movement through aquatic habitat if it becomes too dense. Consistent with this objective, non-native invasive plant species that degrade giant garter snake habitat or non-native wildlife species that prey on the giant garter snake should be controlled if monitoring determines that giant garter snake populations on managed lands are threatened by these factors.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change,* will provide for adaptive management of habitat across environmental gradients and to address threats from climate change.
- *Objective CA1-1, Encourage Habitat Values Incorporated with Agricultural Uses,* will encourage agricultural uses that are compatible with giant garter snake habitat such as rice fields with irrigation and drainage canals that maintain water during the snake's active season.
- *Objective CA1-2, Incorporate Habitat Features,* will enhance or maintain habitat features (e.g., providing sufficient water during the active season, providing basking sites) that are necessary for giant garter snake populations.
- *Objective FW1-1, Enhance, Restore, and Protect Freshwater Emergent Wetlands*, will manage, restore, and protect freshwater emergent wetlands that support giant garter snakes.

3.8.3.2 Conservation Goals and Objectives

Goal GGS-1. Conserve giant garter snake in the RCIS area, including segments of the Sutter Basin, Colusa Basin, and Butte Basin subpopulations, and connectivity between subpopulations.

Objective GGS1-1. Manage Large, Interconnected Blocks of Giant Garter Snake Habitat. Building upon existing protected lands for giant garter snake, increase the amount of protected (either permanently, or through a term agreement) and/or managed habitat for this species by 5%, including overwintering habitat, aquatic agricultural habitat (e.g., rice fields), upland movement, and aquatic natural habitat (e.g., wetlands). Measure progress towards achieving this objective in acres.

- ***Action GGS1.1-1.*** Work with willing landowners to protect and/or manage (i.e., with habitat enhancement actions) giant garter snake habitat.
- ***Action GGS1.1-2.*** Minimize or remove barriers to connectivity by creating under-crossings such as appropriately designed culverts that facilitate the movement and dispersal of snakes (California Department of Water Resources 2016).
- ***Action GGS1.1-3***. Create management agreements with willing landowners to implement habitat enhancement actions, including managing rice land and freshwater emergent wetlands to maintain or enhance habitat for giant garter snake (e.g., Natural Resources Conservation Service Wetland Reserve Program, Central Valley Habitat Exchange).
- ***Action GGS1.1-4.*** Encourage private landowners to voluntarily conduct agricultural practices in a way that minimizes impacts on giant garter snake, such as the following.

   - Perform no to minimal canal grading during the giant garter snake winter dormancy period (October 1 to March 15). If canal grading is necessary, operating equipment along the center of the canal is preferred, and grading along only one side is second best.
   - Maintain rice fields so that they will not overflow during winter events.
   - Conduct aboveground vegetation management during the giant garter snake's winter dormancy period.
   - Maintain areas where giant garter snakes can bask (i.e., areas with short, perennial grasses) adjacent to aquatic habitat.
- ***Action GGS1.1-5***. Maintain water levels in canals and ditches during the snake's active season (particularly during years when rice is fallowed) (California Department of Water Resources 2016).
- ***Action GGS1.1-6***. Work with willing landowners to fallow rice fields for short periods to flush contaminants and promote prey production (California Department of Water Resources 2016).
- ***Action GGS1.1-7.*** Collaborate with the California Climate Change Center to investigate the effects of climate change on the giant garter snake and its habitat. Information developed should, in part, inform development of adaptive management guidelines that should be implemented throughout the range of the giant garter snake (U.S. Fish and Wildlife Service 2017b).

Objective GGS1-2. Enhance Suitable Habitat for Giant Garter Snake in the Sutter Bypass. Improve habitat conditions in or adjacent to Sutter Bypass in the RCIS area in ways that are compatible with flood-control operations and maintenance. Measure progress towards achieving this objective in acres.

- ***Action GGS1.2-1.*** Strategically lower floodway elevations in the Sutter Bypass to form marshes and modify the floodway to achieve greater topographic and hydrologic diversity. Supporting a mosaic of marsh habitat and high-water refugia could create movement corridors, basking sites, and burrowing opportunities in close proximity to foraging sites.
- ***Action GGS1.2-2.*** Enhance habitat for giant garter snake in Sutter Bypass by incorporating freshwater emergent wetlands that support a suitable prey base, vegetation for cover from predators, and upland refugia, to provide expansive suitable habitat that mimics historical conditions (California Department of Water Resources 2016).
- ***Action GGS1.2-3.*** Maintain low-flow channels in Sutter Bypass to minimize invasive plants to provide suitable habitat and movement corridors for giant garter snake.

3.8.3.3 Conservation Priorities

- Prioritize protection and management of habitat in large blocks of contiguous habitat, especially where wetlands and rice lands are located within 5 miles of one another, to contribute to the habitat protection goals in the Giant Garter Snake Recovery Plan (U.S. Fish and Wildlife Service 2017b).
- Prioritize management of habitat for giant garter snake hydrologically connected to the Delevan NWR, Colusa NWR, and Sutter NWR in the RCIS area to expand functional habitat for protected populations (Chapter 2, Section 2.2.5.5, *Giant Garter Snake*).

- Prioritize protection or management of habitat for giant garter snake at a minimum of 0.25 mile from each bank along watercourses in the Colusa Basin to provide connectivity between existing populations of giant garter snake (U.S. Fish and Wildlife Service 2017b).
- Work with willing landowners to protect giant garter snake habitat in each management unit in the Colusa Basin Recovery Unit, which includes the Colusa Management Unit and the Delevan Management Unit in the RCIS area (U.S. Fish and Wildlife Service 2017b).
- Work with willing landowners to protect giant garter snake habitat in each management unit in the Sutter Basin Recovery Unit, which includes the Sutter Management Unit and the Robbins Management Unit in the RCIS area (areas within high flooding flows within the Sutter Bypass should be considered as unsuitable habitat) (U.S. Fish and Wildlife Service 2017b).
- Prioritize protection of habitat as a continuous corridor along the western bank (levee) of the Sutter Bypass out to a width of 0.5 mile from the bank to provide connectivity between northern and southern populations of giant garter snake (U.S. Fish and Wildlife Service 2017b).
- Integrate giant garter snake conservation and restoration activities with flood management actions (California Department of Water Resources 2016) where management actions provide a positive contribution to the conservation needs of giant garter snake. Integration activities can include preventing severe flooding of the Sutter Bypass during giant garter snake active season; preventing flooding from eliminating burrows in upland areas; constructing suitable upland habitat in areas that are not subject to frequent facility maintenance activities; and modifying floodplain topography by lowering floodway elevations on the Sutter Bypass and areas near the confluence of the Sacramento and Feather Rivers (Chapter 2, , Section 2.2.1.6, *Natomas Basin Habitat Conservation Plan* and Section 2.2.4.7, *Waterbird Habitat Enhancement Regional Conservation Partnership Program*).

3.8.3.4 Opportunities for Adaptation to Climate Change

Wright et al. (2013) assessed the conservation risk posed by climate change of 153 California reptile and amphibians species in California. Wright et al. created species distribution models to forecast the distribution of climatically suitable habitat under four future climate scenarios for 2050. They estimated the percentage of currently occupied localities remaining suitable in the future and the change in suitable area within currently occupied localities, and identified the species most and least vulnerable to climate shifting away from conditions that the species is known to tolerate. Vulnerability was calculated as the combined metric of numerous attributes, including sensitivity to climates, dispersal ability, and the distribution of available future habitat. They estimated that generally less than 100% but great than 80% of the current giant garter snake occurrences would persist through 2050, with a percent change of +20% to -20% of predicted suitable habitat within currently occupied habitat. Based on the models, giant garter snake falls between low to intermediate risk from climate change.

Apart from the modeling efforts by Wright et al. (2013), the potential effects of climate change on giant garter snake are poorly known, as focused research on the impacts of climate change and drought for giant garter snake is lacking (U.S. Fish and Wildlife Service 2017b). Action GGS1.1-7, seeks to inform future management actions to benefit giant garter snake in a changing climate by recommending collaborative efforts to investigate potential effects of climate change on giant garter snake.

Apart from the modeling efforts by Wright et al. (2013), the potential effects of climate change on giant garter snake are poorly known, as focused research on the impacts of climate change and drought for giant garter snake is lacking (U.S. Fish and Wildlife Service 2017b). Action GGS-10, seeks to inform future management actions to benefit giant garter snake in a changing climate by recommending collaborative efforts to investigate potential effects of climate change on giant garter snake.

Water availability is a critical part of the giant garter snake's ecological requirements, and water availability will likely change with a changing climate. Action GGS-9 recommends providing financial or regulatory incentives to private landowners on working lands to pump water into giant garter snake habitat during times of drought, as has been used elsewhere to provide aquatic habitat during droughts (Shuford 2017). In addition, many of the actions will protect and restore habitat and remove barriers to migration. This is also consistent with the Giant Garter Snake Recovery Plan (U.S. Fish and Wildlife Service 2017b), which states that preserved perennial marshes and rice lands must be maintained and host stable populations of giant garter snake during adverse climate conditions, such as drought and extreme temperatures.

3.8.4 Western Pond Turtle

3.8.4.1 Context for a Regional Conservation Strategy

Western pond turtle is found in a diversity of wetland and aquatic habitats, including rivers, streams, ponds, wetlands, reservoirs, and canals (Holland 1994, Jennings and Hayes 1994, Germano and Bury 2001, Thomson et al. 2016). Hatchling and young turtles (e.g., 1 year old) require areas with shallow water dominated by emergent aquatic reeds, such as *Juncus* (*Juncus* spp.) and sedge (*Carex* spp.) (Holland 1991). Western pond turtles use aquatic habitats primarily for foraging, thermoregulation, and avoidance of predators; they require emergent basking sites, and have been observed to avoid areas of open water lacking them (Holland 1994). Basking sites can include rocks, logs, or emergent vegetation, and are used by turtles for thermoregulation (Chapter 2, Section 2.9.2.8, *Western Pond Turtle* [Actinemys marmorata]).

There are two known occurrences of western pond turtle in the RCIS area, though western pond turtle may be present in other locations not yet surveyed. Within the RCIS area, protection and management of aquatic habitats including rivers, creeks, and wetlands with emergent basking sites and adjacent upland refugia and nesting sites is of highest priority.

The following landscape and natural community objectives contribute to the conservation of western pond turtle in the RCIS area.

- *Objective HC1-1, Reestablish Landscape Connectivity,* will provide for habitat connectivity, facilitating dispersal of western pond turtle populations in the RCIS area.
- *Objective HC1-3, Enhance Wildlife Permeability,* will enhance wildlife permeability across I-5, SR 20, SR 113, SR 45, and Princeton Road, and other potential barriers to dispersal. This objective provides for addressing conflicts related to roads and other human-made structures that could impede movement of western pond turtles.
- *Objective HC1-2, Maintain or Increase Natural Communities*, will provide for the restoration of habitat that will benefit western pond turtle populations.

- *Objective HC1-4, Maintain Heterogeneity within Agricultural Lands*, will promote agricultural uses that are compatible with western pond turtle habitat requirements and provide pond turtle habitat (patches of freshwater emergent wetland or upland basking areas) within the agricultural matrix where turtles occur in association with irrigation channels.
- *Objective IS1-1, Control Invasive Species,* will control non-native species, such as predatory bullfrog that prey upon hatchling western pond turtle.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change,* will provide for adaptive management to address emerging threats to western pond turtle from climate change and facilitate dispersal to new habitats in a changing climate.
- *Objective CA1-1, Encourage Habitat Values Incorporated with Agricultural Uses,* will provide patches of suitable western pond turtle habitat in the agricultural matrix.
- *Objective CA1-2, Incorporate Habitat Features,* encourages agricultural practices that provide habitat features for western pond turtle.
- *Objective RR1-1, Protect and Restore Riparian and Floodplains,* will provide protection and restoration of aquatic and adjacent upland habitat, and woody riparian vegetation that contributes basking and cover habitat to riverine systems.
- *Objective RR1-2, Maintain or Enhance Riparian Areas,* will maintain or improve habitat for western pond turtle in the RCIS area.
- *Objective FW1-1, Enhance, Restore, and Protect Freshwater Emergent Wetlands,* will manage, restore, and protect wetlands that support focal species, including western pond turtle.

3.8.4.2 Conservation Goals and Objectives

Goal WPT-1. Increase the distribution and abundance of western pond turtle in the RCIS area.

Objective WPT1-1. Protect and Enhance Habitat. Increase the amount of protected (either permanently, or through a term agreement) and/or managed western pond turtle habitat by 5% in the RCIS area. Measure progress towards achieving this objective in acres.

- ***Action WPT1.1-1.*** Work with willing landowners to protect, enhance, and restore western pond turtle habitat for western pond turtle, including freshwater emergent wetlands and habitat on working lands.
- ***Action WPT1.1-2.*** Add rocks and logs to aquatic habitat to provide basking sites and cover, as needed.

3.8.4.3 Conservation Priorities

- Work with willing landowners to protect known occurrences of western pond turtle in the RCIS area.
- Work with willing landowners to survey habitat for western pond turtle to identify areas to implement conservation and habitat enhancement actions to benefit this species.

3.8.4.4 Opportunities for Adaptation to Climate Change

Western pond turtle is sensitive to climate changes that degrade habitat (Wright et al. 2013, EcoAdapt 2017). These factors include the following, as summarized by EcoAdapt (2017).

- Changes to aquatic habitat availability and quality (Hallock et al. 2017).
- Increasing air temperatures, which can affect sex ratios, as the sex of developing embryos is determined by environmental temperature (Spinks et al. 2013).
- Increasing water temperature, which can accelerate growth rates, and alter western pond turtle behavior by reducing the need to bask (Hallock et al. 2017), as well as influence prey availability (Central Valley Landscape Conservation Project 2017).
- Increasing storm frequency and severity, which can affect flooding regimes and habitat quality (Hallock 2017).

Wright et al. (2013) assessed the conservation risk posed by climate change of 153 California reptile and amphibians species in California. Wright et al. created species distribution models to forecast the distribution of climatically suitable habitat under four future climate scenarios for 2050. They estimated the percentage of currently occupied localities remaining suitable in the future, the change in suitable area within currently occupied localities, and identified the species most and least vulnerable to climate shifting away from conditions that the species is known to tolerate. Vulnerability was calculated as the combined metric of numerous attributes including sensitivity to climates, dispersal ability, and the distribution of available future habitat. They estimated that generally less than 100% but greater than 80% of the current western pond turtle occurrences would persist through 2050, with a percent change of +20% to -20% of predicted suitable habitat within currently occupied habitat. Based on the models, western pond turtle is estimated to have a low to intermediate risk from climate change.

The overall intent of the conservation strategy for western pond turtle is to protect existing occurrences, enhance habitats to improve productivity, and protect and manage larger blocks of habitat so that individuals will have access to other habitat areas, should conditions at historical locations degrade and become unsuitable. In a warmer, drier climate, the quality and quantity of aquatic habitat may be diminished. Managed water regimes, particularly those associated with agriculture, could be adaptively managed to maintain aquatic habitats.

3.8.5 Swainson's Hawk

3.8.5.1 Context for a Regional Conservation Strategy

Swainson's hawk requires large, open landscapes that include suitable grassland or agricultural foraging habitat and sparsely distributed trees for nesting. Swainson's hawk usually nests in large, native trees such as valley oaks (*Quercus lobata*), cottonwoods (*Populus fremontia*), and willows (*Salix* spp.), although non-native trees such as eucalyptus (*Eucalyptus* spp.) are also used (Bechard et al. 2010). As Swainson's hawk commonly exhibit nest fidelity (i.e., the use of the same nest in subsequent years), the protection of nest sites is of high priority (Chapter 2, Section 2.9.2.9, *Swainson's Hawk* [Buteo swainsoni]).

Swainson's hawks benefit from a variety of cultivated agriculture crop types. South of the RCIS area in Yolo County, annually rotated irrigated cropland provides the bulk of suitable foraging habitat.

Agricultural uses that provide suitable foraging habitat include a mixture of alfalfa and other hay crops, grain, row crops, and lightly grazed pasture with low-lying vegetation that support adequate rodent prey populations (Estep 1989, Bechard et al. 2010). Alfalfa provides the highest value crop type for foraging habitat due to its more consistent vegetation structure, its semiperennial regime (typically 3 to 5 years between cultivation events), and its management (mowing and irrigating) that enhances prey accessibility (Estep 1989, 2009, Hartman and Kyle 2010). Other types, including irrigated pastures and dry pastures or grasslands, are also moderately suitable habitats for foraging. Perennial crop types, such as vineyards, orchards, and rice that do not support accessible prey receive significantly less use by Swainson's hawk (Estep 1989, Swolgaard et al. 2008) and are considered unsuitable.

The following landscape and natural community objectives contribute to the conservation of Swainson's hawk in the RCIS area.

- *Objective HC1-2, Maintain or Increase Natural Communities*, will restore natural communities that provide foraging and nesting habitat for Swainson's hawk.
- *Objective HC1-4, Maintain Heterogeneity within Agricultural Lands*, will incorporate patches of riparian and grasslands or other suitable Swainson's hawk habitat within the agricultural matrix.
- *Objective EP&C1-1, Improve Hydrologic and Geomorphic Processes,* will provide more active floodplain and riparian habitat, resulting in more and larger contiguous areas of riparian habitat, which in turn provides a buffer to Swainson's hawk nesting sites (California Department of Water Resources 2016).
- *Objective CC1-1, Increase Landscape Resilience to Climate Change, w*ill allow for Swainson's hawk to shift within environmental gradients in response to changing climate conditions, provide for adaptive management, and facilitate changes in the distribution of populations in response to changing climate conditions.
- *Objective CA1-1, Encourage Habitat Values Incorporated with Agricultural Uses,* will encourage agricultural uses that are compatible with Swainson's hawk, such as the cultivation of crops, such as alfalfa, that have high habitat value; provide foraging habitat during all stages of the breeding season; and time farming activities such as cultivating, disking, mowing, harvesting, and irrigating to increase foraging value.
- *Objective CA1-2*, *Incorporate Habitat Features,* will encourage the incorporation of a mosaic of suitable habitat elements that provides Swainson's hawk foraging and nesting habitat within working landscapes. Habitat elements could include features such as windrows of trees or clusters of trees in farmyards or at rural residences for nesting, and patches of grasslands or field crops for foraging opportunities, or other habitat elements within the agricultural matrix.
- *Objective GL1-1, Functional Grassland,* will increase the availability of Swainson's hawk foraging habitat and adequate prey accessibility on natural lands. Existing grassland habitats should be preserved.
- *Objective GL1.2, Burrowing Rodents,* will support Swainson's hawk prey abundance and accessibility.
- *Objective GL1-3, Grazing Regimes,* will maintain and enhance the grasslands that provide foraging habitat for Swainson's hawk.

- *Objective RR1-1, Protect and Restore Riparian and Floodplains,* will provide for protection and restoration of Swainson's hawk nesting habitat and larger riparian areas that provides disturbance buffers for nesting hawks (California Department of Water Resources 2016).
- *Objective RR1-2, Maintain or Enhance Riparian Habitat,* will improve existing nesting habitat for Swainson's hawk.

3.8.5.2 Conservation Goals and Objectives

Goal SWHA-1. Conserve Swainson's hawks in the RCIS area.

Objective SWHA1-1. Manage Natural and Agricultural Habitat to Benefit Swainson's Hawk. Increase the amount of protected (either permanently, or through a term agreement) and/or managed Swainson's hawk habitat by 5% in the RCIS area. Measure progress towards achieving this objective in acres.

- ***Action SWHA1.1-1.*** Work with willing landowners to protect Swainson's hawk foraging habitat in regions of the RCIS area that support the bulk of the nesting population in the RCIS area.
- ***Action SWHA1.1-2.*** Encourage private landowners to voluntarily manage working lands to support Swainson's hawk foraging habitat (e.g., planting alfalfa, irrigated pasture, and low-height row crops that provide high-quality foraging habitat) and nest trees**.** Crop types should be monitored and rotated regionally, to provide adequate quantities of foraging habitat to support the population of Swainson's hawk at the scale of the RCIS area (California Department of Water Resources 2016).
- ***Action SWHA1.1-3.*** Work with willing landowners to increase the amount and extent of suitable foraging habitat by restoring grasslands (California Department of Water Resources 2016).

Objective SWHA1-2. Maintain/Enhance the Density of Swainson's Hawk Nest Trees. Maintain or enhance the density of Swainson's hawk nest trees within foraging habitat to provide a density of one tree or clump of trees suitable for Swainson's hawk nesting per 10 acres of cultivated lands (ICF 2018). Where existing protected habitats have a lower density of nest trees, plant suitable nest trees or clumps of trees to meet this density. Measure progress towards achieving this objective in the amount of foraging habitat with suitable nesting trees or nesting habitat.

- ***Action SWHA1.2-1.*** Plant and maintain suitable nest trees or clumps of nest trees, where feasible (California Department of Water Resources 2016) (preferably native trees that grow to over 20 feet in height), on foraging habitat, that maintains consistency with the landscape and soils. For example, in a vernal pool grassland prairie, trees along watercourses and roads should be consistent with historic landscape patterns to increase likelihood of tree survival and regeneration (Stillwater Sciences et al. 2017).

3.8.5.3 Conservation Priorities

- Prioritize protection of nest trees that have supported an active nest in the past 5 years and are still structurally viable.
- Prioritize protection and management of foraging habitat within 10 miles of active nest sites.
- Offer financial and regulatory incentives to willing landowners to grow crops that provide foraging habitat for Swainson's hawk, with a priority of increasing the extent of alfalfa over other crop types. Large, contiguous patches of habitat are preferred over fragmented habitats

(Stillwater Sciences, Environmental Defense Fund, Trout Unlimited, and Point Blue 2017) (Chapter 2, Section 2.9.2.9, *Swainson's Hawk* [*Buteo swainsoni*]).

- Integrate conservation and restoration actions with flood management actions that provide a positive contribution towards the conservation of the Swainson's hawk, facilitate riparian habitat restoration after floodway maintenance by planting native vegetation after sediment removal to enrich habitat diversity and thus prey assemblage (California Department of Water Resources 2016).

3.8.5.4 Opportunities for Adaptation to Climate Change

Gardali et al. (2012) ranked the climate vulnerability of 358 California bird species (Climate Vulnerability Assessment). Those rankings were based on the exposure and sensitivity that a species has to climate change. Exposure to climate change was based on expected changes in habitat suitability, changes in food availability, and exposure to extreme weather. Sensitivity to climate change was based on a species' habitat specialization, physiological tolerance, migratory status, and dispersal ability. Analyses were only conducted on the portion of a species' life history spent in California. In that assessment, Climate Vulnerability Scores ranged from 12 to 72, with a median score of 24. All species with a score of 30 or higher (128 species) were considered prioritized taxa and given a ranking of low, moderate, or high vulnerability to climate change (Table 3-5).

Swainson's hawk was given a score of 42 and moderate climate priority in the Climate Vulnerability Assessment (Gardali et al. 2012) and was therefore considered a priority with respect to climate vulnerability. Swainson's hawk is vulnerable to the effects of climate change due to an expected loss of nesting habitat in the Central Valley, loss of foraging habitat to urban development and to conversion to unsuitable agricultural practices, and a potential increase in exposure to extreme weather events because it is a long-distance migrant.

Table 3-5. Climate Vulnerability Scoring for Swainson's hawk, as Described in Gardali et al. (2012)[1]

Criteria	Score[2, 3]
Exposure	
Habitat suitability	3 – high; habitat suitability is expected to decrease by >50%
Food availability	1 – low; food availability for taxon would be unchanged or increase
Extreme weather	2 – moderate; taxon is expected to be exposed to some increase in extreme weather events
Sensitivity	
Habitat specialization	2 – moderate; taxon that tolerates some variability in habitat type or element
Physiological tolerance	1 – low; minimal or no evidence of physiological sensitivity to climatic conditions
Migratory status	3 – high; long-distance migrants (migrates at least to the neotropics)
Dispersal ability	1 – low; taxa with high dispersal ability

[1] Additional information about species scoring, including the database of scores is located here: http://data.prbo.org/apps/bssc/index.php?page=climate-change-vulnerability
[2] Scores range from 1 to 3; generally low, medium, and high
[3] Climate vulnerability score = sum of exposure score X sum of sensitivity score

With a changing climate, habitat distributions will likely shift for many organisms. Using climate modeling approaches and multi-sourced bird data, Point Blue Conservation Science created a mapping tool to predict current (1971 to 2000) and projected (2038 to 2070) bird species distribution for California terrestrial breeding bird species (Point Blue Conservation Science and California Department of Fish and Wildlife 2011). Models predict that the probability of Swainson's hawk occurrence in the RCIS area could decrease over time (Point Blue Conservation Science and California Department of Fish and Wildlife 2011) and with a range contraction across the western U.S. (National Audubon Society 2015). The models predict a significant decrease in probability of occurrence throughout the RCIS area, from 60 to 80% currently, around the confluence of Sacramento and Feather River, Knights Landing, and along the Sacramento River north to Colusa to an overall probability of occurrence in the future of 0 to 20%.

The overall intent of the conservation strategy for Swainson's hawk is to stabilize the current population of Swainson's hawk in the RCIS area through the protection of existing nesting and foraging habitat. Increasing the availability of habitat facilitates the movement of Swainson's hawks from current habitat to more suitable habitat under changing climate conditions. Historically, Swainson's hawk occupied large grassland and shrubstep habitats in California (Woodbridge 1998); protecting natural habitat will provide Swainson's hawks with foraging habitat in the RCIS area that is not subject to variation as a result of changing agricultural crop patterns. Swainson's hawks have also successfully adapted to certain agricultural landscapes. With a decrease in water availability, and a potential decrease in the profitability of some crop types (e.g., alfalfa), agricultural practices and land uses may change. Loss of foraging habitat in the RCIS area would make nesting attempts less successful. The conservation strategy recommends creating incentive programs to encourage private landowners to plant good forage crops, which could help to offset these effects.

3.8.6 Tricolored Blackbird

3.8.6.1 Context for a Regional Conservation Strategy

Tricolored blackbird colonies breed in freshwater marsh dominated by cattails and bulrushes, and in other flooded or thorny vegetation such as willows, blackberries, thistles, or nettles at or near open and accessible water. The species will also use agricultural fields, such as silage and grain fields, for nesting, though in the RCIS area most colonies nest in cattails and other substrates in freshwater emergent wetlands (University of California, Davis 2017). Tricolored blackbird breeding colonies have been reported throughout most of the RCIS area (University of California, Davis 2017); however, because the distribution and abundance of breeding colonies varies annually, the current breeding population at a given colony site may be small or absent. Therefore, currently unoccupied colony sites that provide suitable habitat characteristics retain conservation value as sites that may be used in the future (Chapter 2, Section 2.9.2.10, *Tricolored Blackbird* [Agelaius tricolor]).

Most nesting habitat in the RCIS area (i.e., freshwater emergent wetlands) is already protected (87%; Table 3-3) and managed to some extent to provide habitat values. Because a large proportion of freshwater emergent wetland in the RCIS area is already protected (Appendix E, *Focal Species Habitat Models*, Figure E-10), the conservation strategy prioritizes protection of recently occupied, unprotected colony sites, and management of foraging habitat on agricultural lands near colony sites.

Tricolored blackbirds need suitable foraging habitat within a few miles of the nesting colony (Orians 1961, Beedy and Hamilton 1997). Tricolored blackbird will forage in annual grasslands, dry vernal pools and other seasonal wetlands, agricultural fields, cattle feedlots, and dairies. For the conservation of tricolored blackbird in the RCIS area, protection and management of the habitats described above, including current and past colony sites, is of highest priority.

The following landscape and natural community objectives contribute to the conservation of Tricolored blackbird in the RCIS area.

- *Objective HC1-2, Maintain or Increase Natural Communities,* will improve foraging and nesting habitat suitability for tricolored blackbirds.
- Objective HC1-4, *Maintain Heterogeneity within Agricultural Lands*, will incorporate patches of freshwater emergent wetland and other suitable tricolored blackbird habitat within the agricultural matrix and on agricultural lands where the species forages.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change*, will provide adaptive management of the species to address stressors of climate change on tricolored blackbird and allows movement across environmental gradients.
- *Objective CA1-1, Encourage Habitat Values Incorporated with Agricultural Uses,* will provide the opportunity to incorporate elements of tricolored blackbird nesting and/or foraging habitat needs into the working landscape.
- *Objective CA1-2, Incorporate Habitat Features,* will incorporate elements of tricolored blackbird nesting and or foraging habitat needs into the working landscape.
- *Objective GL1-1, Functional Grassland*, will increase the availability of foraging habitat.
- Objective FW1-1, Enhance, Restore, and Protect Freshwater Emergent Wetlands, will manage, restore, and protect nesting and roosting habitat for tricolored blackbirds.

3.8.6.2 Conservation Goals and Objectives

Goal TRBL-1. Conserve tricolored blackbird populations in the RCIS area.

Objective TRBL1-1. Protect Nesting and Foraging Habitat and Nest Colonies. Increase the amount of protected (either permanently, or through a term agreement) and/or managed tricolored blackbird nesting and foraging habitat by 5%, prioritizing areas supporting active and recently active nesting colonies. Measure progress towards achieving this objective in acres and/or number of active tricolored blackbird colonies.

- ***Action TRBL1.1-1.*** Work with willing landowners to protect unprotected tricolored blackbird colony sites in the RCIS area.
- ***Action TRBL1.1-2.*** Work with willing landowners to protect tricolored blackbird nesting habitat and foraging habitat within 3 miles of occupied or recently occupied (within the last 15 years) colony sites.

Objective TRBL1-2. Manage and Enhance Tricolored Blackbird Habitat. Increase the amount of wetland nesting habitat and foraging habitat managed to benefit tricolored blackbird in the RCIS area. Measure progress towards achieving this objective in acres and/or number of active tricolored blackbird colonies

- ***Action TRBL1.2-1.*** Nesting habitat: Management and enhancement of tricolored blackbird nesting habitat should be consistent with the recommendations provided by Kyle (2011). The following criteria will guide management of emergent wetland habitat to benefit tricolored blackbird.
  - Burn, mow, or disc bulrush/cattail vegetation every 2 to 5 years, as needed, to remove dead growth and encourage the development of new vegetative structure.
  - Maintain large continuous stands of bulrush/cattail that are at least 30 to 45 feet wide to provide adequate space for breeding as well as protection from predators.
  - Provide a 50:50 to 60:40 ratio of bulrush/cattail marsh to open water in areas intended to support tricolored blackbird nesting.
- ***Action TRBL1.2-2.*** Foraging habitat: Work with willing landowners to encourage planting agricultural areas with cover strips and hedgerows to provide habitat to increase prey (insect) abundance for tricolored blackbird. Where possible, plant in high- and very high-value crop types, as defined below. Crop types have foraging habitat values for tricolored blackbird as follows (natural lands are not listed below) (Meese pers. comm. 2013, as cited in the Yolo Habitat Conservation Plan/Natural Community Conservation Plan [ICF 2018]).
  - Very high value: Native pasture.
  - High value: alfalfa, sunflower, mixed pasture.
  - Medium value: Fallow lands cropped within 3 years, new lands prepared for crop production.
  - Low value: Mixed grain and hay crops.
  - Marginal value: Rice.

3.8.6.3 Conservation Priorities

- Prioritize recently occupied nest colony sites for protection.
- Prioritize landscape level management of foraging habitat in agricultural lands within foraging range (e.g., 3 miles [Orians 1961, Beedy and Hamilton 1997]) of occupied or recently occupied (e.g., within the last 15 years) nesting tricolored blackbird habitat (California Department of Fish and Wildlife 2018f) (Chapter 2, Section 2.9.2.10, *Tricolored Blackbird* [Agelaius tricolor]).

3.8.6.4 Opportunities for Adaptation to Climate Change

The Climate Vulnerability Assessment gave tricolored blackbird a score of 25, and the species is not considered a priority with respect to climate vulnerability (Table 3-6) (Gardali et al. 2012). Despite the assessment that tricolored blackbird may not be among the most vulnerable bird species to climate change, water availability and precipitation is predicted to decrease in the future, likely reducing fresh emergent wetlands throughout California (PRBO Conservation Science 2011). In the RCIS area, a reduction of fresh emergent wetlands would result in a reduction in the nesting and foraging habitats that the tricolored blackbird relies upon.

Table 3-6. Climate Vulnerability Scoring for Tricolored Blackbird as Described in Gardali et al. (2012)[1]

Criteria	Score[2, 3]
Exposure	
Habitat suitability	2 – moderate; habitat suitability is expected to decrease by 10–50%
Food availability	1 – low; food availability for taxon would be unchanged or increase
Extreme weather	2 – moderate; taxon is expected to be exposed to some increase in extreme weather events
Sensitivity	
Habitat specialization	2 – moderate; taxon that tolerates some variability in habitat type or element
Physiological tolerance	1 – low; minimal or no evidence of physiological sensitivity to climatic conditions
Migratory status	1 – low; year-round resident
Dispersal ability	1 – low; taxa with high dispersal ability

1 Additional information about species scoring, including the database of scores is located here: http://data.prbo.org/apps/bssc/index.php?page=climate-change-vulnerability
2 Scores range from 1 to 3; generally low, medium, and high
3 Climate vulnerability score = sum of exposure score X sum of sensitivity score

Marshes with emergent wetland are the primary breeding habitat in the RCIS area for tricolored blackbird; freshwater emergent wetlands could become more ephemeral under drier conditions, reducing the availability of nesting habitat. Climate change may also alter wetland recharge, with consequent changes in plant communities, and changes in the abundance of prey, further stressing the blackbirds. With drier conditions and increasing water demands, land use and agricultural practices are likely to change; for example, the extent of ricelands in the RCIS area, which are abundant in insects, may be reduced. Extreme weather, including flooding, wind, and severe spring storms, may cause the mass mortality of nests, reducing or eliminating colony reproductive success.

With a changing climate, habitat distributions will likely shift for many organisms. Models of future habitat distributions under climate change scenarios predict that the probability of tricolored blackbird occurrence in the RCIS area would decrease over time (Point Blue Conservation Science and California Department of Fish and Wildlife 2011). Regionally, the models predict a decreased distribution throughout the Sacramento Valley, with a range shift into the foothills east of the RCIS area and into parts of the Coast Range west of the RCIS area. Audubon's Climate Report similarly predicts that tricolored blackbird's range will likely decrease in the Central Valley, shifting to the hills of the Coast Range by 2080 (National Audubon Society 2015).

Strategies to mitigate the effects of climate change on tricolored blackbird populations in the RCIS area include maintaining the resilience of their foraging and nesting habitats by reducing stressors that potentially interact with climate change and magnify its impact. The conservation strategy emphasizes the protection of active colony sites and adjacent foraging habitat to maintain populations that can shift to new areas under a changing climate. The conservation strategy also seeks to increase and restore areas of protected freshwater emergent wetland, which will serve to maintain, if not expand, functional nesting habitat for tricolored blackbird in the RCIS area and buffer existing tricolored blackbird populations from climate change stressors. The conservation strategy also recommends monitoring the quality of functional habitat in the RCIS area to adaptively manage land uses and management actions to adapt to changing environmental conditions.

3.8.7 Western Yellow-Billed Cuckoo

3.8.7.1 Context for a Regional Conservation Strategy

Western yellow-billed cuckoo nesting pairs have been reported in the northern and eastern portions of the RCIS area along the Sacramento River, Butte Creek, Feather River, and Sutter Bypass. Suitable habitat for western yellow-billed cuckoo consists of large blocks of riparian habitat, particularly cottonwood-willow riparian woodland. Western yellow-billed cuckoos are most likely found in patches of willow-cottonwood riparian habitat greater than 200 acres in size (Halterman et al. 2015), though patches greater than at least 25 acres and 330 feet wide can be large enough to support nesting yellow-billed cuckoo (Gaines 1974, Laymon and Halterman 1989) (Chapter 2, Section 2.9.2.11, *Yellow-Billed Cuckoo, Western U.S. Distinct Population Segment* [Coccyzus americanus occidentalis]).

Conversion of riparian habitat to agricultural uses, among others, in the RCIS area and the greater Sacramento Valley has greatly reduced the historic extent of riparian habitat. In the RCIS area, the majority of western yellow-billed cuckoo habitat is located along the Sacramento River and Butte Creek in the north of RCIS area, and along the Sutter Bypass (Appendix E, *Focal Species Habitat Models*, Figure E-11). Because of relative scarcity of western yellow-billed cuckoo habitat in the RCIS area, the conservation strategy focuses on protecting large patches of riparian habitat, and expanding patches by restoring riparian habitat.

The following landscape and natural community objectives contribute to the conservation of yellow-billed cuckoo in the RCIS area.

- *Objective HC1-1, Reestablish Landscape Connectivity,* will conserve large interconnected areas to reconnect and expand large habitat patches.
- *Objective HC1-2, Maintain or Increase Natural Communities,* will benefit western yellow-billed cuckoo by increasing available habitat, expanding habitat patches, and reducing habitat fragmentation.
- *Objective IS1-1, Control Invasive Species,* will facilitate growth of native vegetation that contributes to riparian structural diversity, and removes invasive plants (e.g., Himalayan blackberry) that may degrade structural components of riparian habitat.
- *Objective CC1-1, Increase Landscape Resilience to Climate Change,* will provide for adaptive management to address climate change-related stressors on western yellow-billed cuckoo habitat.
- *Objective RR1-1, Protect and Restore Riparian and Floodplains,* will protect and restore western yellow-billed cuckoo habitat.
- *Objective RR1-2, Maintain or Enhance Riparian Habitat,* will improve yellow-billed cuckoo habitat by enhancing the structural complexity of riparian vegetation.

3.8.7.2 Conservation Goals and Objectives

Goal WYBC-1. Increase the population size of breeding western yellow-billed cuckoo in the RCIS.

Objective WYBC1-1. Protection and Restoration of Western Yellow-billed Cuckoo Habitat. Increase the amount of western yellow-billed cuckoo habitat protected (either permanently, or through a term agreement) in the RCIS area by 5% by protecting (either permanently, or through a term agreement), enhancing, or restoring valley foothill riparian (Riparian Habitat Joint Venture 2004). Measure progress towards achieving this objective in acres.

- ***Action WYBC1.1-1.*** Work with willing landowners to protect western yellow-billed cuckoo habitat.
- ***Action WYBC1.1-2.*** Work with willing landowners to restore patches of riparian habitat, ideally greater than 100 acres in size (with a goal to restore patches greater than 200 acres) and 660 feet in width, to provide high-quality habitat for western yellow-billed cuckoo where there is potential for occupancy (California Department of Water Resources 2016). Restored patches should be adjacent to or connected to existing nesting habitat to support populations of western yellow-billed cuckoos, where possible.
- ***Action WYBC1.1-3.*** Consider habitat needs for western yellow-billed cuckoo when designing riparian restoration projects to expand and connect existing riparian patches, and maintain mature riparian forest intermixed with early- to mid-successional riparian vegetation**.**
- ***Action WYBC1.1-4.*** Work with willing landowners to restore upland habitat adjacent to riparian areas. These areas also provide flood refugia and in wet years western yellow-billed cuckoo forages in upland areas for its prey base until the prey base in the lower floodplain recovers (Riparian Habitat Joint Venture 2004).
- ***Action WYBC1.1-5.*** Design restoration projects to include cottonwoods, willows, and other riparian plant species to provide greater than 40% canopy closure, with a mean canopy height of approximately 23 to 33 feet (Laymon 1998, Riparian Habitat Joint Venture 2004).

3.8.7.3 Conservation Priorities

- Prioritize protection of large, occupied riparian patches (i.e., at least 25 acres and 330 feet wide) (Chapter 2, Section 2.9.2.11, Yellow-Billed Cuckoo, Western U.S. Distinct Population Segment [*Coccyzus americanus occidentalis*]).
- Prioritize riparian restoration projects in sites that will expand and connect occupied riparian patches, in a way compatible with flood-control facilities.
- Integrate conservation and restoration actions with flood-management actions that would provide a positive contribution to the conservation needs of western yellow-billed cuckoos. Actions may include altering floodway vegetation maintenance activities in the Sacramento and Feather Rivers where western yellow-billed cuckoo nests (California Department of Water Resources 2016).
- Prioritize levee and revetment removal and setback levees in areas adjacent to existing western yellow-billed cuckoo habitat in the Feather and Sacramento Rivers and near the confluence of these two rivers. Within the RCIS area, levee and revetment removal between river mile 80 and river mile 164.5 has the greatest potential to maintain large patches of suitable habitat for western yellow-billed cuckoo due to this section of the Sacramento River already containing

sections with setback levees, eroding banks, and point bars that function normally. By removing further levee revetment, larger and more contiguous habitat patches would become available to yellow-billed cuckoo (California Department of Water Resources 2016).

3.8.7.4 Opportunities for Adaptation to Climate Change

The Climate Vulnerability Assessment gave western yellow-billed cuckoo a score of 40 (Table 3-7), and the species is considered a moderate priority with respect to climate vulnerability (Gardali et al 2012). The species is vulnerable to the effects of climate change due to its high degree of habitat specialization and expected change in habitat suitability along rivers in the RCIS area, with a potential increase in exposure to extreme weather events because it is a long-distance migrant. Climate change may also alter the plant species composition and humidity of riparian forests over time and decrease riparian cover which could affect the quality of nesting habitat. Altered climate conditions may also change food availability for western yellow-billed cuckoo if timing of peak insect emergence changes in relation to when the birds arrive on their breeding grounds.

Table 3-7. Climate Vulnerability Scoring for Western Yellow-billed Cuckoo as Described in Gardali et al. (2012)[1]

Criteria	Score[2, 3]
Exposure	
Habitat suitability	2 – moderate; habitat suitability is expected to decrease by 10–50%
Food availability	1 – low; food availability for taxon would be unchanged or increase
Extreme weather	2 – moderate; taxon is expected to be exposed to some increase in extreme weather events
Sensitivity	
Habitat specialization	3 – high; taxon that use only specific habitat types or elements
Physiological tolerance	1 – low; minimal or no evidence of physiological sensitivity to climatic conditions
Migratory status	3 – high; long-distance migrants (migrates at least to the neotropics)
Dispersal ability	1 – low; taxa with high dispersal ability

1 Additional information about species scoring, including the database of scores is located here: http://data.prbo.org/apps/bssc/index.php?page=climate-change-vulnerability
2 Scores range from 1 to 3; generally low, medium, and high
3 Climate vulnerability score = sum of exposure score X sum of sensitivity score

With a changing climate, habitat distributions will likely shift for many organisms. Models used to predict future habitat distribution affected by climate change predict that the probability of yellow-billed cuckoo occurrence in the RCIS area could increase over time (Point Blue Conservation Science and California Department of Fish and Wildlife 2011). Models predict an increased probability of occurrence over a larger area, with a higher probability (60 to 80%, up from 40 to 60%) along the Sacramento River to the northern portion of the RCIS area, the lower portion of the Colusa Basin Drainage Canal, and around the confluence of the Sacramento and Feather Rivers; models also predict an increased probability for occurrence around Arbuckle and Williams northward to Maxwell. Overall, the models predict increased overall probability of western yellow-billed cuckoo occurrence along riparian corridors in the Sacramento Valley. If this RCIS's conservation goals and objectives are achieved, landscapes with large, interconnected riparian woodland will provide opportunities for western yellow-billed cuckoo to shift and expand its distribution in the RCIS area.

3.8.8 Bank Swallow

3.8.8.1 Context for a Regional Conservation Strategy

Bank swallows are colonial nesters, nesting in cavities in the banks of primarily the Sacramento River and Feather River in the RCIS area (Appendix E, *Focal Species Habitat Models*, Figure E-12) (Chapter 2, Section 2.9.2.12, *Bank Swallow* [Riparia riparia]). The loss of nesting habitat along the Sacramento River, including in the RCIS area, due to bank protection and flood-control projects (Garrison et al. 1987) is a primary cause for population declines. Protecting channel banks from anthropogenic alterations (predominantly bank stabilization and rip-rapping) will ensure that natural processes of bank habitat creation continue, and bank swallow nesting habitat is maintained.

Habitat formation and degradation is a natural process of stream bank cutting and channel erosion and deposition. Restoring natural bank-forming processes by removing rip-rap, where feasible and without affecting flood safety, will help to restore nesting habitat. Protecting channel banks that support suitable bank swallow nesting substrate and channel banks that are actively eroding will help ensure the continued availability of nesting habitat to support the existing breeding population. Because habitat formation is a dynamic process, with the location of suitable bank habitat changing over time as rivers meander, tools other than permanent protection should be considered for protecting suitable nesting habitat. For example, durability agreements that last long enough to protect ephemeral habitat (e.g., 20 years), but without permanent protection could be used.

Bank swallows also depend on floodplains, which provide foraging habitat and erode to form steep cut-banks. The Bank Swallow Technical Advisory Committee recommends management of floodplains supporting bank swallow to promote open grass and forb vegetation, including management actions that stimulate new plant growth and reduce invasive plant species to enhance production of insects that provide high-value food for bank swallows (Bank Swallow Technical Advisory Committee 2013).

The following landscape and natural community objectives contribute to the conservation of bank swallow in the RCIS area.

- *Objective HC1-1, Reestablish Landscape Connectivity,* will provide conservation of large interconnected habitat areas, including valuable floodplain foraging habitat.
- *Objective EP&C1-1, Improve Hydrologic and Geomorphic Processes,* will restore natural fluvial processes to improve habitat conditions, such as eroding banks that provide vertical banks necessary for the creation of nesting cavities, except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- *Objective IS1-1. Control Invasive Species,* will control invasive vegetation that outcompetes native vegetation (grasses and forbs) which provide higher-value foraging habitat for bank swallow (Bank Swallow Technical Advisory Committee 2013).
- *Objective CC1-1, Increase Landscape Resilience to Climate Change,* will provide adaptive management to address threats to bank swallow from climate change.

- *Objective RR1-1, Protect and Restore Riparian and Floodplains,* will protect and restore bank swallow foraging habitat and adjacent bank nesting habitat (California Department of Water Resources 2016).
- *Objective RR1-2, Maintain or Enhance Riparian Habitat,* will enhance bank swallow habitat.
- *Objective RR2-1, Maintain and/or Restore Fluvial Equilibrium,* will maintain or improve processes that provide nesting habitat for bank swallows.

3.8.8.2 Conservation Goals and Objectives

Goal BASW-1. Increase the population size of bank swallows in the RCIS area.

Objective BASW1-1. Protection and Restoration of Nesting Habitat. Increase the amount of bank swallow nesting habitat protected along the Sacramento River, Feather River, and Butte Creek, by 5% by protecting (either permanently, or through a term agreement) and/or restoring bank swallow nesting habitat. Measure progress towards achieving this objective in miles of bank nesting habitat.

- ***Action BASW1.1-1.*** Work with willing landowners to protect areas with bank swallow colonies and banks suitable for nesting (Bank Swallow Technical Advisory Committee 2013), either permanently, or with durability agreements, with appropriate length of the agreement informed by river meander models.
- ***Action BASW1.1-2.*** Use river meander modeling to help identify areas that may become suitable nesting habitat in the future, to locate areas for possible protection. Work with willing landowners to protect potential habitat either permanently, or with durability agreements, with appropriate length of the agreement informed by meander models.
- ***Action BASW1.1-3.*** Protect natural channel banks from anthropogenic alterations (predominantly bank stabilization and rip-rapping), except as otherwise prohibited by state and federal laws and regulations related to flood-control infrastructure protection.
- ***Action BASW1.1-4.*** Remove unnecessary rip-rap on the banks of the Sacramento River, Feather River, and Butte Creek through the use of setback levees and riverine meander belt, where feasible and without affecting flood safety (California Department of Water Resources 2016).
- ***Action BASW1.1-5.*** Avoid degrading bank swallow habitat when vegetating banks to restore riparian habitat to provide shaded riverine habitat for fish.
- ***Action BASW1.1-6.*** Promote scouring and flooding to create banks that provide suitable nesting habitat.

Objective BASW1-2. Manage and Enhance Habitat. Manage and enhance bank swallow foraging habitat. Measure progress towards achieving this objective in acres of managed and enhanced foraging habitat.

- ***Action BASW1.2-1.*** Work with willing landowners to promote open grass and forb vegetation along floodplains for bank swallow foraging habitat (Bank Swallow Technical Advisory Committee 2013).
- ***Action BASW1.2-2.*** Work with willing landowners to control invasive plant species. The Bank Swallow Technical Advisory Committee (2013) recommends that foraging habitat for bank

swallows be restored by supporting open grassland and wildflower vegetation through management actions that reduce invasive plant species (e.g., actions described under *Objective IS1.1, Control Invasive Species*).

3.8.8.3 Conservation Priorities

- Focus restoration efforts in areas where dynamic fluvial processes are still intact, and where connectivity can be established with adjacent intact habitat (Chapter 2, Section 2.2.5.6, *Bank Swallow*).
- Work with willing landowners to protect sites with active colonies and use river meander modeling to help identify for protection potential bank areas that may be colonized by bank swallows in the future habitat (Chapter 2, Section 2.2.5.6, *Bank Swallow*).

3.8.8.4 Opportunities for Adaptation to Climate Change

The Climate Vulnerability Assessment gave bank swallow a score of 32 (Table 3-8), and the species is considered a low priority with respect to climate vulnerability (Gardali et al. 2012). Bank swallow is vulnerable to the effects of climate change due to its high degree of habitat specialization (i.e., nesting in banks) and an expected decrease of habitat along all major rivers in the RCIS area. Already limited breeding habitat could be further stressed under hotter and drier conditions, and lower river levels could affect river meandering processes that create and erode banks. An increase in the incidence of extreme weather events, such as those that cause flooding or high-flows that flood nest colonies, could also affect bank swallow populations.

Table 3-8. Climate Vulnerability Scoring for Bank Swallow as Described in Gardali et al. (2012)[1]

Criteria	Score[2, 3]
Exposure	
Habitat suitability	2 – moderate; habitat suitability is expected to decrease by 10–50%
Food availability	1 – low; food availability for taxon would be unchanged or increase
Extreme weather	1 – low; no evidence that taxon would be exposed to more frequent or severe extreme weather events
Sensitivity	
Habitat specialization	3 – high; taxon that use only specific habitat types or elements
Physiological tolerance	1 – low; minimal or no evidence of physiological sensitivity to climatic conditions
Migratory status	3 – high; long-distance migrants (migrates at least to the neotropics)
Dispersal ability	1 – low; taxa with high dispersal ability

[1] Additional information about species scoring, including the database of scores is located here: http://data.prbo.org/apps/bssc/index.php?page=climate-change-vulnerability
[2] Scores range from 1 to 3; generally low, medium, and high
[3] Climate vulnerability score = sum of exposure score X sum of sensitivity score

With a changing climate, habitat distributions will likely shift for many organisms. Models of future habitat distributions under climate change scenarios predict that the probability of bank swallow occurrence in the RCIS area would decrease over time (Point Blue Conservation Science and California Department of Fish and Wildlife 2011) and the species may shift its range northward

(National Audubon Society 2015). Models predict significant decrease in probability of occurrence throughout the RCIS area, down from 60 to 80% along the Sacramento River and areas north of Williams east to Colusa, to an overall 0 to 20% probability of occurrence. Pockets of habitat may remain, with a 20 to 40% probably of occurrence in the northern portion of the RCIS area north of Colusa along the Sacramento River, along Butte Creek, and near the confluence of the Feather and Sacramento River.

This RCIS provides opportunities for adaptation to climate change by promoting the protection of existing bank swallow habitat from future habitat loss. The conservation strategy also promotes the improvement of hydrologic and geomorphic processes (Objective EP&C1-1, *Improve Hydrologic and Geomorphic Processes*), which could expand available nesting habitat in a changing climate. The conservation strategy promotes landscape and natural community resilience to climate change by restoring degraded areas to desired habitat conditions (Objective HC1-2, *Maintain or Increase Natural Communities*), maintaining those habitat values under changing climate, and incorporating redundancies into RCIS area landscapes (*Objectives RR1-1, Protect and Restore Riparian and Floodplains,* RR1-2, *Maintain or Enhance Riparian Habitat*, and CC1-1, *Increase Landscape Resilience to Climate Change*); these actions support future habitat needs and allow bank swallow the opportunity to move from one refuge to another as climate conditions change.

3.9 Consistency with Approved Recovery Plans and Conservation Strategies

3.9.1 Approved Recovery Plans

California Fish and Game Code 1852(c)(10) states that an RCIS shall have "Provisions ensuring that the strategy is consistent with and complements any administrative draft natural community conservation plan, approved natural community conservation plan, or federal habitat conservation plan that overlaps with the strategy area."

There are no available administrative draft NCCPs or approved NCCPs that overlap with the strategy area, and no approved federal habitat conservation plan that overlaps with the RCIS area (Chapter 2, Section 2.2.1, *Natural Community Conservation Plans and Habitat Conservation Plans in and Adjacent to the Strategy Area*).

California Fish and Game Code 1852(c)(11) states that an RCIS shall have "an explanation of whether and to what extent the strategy is consistent with any previously approved strategy or amended strategy, state or federal recovery plan, or other state or federal approved conservation strategy that overlaps with the strategy area."

There are no previously approved or amended RCISs in the Mid-Sacramento Valley RCIS area; however, there are five approved recovery plans that overlap the RCIS area.[8] This section briefly summarizes those recovery plans, and explains how this RCIS is consistent with these plans that

[8] In 2018, National Marine Fisheries Service released the Draft Federal Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (National Marine Fisheries Service 2018). The draft recovery plan is currently under public review and has not been finalized.

overlap the RCIS area. See Chapter 2, Section 2.2.5, *Species Recovery Plans*, for additional summaries of the recovery plans that overlap the RCIS area.

3.9.1.1 Valley Elderberry Longhorn Beetle

USFWS approved the Recovery Plan for Valley Elderberry Longhorn Beetle in 1984 (U.S. Fish and Wildlife Service 1984). The strategy to recover the valley elderberry longhorn beetle focuses on protecting known localities, surveying for populations along certain Central Valley Rivers, protecting habitat, and determining the number of sites and populations necessary to delist the species (U.S. Fish and Wildlife Service 1984).

The goal of this recovery plan is to reduce the threats to the valley elderberry longhorn beetle to ensure its long-term viability in the wild and allow for its removal from the list of threatened and endangered species. At the time the recovery plan was written, information was insufficient to provide specific recommendations or actions that could be taken to recover the species; thus, the actions in the recovery plan were considered interim actions. Those actions are grouped into the following seven categories.

- Preserve and protect known habitat sites to provide adequate conditions for valley elderberry longhorn beetle.
- Survey riparian forests of the Sacramento and San Joaquin Valleys for presence of valley elderberry longhorn beetle and incorporate findings into short-and long-term programs.
- Determine ecological requirements and management needs of the valley elderberry longhorn beetle.
- Preserve and protect newly discovered valley elderberry beetle habitat to provide suitable conditions for the species.
- Reestablish valley elderberry longhorn beetle sites within the presumed historical range in the Sacramento and San Joaquin Valleys.
- Increase public awareness of valley elderberry longhorn beetle.
- Enforce laws and regulations to protect valley elderberry longhorn beetle.

This RCIS is consistent and compatible with the Recovery Plan for Valley Elderberry Longhorn Beetle. Development of the conservation goals, objectives, actions, and priorities for this Mid-Sacramento Valley RCIS (Section 3.8.1, *Valley Elderberry Longhorn Beetle*) were, in part, informed by the valley elderberry longhorn beetle recovery plan and address many of the high-level recovery actions in the recovery plan. This RCIS recommends protecting habitat occupied by, and suitable habitat potentially occupied by, valley elderberry longhorn beetle. This RCIS also recommends restoring suitable habitat to increase the amount, connectivity, and quality of valley elderberry longhorn beetle habitat in the RCIS area. The primary objectives to protect populations, preserve habitat, and reestablish historic occurrences within the range are central pieces of this RCIS and the recovery plan. Considerably more is known now about valley elderberry longhorn beetle than at the time the recovery plan was approved, and some of the objectives and actions are outdated and are not relevant to the RCIS, such as determining the ecological requirements of the species.

3.9.1.2 Vernal Pools

USFWS approved the Recovery Plan for Vernal Pool Ecosystems in California and Southern Oregon (Vernal Pool Recovery Plan) in 2005 (U.S. Fish and Wildlife Service 2005). The Vernal Pool Recovery Plan addresses 24 plants species, seven invertebrate species, and one animal species that occur exclusively or primarily on vernal pool complexes in California and Southern Oregon. These species are associated with vernal pools in several different landforms, geologic formations and soils types. Although none of the species addressed in the Vernal Pool Recovery Plan are included as focal species in this RCIS, this RCIS provides a conservation strategy for vernal pool complexes that, if implemented, will benefit the species that rely on vernal pools.

The overall objective of the recovery plan is to protect self-sustaining populations of vernal pool species by eliminating threats throughout their range (U.S. Fish and Wildlife Service 2005), which is achieved through three interim goals.

- Stabilize and protect populations.
- Conduct research.
- Down-list species to threatened when the species is no longer in danger of extinction.

Similar to this RCIS, the recovery plan presents a community-level strategy for recovery and conservation, because all of the listed species and species of concern co-occur in vernal pools. The likelihood of successful recovery for the listed species and species of concern addressed by the recovery plan is increased by protecting entire communities. The community-level approach facilitates species recovery and conservation, but does not negate the need to consider the requirements of each species addressed by the recovery plan.

Recovery and long-term conservation objectives emphasized in the recovery plan include the following.

- Ameliorate or eliminate threats.
- Promote ecosystem processes and functions by protecting and conserving vernal pool complexes.

Actions which will contribute to achieving these objectives include the following.

- Habitat protection.
- Adaptive habitat management, restoration, creation, and monitoring.
- Surveys for sensitive species.
- Research.
- Participation and outreach.

This RCIS is consistent and compatible with the Recovery Plan for Vernal Pool Ecosystems in California and Southern Oregon. The conservation goals and objectives for vernal pool complexes in this RCIS (Section 3.7.2, *Grasslands*) address the core recovery objectives in the Vernal Pool Recovery Plan. The RCIS and recovery plan include actions to protect vernal pool complexes, enhance degraded vernal pool complexes to improve ecological functions and process, and restore vernal pool complexes where vernal pools historically occurred, but are no longer present.

The recovery plan delineates core areas to identify locations that should be the initial focus for implementation of protection measures. There are two core areas within the RCIS area: the Sacramento NWR core area and the Dolan core area (Figure 2-2, and described in Chapter 2, Section 2.2.5.2, *Vernal Pools*). Preservation and enhancement of core areas is important to maintain and possibly expand the distribution of the vernal pool species range-wide. As described in Section 3.7.2.1, *Context for a Regional Conservation Strategy*, most (99%) of the Sacramento NWR Core Area in the RCIS area is protected (most of the Sacramento NWR core area is in Glenn County, outside of the RCIS area). Considerably less (28%) of the Dolan Core Area is protected. Most of the western unit of the Dolan core area is cultivated agriculture (primarily rice), and only approximately 14% of the Dolan core is mapped by this RCIS as vernal pool complex. Rather than prioritizing the western unit of the Dolan core area for protection, enhancement, and restoration of vernal pool complexes, this RCIS prioritizes the protection and enhancement of existing vernal pool complex, as mapped for California's Great Central Valley (Witham et al. 2014) and used in this RCIS (Figure 2-23 and Chapter 2, Section 2.5, *Land Cover Mapping*).

3.9.1.3 Steelhead and Chinook Salmon

In 2014, National Marine Fisheries Service released the Recovery Plan for the Evolutionarily Significant Units (ESUs) of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of the California Central Valley Steelhead (National Marine Fisheries Service 2014). The two ESUs and the distinct population segment (DPS) addressed by the recovery plan are also Mid-Sacramento Valley RCIS focal species. The recovery plan addresses the rivers draining the Central Valley and adjacent Sierra Nevada and Cascade Range, including the Sacramento River, Feather River, and Butte Creek in the RCIS area.

The overarching goal of the recovery plan is the removal of the Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, and California Central Valley steelhead DPS from the Federal List of Endangered and Threatened Wildlife. According to the recovery plan, recovery and long-term sustainability of an endangered or threatened species requires the following.

- Adequate reproduction for replacement of losses due to natural mortality factors (including disease and stochastic events).
- Sufficient genetic robustness to avoid inbreeding depression and allow adaptation.
- Sufficient habitat (type, amount, and quality) for long-term population maintenance.
- Elimination or control of threats (this may also include having adequate regulatory mechanisms in place).

The recovery plan organizes biological objectives and criteria for achieving those objectives at the population, diversity group,[9] and ESU/DPS levels. The recovery plan also identifies critical recovery actions for the Central Valley, as well as watershed- and site-specific recovery actions. Watershed-specific recovery actions address threats in each of the rivers or creeks that currently support spawning populations of the Sacramento River winter-run Chinook salmon ESU, the Central Valley spring-run Chinook salmon ESU, or the California Central Valley steelhead DPS. Site-specific

[9] The recovery plan (National Marine Fisheries Service 2014) identifies population groups, or salmonid ecoregions, as diversity groups.

recovery actions address threats to these species occurring within a migration corridor (e.g., San Francisco Bay or the Delta).

The recovery actions are organized according to geographic region. Four regions overlap the RCIS area: 1) throughout California or the Central Valley, 2) the Mainstem Sacramento River, 3) the Northern Sierra Nevada Diversity Group, and 4) the Northern Sierra Nevada Diversity Group.

This RCIS is consistent and compatible with the Recovery Plan for the ESUs of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of the California Central Valley Steelhead. The goals, objectives, actions, and priorities for this Mid-Sacramento Valley RCIS were informed by the recovery actions described in the recovery plan. This RCIS includes conservation goals, objectives, actions, and priorities at the landscape-, riverine and riparian natural community-, and focal species-levels that are consistent with the recovery plan's overarching goal and recovery actions.

The recovery plan includes detailed recovery actions presented in a series of tables for each geographic region. Recovery actions addressed by this RCIS include the following general types of actions to do the following.

- Incorporate ecosystem restoration, including setting back levees, as addressed in the CVFPP Conservation Strategy (California Department of Water Resources 2016).
- Restore and maintain riparian and floodplain ecosystems along the Sacramento River to provide a diversity of habitat types, including riparian woodland, gravel bars, bare cut banks, and other features.
- Maintain state-of-the-art fish passage facilities at diversions in the RCIS area.
- Minimize predation at weirs, diversions, and related structures in the Sacramento River.
- Minimize the loss of adult Chinook salmon and steelhead in the Sutter–Butte Basin.
- Implement bank stabilization projects along the Sacramento River that minimize the use of rip-rap.
- Minimize the effects of non-native plants and animals that affect salmonids.
- Improve rearing habitat.
- Improve in-stream refuge cover in the Sacramento River.
- Monitor focal species to inform adaptive management.

Implementing the RCIS conservation strategy to benefit focal fish species will therefore contribute towards achieving the recovery plan's objectives.

3.9.1.4 Giant Garter Snake

In 2017, the USFWS approved the Recovery Plan for Giant Garter Snake (U.S. Fish and Wildlife Service 2017b). The strategy to recover the giant garter snake focuses on protecting existing occupied habitat and identifying and protecting areas for habitat restoration, enhancement, and creation including areas that provide connectivity between populations. An essential part of the strategy is to ensure water is available in aquatic habitat during the summer active season.

USFWS defined nine recovery units that correspond directly to the nine geographically and genetically distinct populations to aid in recovery planning: Butte Basin, Colusa Basin, Sutter Basin, American Basin, Yolo Basin, Delta Basin, Cosumnes-Mokelumne Basin, San Joaquin Basin, and Tulare Basin. Three of the recovery units (Butte Basin, Colusa Basin, and Sutter Basin) overlap with the RCIS area (Figure 2-3).

The goal of this recovery plan is to reduce the threats to the giant garter snake to ensure its long-term viability in the wild and allow for its removal from the list of threatened and endangered species. The recovery plan lists the following three objectives to achieve this goal.

- Protect existing populations and establish (and protect) self-sustaining populations of the giant garter snake throughout the full ecological, geographical, and genetic range of the species.
- Restore and conserve healthy Central Valley wetland ecosystems that function to support the giant garter snake.
- Reduce or eliminate threats that cause the species to be listed, and any foreseeable future threats.

Actions needed to achieve the recovery plan's objectives include the following.

- Protect existing habitat, areas identified for restoration or creation, and areas that will provide connectivity between preserved areas of habitat.
- Develop and implement appropriate management of habitat on public and private wetlands and conservation lands.
- Improve water quality in areas occupied by the giant garter snake and affected by poor water quality conditions.
- Ensure summer water is available for wetland habitats used by the snake.
- Establish an incentive or easement program(s) to encourage private landowners and local agencies to provide or maintain giant garter snake habitat.
- Monitor populations and habitat to assess the success or failure of management activities and habitat protection efforts.
- Conduct surveys and research to identify areas requiring protection and management.
- Conduct research focused on the management needs of the species, and on identifying and removing threats.
- Establish and implement outreach and education, which includes the participation of landowners; interested public and stakeholders; and other federal, state, and local agencies.
- Reestablish populations within the giant garter snake's historical range.

This RCIS is consistent and compatible with the Recovery Plan for Giant Garter Snake. The goal, objectives, actions, and priorities for giant garter snake in this Mid-Sacramento Valley RCIS (Section 3.8.3, *Giant Garter Snake*) were informed by, and are consistent with, the recovery actions described in the recovery plan. This RCIS includes conservation goals, objectives, actions and priorities to do the following.

- Protect, enhance, and restore large interconnected blocks of giant garter snake habitat.
- Improve water quality in agricultural habitats.

- Provide sufficient water in aquatic habitat during the summer active season.
- Provide incentives to encourage private landowners to voluntarily manage working lands for the benefit of giant garter snake.
- Monitor populations to detect responses to climate change.

Implementing the RCIS conservation strategy to benefit giant garter snake will therefore contribute towards achieving the recovery plan's objectives.

3.9.1.5 Bank Swallow

Bank Swallow Recovery Plan

The California Department of Fish and Game approved the recovery plan for bank swallow in 1992 (Bank Swallow Recovery Plan) (California Department of Fish and Game 1992). The strategy to recover the bank swallow focuses on protecting populations, ensuring habitat is available, and enhancing existing populations and reestablishing populations in target areas (California Department of Fish and Game 1992).

The goal of this recovery plan is to reduce the threats to the bank swallow to ensure its long-term viability in the wild and allow for its removal from the list of threatened and endangered species. Although the Bank Swallow Recovery Plan was written 25 year ago, it is still relevant because many of the management issues result from the same threats that the bank swallow faces today; the Bank Swallow Recovery plan states that a critical management challenge is balancing population stability and ongoing bank projects. To address this issue and to recover bank swallow populations, management actions are grouped into the following two categories.

- Research and Monitoring
  - Refine population viability analysis to estimate population size and distribution.
  - Conduct surveys.
  - Assess state populations and distributions.
  - Validate the Habitat Suitability Index model developed by USFWS to determine abundance and quality of nesting habitat.
  - Continue habitat studies to assess impacts of bank projects.
  - Examine bank swallow life history requirements.
  - Study migration route and wintering grounds.
  - Conduct public engagement.
- Management and Acquisition
  - Coordinate with bank protection project proponents.
  - Work with project planners to avoid impacts.
  - Inventory suitable nesting habitat to determine the most suitable locations for development of preserve system.
  - Develop a habitat preserve system.

- ○ Acquire suitable habitat.
- ○ Coordinate acquisition and protection with other riparian habitat values.
- ○ Coordinate the establishment of bank swallow habitat preserves with other similar efforts.
- ○ Work with the public to develop management actions.
- ○ Evaluate the feasibility of reestablishment in southern and central California.

The recovery plan also includes additional management strategies including creating artificial river banks, developing set-back levees and a riverine meander-belt, and mitigating impacts from bank stabilization projects.

Bank Swallow Conservation Strategy

The Bank Swallow Technical Advisory Committee authored Bank Swallow Conservation Strategy (Bank Swallow Technical Advisory Committee 2013). This strategy does not replace the Bank Swallow Recovery Plan, but is meant to build upon the recovery plan, updating the actions in the Bank Swallow Recovery Plan with more current information and specific goals. The Bank Swallow Technical Advisory Committee states that "an effective recovery plan or conservation strategy for the bank swallow must include mitigation and conservation activities that not only offset current impacts to the species habitat, but reverse that impacts that have already occurred" (Bank Swallow Technical Advisory Committee 2013).

The goal of the Bank Swallow Conservation Strategy is to restore the Sacramento River and its tributaries to maintain habitat for bank swallow that supports 25,000 pairs based on a burrow count of at least 50,000. The Bank Swallow Conservation Strategy has three main objectives in pursuit of this goal: to remove bank revetment, use set-back levees and conservation easements to increase belt meander by 12,000 acres, and modify flow regimes. To achieve these objectives, the Bank Swallow Conservation Strategy includes the following actions.

- Avoid impacts on individuals, colonies, current and potential habitat and river processes.
- Protect existing colonies, suitable habitat, and river processes by acquiring property or easements.
- Protect connected floodplains and dynamic hydrologic and geomorphic processes on the Sacramento River and tributaries.
- Restore habitat/dynamic river processes, particularly riparian grassland next to river channels.
- Remove revetment on Sacramento River—10 miles between Chico Landing and Colusa; 25 miles between Colusa and Verona; and 2 miles from the Feather River.
- Remove revetment from other tributaries.
- Restore floodplain habitats through implementation of the USFWS Sacramento River National Wildlife Refuge riparian and floodplain habitat restoration program, the CDFW Comprehensive Management Plan for Sacramento River Wildlife Area, and the California State Park Central Valley Vision Implementation Plan.

This RCIS is consistent and compatible with the Bank Swallow Conservation Strategy and the Bank Swallow Recovery Plan. The goal, objectives, actions, and priorities for bank swallow in this RCIS (Section 3.8.8, *Bank Swallow*) were informed by, and consistent with, the actions in the Bank

Swallow Conservation Strategy (Bank Swallow Technical Advisory Committee 2013), which builds upon the recovery plan, updating the actions in the Bank Swallow Recovery Plan with more current information and specific goals. This RCIS includes conservation goals, objectives, actions and priorities to do the following.

- Protect active colony sites, suitable habitat, and riverine processes.
- Protect and restore interconnected floodplains and hydrologic and geomorphic process.
- Protect and restore river processes that provide suitable foraging habitat adjacent to river channels.
- Remove revetment, where feasible.
- Restore riparian and floodplain habitats.

Implementing the RCIS conservation strategy to benefit bank swallow will therefore contribute towards achieving the recovery plan's and conservation strategy's objectives.

3.10 Adaptive Management and Monitoring Strategy

According to California Fish and Game Code 1856(b), for an individual or entity to develop an MCA under this Mid-Sacramento Valley RCIS, this RCIS must include an adaptive management and monitoring strategy for conserved habitat and other conserved natural resources. The adaptive management and monitoring plan included in MCAs will be consistent with the MCA adaptive management and monitoring plan template (California Department of Fish and Wildlife 2018a). This section is intended to provide an overview of an adaptive management and monitoring strategy that can be used to inform the adaptive management and monitoring strategy used in an MCA under this RCIS.

Adaptive management and monitoring plans will only be required for conservation actions or habitat enhancement actions that are implemented under MCAs. MCA sponsors may be asked by the RCIS proponent to submit progress reports to the RCIS proponent, which can be provided as part of adaptive management and monitoring reporting requirements, or separately (Chapter 4, Section 4.3.2.2, *Mitigation Credit Agreement Proponent Responsibilities*).

An adaptive management and monitoring plan could be developed for any voluntary conservation action or habitat enhancement action in the RCIS area (unrelated to an MCA), but it is not required. Such an adaptive management and monitoring plan consistent with the strategy described in this section would provide the same benefits as those described for mitigation actions.

The overarching objective of adaptive management and monitoring is to ensure that conservation and habitat enhancement actions are implemented in ways that benefit focal species and other resources credited under an MCA, and contribute to the achievement of conservation goals and objectives stated in the RCIS. The key elements of the strategy are outlined and described in this section. The level of detail and application of the strategy will vary depending on the size and complexity of the MCA site or sites, the resources being monitored, and the nature of the conservation or enhancement actions being executed.

3.10.1 Periods of Adaptive Management and Monitoring

Adaptive management and monitoring can be organized into two periods: the interim management period, and the long-term management period. Key aspects of each period are described in this section.

3.10.1.1 Interim Management Period

The interim management period is the period from when the MCA site is established to when performance standards have been met and the endowment fund for the MCA has matured. During this period, baseline conditions are determined, conservation actions and habitat enhancement actions are implemented (the type[s] of conservation action and habitat enhancement action will depend on the condition of resources, such as habitat, at the site, or if resources are being restored or created), and ecological performance monitoring is conducted to assess the progress and status of resources being enhanced or restored, and the long-term funding gains interest and earnings without being expended. If ecological performance standards are not met, remedial actions will be implemented. Monitoring is more intensive and frequent during this period than it is under long-term management, and there may be different or additional management actions that are not required during the long-term.

During the interim management period, management of the site will be guided by the interim management plan, which describes the management, including the conservation actions or habitat enhancement actions, monitoring, adaptive management, reporting and other activities to be implemented by the MCA sponsor.

Monitoring during this period will include the collection of baseline data so that MCA sponsors can assess the following.

- The contribution of conservation or habitat enhancement actions towards achieving the relevant conservation goals and objectives in the RCIS.
- The identification of pressures and stressors on focal species, their habitats, and other resources for which credits are being sought.
- The net ecological gain in the area and quality of habitat or other natural resource values.
- The progress toward meeting performance-based milestones and achievement of ecological performance standards that will determine when and how many mitigation credits are released.

Baseline conditions on the mitigation site need to be documented to inform long-term management planning and to serve as a comparison point for future monitoring. Accordingly, resources in the mitigation site for which credits are being sought need to be assessed, documented, and mapped. Baseline conditions can be documented with historical data, as available and appropriate; surveys focused on presence/absence of focal species for which mitigation credit is being sought; or, assessments of the condition of habitats that support those species. If mitigation credit is being sought for other conservation elements (e.g., landscape linkages, aquatic resources) those resources should be assessed as well. Baseline assessments of resources that are regulated by other federal, state, or local agencies, or are subject to other CDFW permits (i.e., Lake and Streambed Alteration Agreement) should be consistent with standards and protocols.

3.10.1.2 Long-Term Management Period

The long-term monitoring period begins upon conclusion of the interim management period, and continues for the length of the durability agreement which may be in perpetuity, or a shorter period, as applicable, for a habitat enhancement action with appropriate durability that does not involve acquiring land or permanently protecting habitat.

During the long-term management period, management of the site will be guided by the long-term management plan, which will include measures intended to ensure that the MCA site is managed, monitored, and maintained in perpetuity (or a shorter period, as applicable, for a habitat enhancement action with species or habitat-appropriate durability that does not involve acquiring land or permanently protecting habitat), to conserve and protect the resources with MCA credits, and other natural resources.

Long-term management and monitoring planning should generally consist of the following tasks.

- Describe management actions that will be used to address the pressures and stressors and improve habitat for focal species, as well as conditions for other conservation elements.
- Describe desired outcomes of management actions, including a species' population response, habitat condition, or change in other conservation element.
- Prioritize implementation of actions to best achieve mitigation objectives.
- Describe monitoring protocols including methods and equipment used, monitoring frequency, and monitoring timing, and identify sampling design.

As much as possible, the long-term management plan should be a practical guide to management and monitoring actions that will occur on the mitigation site over time, written with the land manager and monitors in mind.

Similar to adaptive management actions, the monitoring program can change over time in response to the information collected and the trends observed. This adaptive approach to monitoring ensures that enough data are being collected to determine whether the mitigation site is performing as expected, while also avoiding unnecessary monitoring costs, particularly once the effectiveness of the site has been supported by several years of monitoring.

3.10.2 Adaptive Management

Adaptive management is a decision-making process that adjust actions as uncertainties become better understood or as conditions change. Monitoring the outcomes of management is the foundation of an adaptive approach, and thoughtful monitoring can both advance scientific understanding and modify management actions iteratively (Williams et al. 2007).

Adaptive management is necessary because of the degree of uncertainty and natural variability associated with ecosystems and their responses to management. It is possible that additional and different actions not described in this Mid-Sacramento Valley RCIS or an MCA will be identified in the future and proven to be more effective. Results of monitoring may also indicate that some management measures are less effective than anticipated. To address these uncertainties, an adaptive approach will be used to inform management on land subject to MCAs.

The cornerstone of an adaptive management and monitoring program is an approach in which monitoring yields scientifically valid results that inform management decisions. Information collected through monitoring is used to manage mitigation lands and help determine progress toward conservation objectives. The adaptive management process is administered by the MCA holder in coordination with CDFW.

Adaptive management may include the following tasks.

- Evaluate efficacy of monitoring protocols.
- Incorporate best available scientific information into management.
- Review any unexpected or unfavorable results and test hypotheses to achieve desired outcome.
- Adjust management actions and continue to monitor, either with the same or new monitoring techniques.
- Adjust success criteria, or the conservation objective, if necessary.

3.10.3 Types of Monitoring

Types of monitoring that may be included in a monitoring plan include, but are not limited to, conservation easement and MCA monitoring and biological monitoring. The monitoring plan may also include protocols, indicators, monitoring schedule, and success criteria.

3.10.3.1 Conservation Easement and Durability Instrument Monitoring

Conservation easement monitoring tracks the status of mitigation sites under a conservation easement and documents that the requirements of the conservation easement are being met, to protect the conservation values of the site. A similar type of monitoring may be used to track the status of a site used for a habitat enhancement action under a long-term durability instrument. Conservation easement and durability instrument monitoring may include the following components.

- Maintaining the property in a condition consistent with the easement or durability instrument.
- Maintaining infrastructure and access as stated in the easement or durability instrument.
- Implementing conservation and habitat enhancement actions as described in the MCA.
- Implementing management actions as described in the MCA.
- Reporting of monitoring activities conducted.

3.10.3.2 Effectiveness Monitoring

Effectiveness monitoring assesses the biological success or failure of conservation actions or habitat enhancement actions. Monitoring results may also be used to determine when mitigation credits can be released and when they are available for use or sale. Effectiveness monitoring may also be used on voluntary conservation investments sites to determine if management actions are achieving the desired outcomes.

Effectiveness monitoring is focused on the status of focal species or other conservation elements in the RCIS area for which mitigation credit has been assigned under the MCA. Understanding the effects of management actions is a critical component of the monitoring and adaptive management program. The purpose of effectiveness monitoring is to ascertain the success of management in achieving desired outcomes and to provide information and mechanisms for altering management, if necessary. Results from effectiveness monitoring can also be used to establish how implementation of the MCA or voluntary conservation investment contributes to the achievement of conservation goals and objectives.

3.10.4 Key Elements of a Monitoring Program

In addition to the guidelines described previously, the following steps should be taken when designing the monitoring program so that it can most effectively inform any necessary changes in management.

- **Determine what to measure.** Establish the attributes or variables that the monitoring will measure to answer the question previously defined. This step includes the development of measurable performance standards for evaluating management actions. These variables could include:
  - **Species population status.** Monitoring whether species are present and comparing occupancy, or detection rates across years can determine whether and how well management actions are working.
  - **Habitat quality**. Monitoring the function and health of certain habitat types could serve as an indicator of the status of several species at one time. This includes assessing how species respond to restoration or habitat enhancement actions on mitigation lands. The use of the condition of a habitat as an indicator for the status of one or several species, however, should be evaluated on a case-by-case basis.
- **Develop monitoring protocols.** Questions to be answered by the monitoring program will be at the species or habitat level (e.g., riparian). Monitoring protocols vary depending on the species or habitat type being monitored. In some cases, standardized or CDFW-approved protocols exist. When appropriate, those protocols should be used, although sometimes variations from those protocols may be warranted.
- **Ensure monitoring frequency matches need.** Match the frequency of monitoring directly to the needs of the MCA and the cycles of the focal species and other natural resources. Often, such as during the interim management period, more frequent monitoring may ensure that conservation and habitat enhancement actions make progress toward performance-based milestones (and, ultimately, credit release). In other cases, such as during the long-term monitoring period, monitoring may occur less frequently. Factors that may influence the frequency or type of monitoring include, but are not limited to the following.
  - Natural history of the species being monitored.
  - Variability in habitat between years due to uncontrollable factors (e.g., rainfall).
  - Variability in population levels between years due to uncontrollable factors (e.g., drought or fire).
  - Variability in habitat quality between potential sampling locations.
- **Use indicator species, if appropriate.** Use groups of species or indicator species, where possible, to streamline monitoring. Indicators are selected because they are easy to survey and provide usable information on the species, habitat, or ecosystem in question.

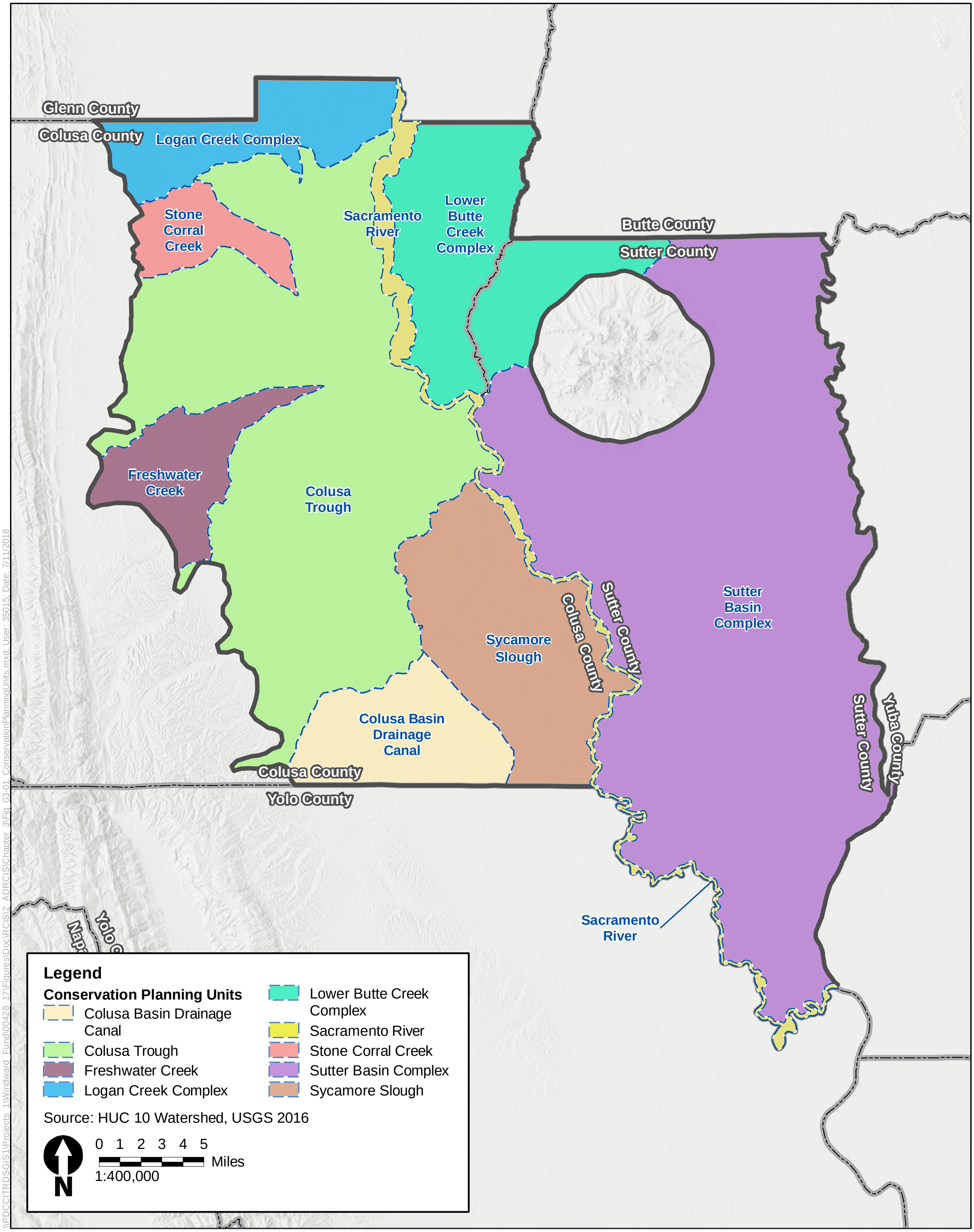

Figure 3-1
Conservation Planning Units

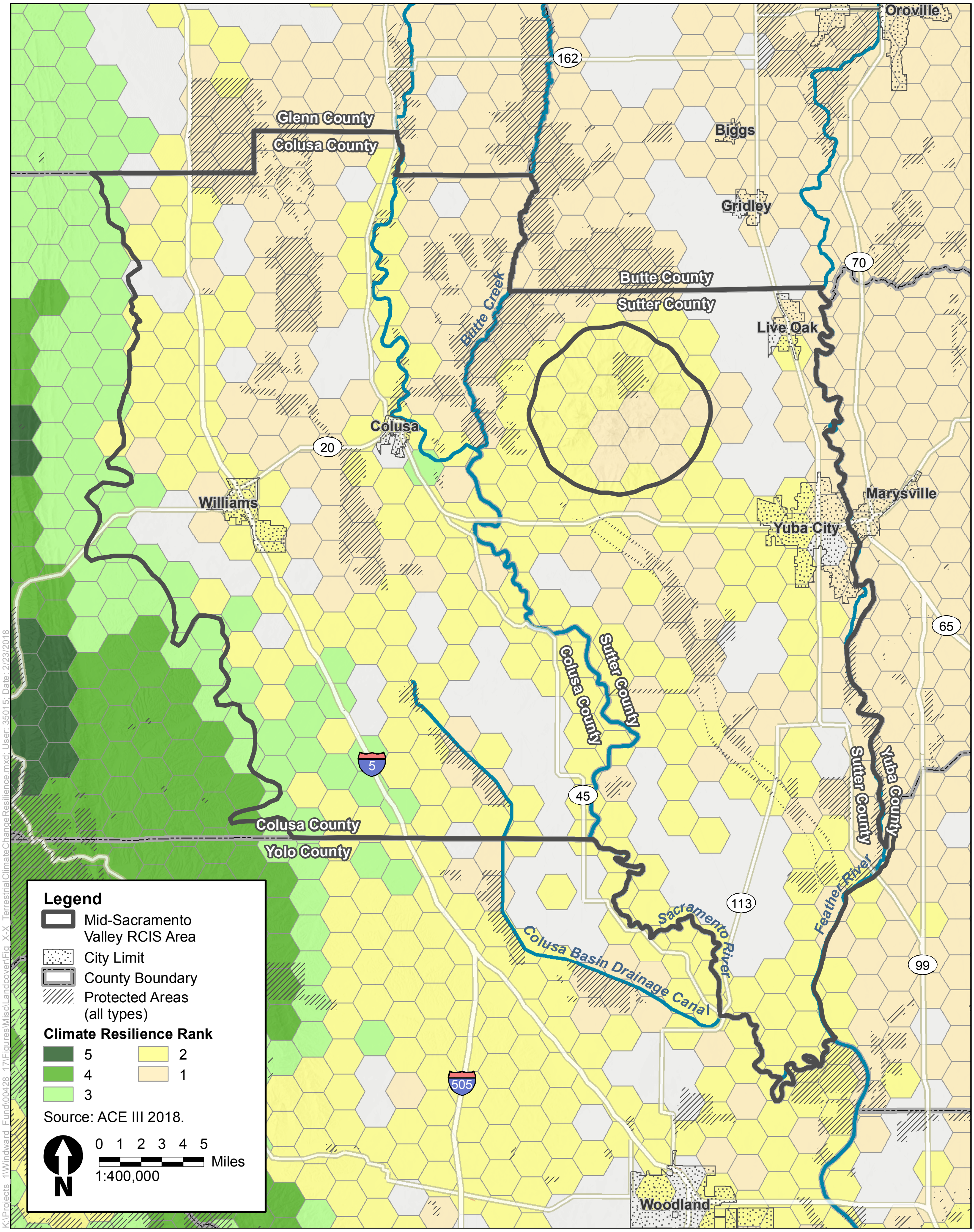

Figure 3-2
Resilience to Climate Change

Chapter 4
Implementation

4.1 Overview

After approval by the California Department of Fish and Wildlife (CDFW), this regional conservation investment strategy (RCIS) can be used immediately to inform decisions related to conservation, restoration, enhancement, and management actions for focal species, and other conservation elements addressed by this RCIS. Examples of how the RCIS may be used voluntarily include the following.

- Inform how conservation organizations make conservation investments in the RCIS area.
- Inform how state or federal agencies evaluate grant or permit applications for local conservation or research projects.
- Inform infrastructure planning, with respect to avoiding and minimizing project-level impacts in the RCIS area.
- Guide project proponents in how they site and design compensatory mitigation such that it meets project-level permitting requirements for California Endangered Species Act-listed or other special-status species, stream alteration, or significant impacts under the California Environmental Quality Act (CEQA) as determined by a Lead Agency.
- Provide an additional mechanism for identifying and developing compensatory mitigation.
- Support the design and creation of conservation and mitigation banks.
- Guide landowners, public agencies, private entities, or others in how to scope advance mitigation projects to create mitigation credits, under a Mitigation Credit Agreement (MCA), that will be usable as compensatory mitigation under CEQA, the California Endangered Species Act, or CDFW's Lake and Streambed Alteration Agreement.

This chapter describes the RCIS implementation process and required RCIS implementation tasks for this RCIS. This chapter also provides an overview of how the tool enabled by the RCIS, the MCA, can be created.

The *Regional Conservation Investment Strategies Program Guidelines* (Program Guidelines) (California Department of Fish and Wildlife 2018) define the RCIS proponent as the public agency or group of public agencies developing an RCIS for review and approval by CDFW and who is responsible for conducting technical and administrative updates[1] of an RCIS (Section 4.3, *Required RCIS Implementation to Create MCAs*). As the RCIS proponent, Reclamation District 108 may share,

[1] The Program Guidelines state that "[a]n update to an RCIS means updates to the best available scientific information contained in a previously-approved RCIS. A data update is generally the submission of GIS data or minor changes to numbers or text in the document that require less than two hours of CDFW staff time. It does not include updates or amendments to the geographic area, focal species, or other conservation elements. An RCIS proponent may update the scientific information in the RCIS at any time." See Section 4.6, *Amending the RCIS,* for the definition of an RCIS amendment and the RCIS amendment process.

Designate, or transfer the RCIS proponent role to another entity or entities at any time, or elect to terminate its role as RCIS proponent[2].

This chapter also identifies optional implementation tasks of this RCIS that exceed what is required by the California Fish and Game Code (CFGC) or the Program Guidelines, but that, if conducted, may improve the success of RCIS implementation. For example, an implementation committee, described in Section 4.4.1, *Implementation Committee (Optional)*, is not required by FGC or the Program Guidelines, but is offered as a suggestion for how local entities may support implementation of the RCIS. Items that are suggestions and not requirements are denoted as those the RCIS proponent *may* do, as opposed to required elements that they *will* do or *shall* do. To make it explicit, Section 4.3, *Required RCIS Implementation to Create MCAs*, describes those elements required during implementation for this RCIS to be used to create MCAs, and Section 4.4, *Optional Implementation Activities*, describes elements that are optional, but are recommended and may prove helpful.

It is not the intent for the RCIS proponent to fund all aspects of implementation. Instead, this Mid-Sacramento Valley RCIS assumes that the RCIS proponent, with support from the Mid-Sacramento Valley RCIS Steering Committee, Mid-Upper Sacramento RFMP and Feather River RFMP member agencies, and other partners, would facilitate implementation activities through partnerships with other interested parties, including proponents of MCAs. This Mid-Sacramento Valley RCIS further assumes that entities pursuing MCAs under this RCIS would fully fund the development of those MCAs and that the RCIS proponent would bear no financial responsibility for development or monitoring of those MCAs.

4.2 Goals of Implementation

The primary purpose of this Mid-Sacramento Valley RCIS is to provide science-based, voluntary guidance for investments in conservation, critical infrastructure, and compensatory mitigation, including the development of MCAs. The guidance in the RCIS will help to ensure that conservation actions and habitat enhancement actions in the RCIS area occur in an informed and strategic manner to achieve the highest degree of conservation benefit at a regional scale. This Mid-Sacramento Valley RCIS is also intended to streamline delivery of projects requiring CDFW permits by identifying priority conservation actions and habitat enhancement actions for focal species and other conservation elements in the RCIS area that can be used to develop advance mitigation in the RCIS area (Chapter 3, *Conservation Strategy*).

As described in Chapter 1, Section 1.3, *Purpose and Intent*, this Mid-Sacramento Valley RCIS was initially envisioned as a companion document to the Mid-Upper Sacramento River RFMP (Mid and Upper Sacramento River Regional Flood Management Plan Partners 2014). Shortly after beginning development of the RCIS, the Steering Committee elected to expand the RCIS area further east in Sutter County to include more of the Feather River RFMP planning area. The 2017 Central Valley Flood Protection Plan (California Department of Water Resources 2017) and its associated Conservation Strategy (California Department of Water Resources 2016), which was informed by

[2] The RCIS proponent has every intention of remaining the RCIS proponent and either renewing the RCIS or transferring the responsibility to renew the RCIS to another entity at the end of the first 10 years. However, if the RCIS proponent is unable to renew the RCIS due to budget or other constraints, and no other local entity is willing to take on the responsibility, the RCIS may expire and no longer be valid.

the Mid-Upper Sacramento River RFMP and Feather River RFMP, provides a framework for integrating conservation into the overall flood management system. This Mid-Sacramento Valley RCIS was developed, in part, to aid in the implementation of flood risk reduction measures. Importantly, the ability to develop advance mitigation credits through an MCA developed under the RCIS may provide an incentive for landowners to propose conservation actions or habitat enhancement actions on their properties that would benefit species. Although this Mid-Sacramento Valley RCIS was initially conceived to support flood risk reduction projects, it is the goal of this Mid-Sacramento Valley RCIS to be used to inform advance mitigation project scoping to create mitigation usable by any type of project, including transportation and other infrastructure projects. Ideally, the Mid-Sacramento Valley RCIS priority conservation actions and habitat enhancement actions will be implemented collectively by all voluntary users of the RCIS and these users could include any or all of the entities summarized in the introduction to this chapter and described further below.

4.3 Required RCIS Implementation to Create MCAs

As a voluntary planning and guidance document, there are no implementation requirements for this RCIS. For an RCIS to be used to create MCAs, however, FGC 1856(b) has requirements for what must be included in the RCIS, and what must be done after the RCIS is approved by CDFW, above and beyond what is required of an RCIS that does not support MCAs. This RCIS is intended to support creation of MCAs, so it includes additional required elements. For an RCIS to support an MCA, FGC 1856(b) states the following.

> (b) For a conservation action or habitat enhancement action identified in a regional conservation investment strategy to be used to create mitigation credits pursuant to this section, the regional conservation investment strategy shall include, in addition to the requirements of Section 1852, all of the following:
>
> > (1) An adaptive management and monitoring strategy for conserved habitat and other conserved natural resources.[3]
> >
> > (2) A process for updating the scientific information used in the strategy, and for tracking the progress of, and evaluating the effectiveness of, conservation actions and habitat enhancement actions identified in the strategy, in offsetting identified threats to focal species and in achieving the strategy's biological goals and objectives, at least once every 10 years, until all mitigation credits are used.
> >
> > (3) Identification of a public or private entity that will be responsible for the updates and evaluation required pursuant to paragraph (2).

This RCIS includes the following elements, to facilitate the creation of MCAs, as described in the Program Guidelines (California Department of Fish and Wildlife 2017).

- An adaptive management and monitoring strategy for focal species, conserved habitat, and other conserved natural resources (Chapter 3, Section 3.10, *Adaptive Management and Monitoring Strategy*).
- A process for updating the scientific information that pertains to focal species, other conservation elements, and conservation actions and habitat enhancement actions at least once every 10 years (Section 4.3.1, *Updating and Extending this RCIS*).

[3] The adaptive management and monitoring framework for this RCIS is presented in Chapter 3, Section 3.10, *Adaptive Management and Monitoring Strategy*.

- A process for tracking the progress and effectiveness of conservation actions and habitat enhancement actions in achieving the goals and objectives for focal species and other conservation elements, including offsetting the effects of identified pressures and stressors at least once every 10 years (Section 4.3.2, *Assessing Progress*).
- Identification of a public or private entity that will be responsible for the updates and effectiveness evaluation (see below).

To facilitate the creation of new MCAs[4], the RCIS proponent, with support from the Mid-Sacramento Valley RCIS Steering Committee, Mid-Upper Sacramento RFMP and Feather River RFMP member agencies, and other partners, and in coordination with CDFW,[5] will be responsible for updating the RCIS and assessing progress toward meeting the RCIS goals and objectives, through conservation investments and mitigation actions, at least once every 10 years.

CDFW may extend the duration of an approved RCIS for additional periods of up to 10 years after this RCIS is updated with new scientific information and CDFW finds that this RCIS continues to meet the requirements of FGC 1852.

4.3.1 Updating and Extending this RCIS

According to the Program Guidelines (California Department of Fish and Wildlife 2018), "an update to an RCIS means updates to the best available scientific information contained in a previously approved RCIS." The Program Guidelines distinguish between a data update and a more substantial update as follows.

> A data update is generally the submission of GIS data or minor changes to numbers or text in the document that require less than four hours of CDFW staff time. It does not include updates or amendments to the geographic area, focal species, or other conservation elements. An RCIS proponent may update the scientific information in the RCIS at any time.

The RCIS proponent will contact CDFW to evaluate proposed data updates and incorporate those updates into the RCIS, as needed.

Under current state law, CDFW may extend the duration of an approved or amended RCIS for additional periods of up to 10 years. If the RCIS proponent, or other entities, intend to use this RCIS to create additional mitigation credits pursuant to FGC section 1856 after the RCIS approval period ends, the RCIS proponent, CDFW,[6] or other entity, with permission from the RCIS proponent, shall update the scientific information in this RCIS that pertains to focal species and other conservation elements, at least once every 10 years. Once the Mid-Sacramento Valley RCIS is updated with new scientific information and CDFW finds that the RCIS continues to meet the requirements of FGC 1852, CDFW may extend the duration of this RCIS.

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[4] Existing, approved MCA credits can be sold after the RCIS term has expired if the RCIS term is not extended by CDFW. However, new MCAs cannot be created without a currently approved RCIS (California Department of Fish and Wildlife 2018).

[5] The RCIS proponent may also coordinate closely with an implementation committee, if used, and as described in Section 4.4.1, *Implementation Committee (Optional)*.

[6] According to the Program Guidelines (California Department of Fish and Wildlife 2018), "[i]f CDFW determines that an approved RCIS needs to be updated or evaluated more frequently and the RCIS proponent or responsible party declines to do so, CDFW may elect to update the RCIS or authorize a third-party public agency to amend an RCIS. Any such updates shall become part of the approved RCIS, pending an evaluation by CDFW."

Because the Mid-Sacramento Valley RCIS is intended to support the creation of mitigation credits, the RCIS proponent, with support from the Mid-Sacramento Valley RCIS Steering Committee, Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies, and other partners, may at least once every 10 years undertake a more substantial update (i.e., not just a data update). This update may include updating and refining, if necessary, the RCIS based on current scientific information that pertains to focal species and other conservation elements addressed in this RCIS, and the goals, objectives, and conservation and habitat enhancement actions pertaining to those elements. The RCIS proponent, with support from the Mid-Sacramento Valley RCIS Steering Committee, Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies, and other partners, will determine when within the 10-year approval period to undertake updates (e.g., after 5 years, and/or towards the end of the 10-year approval period). Updates to the RCIS will be integrated into the RCIS at the end of the 10-year approval period as part of the RCIS renewal process.

The RCIS proponent may use various data sources to inform the updates, including, but not limited to, monitoring results, MCA progress reports (Section 4.3.2, *Assessing Progress*), recent scientific literature, technical reports or studies, and guidance from regulatory agencies. The assumptions on which the RCIS conservation strategy was built, particularly related to focal species, other conservation elements, and conservation priorities may be revised, as necessary, based on new data or information. If the results of this review reveal that fundamental aspects of this Mid-Sacramento Valley RCIS are no longer valid, the RCIS proponent, in consultation with the California Department of Water Resources, may elect to amend this RCIS to address the changes, as outlined in Section 4.6, *Amending the RCIS*.

4.3.2 Assessing Progress

In compliance with FGC 1856 (b), the RCIS proponent will assess the effectiveness of this RCIS's conservation actions and habitat enhancement actions in achieving the goals and objectives for focal species, working lands, natural communities, and other conservation elements (e.g., those included in the landscape-level Conservation Strategy), including offsetting the effects of identified pressures and stressors. This assessment will be done with support from the Mid-Sacramento Valley RCIS Steering Committee, Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies, and other partners, and in coordination with participating landowners.

4.3.2.1 RCIS Progress Report

The evaluation of the effectiveness of this RCIS's conservation actions, habitat enhancement actions, and progress towards achieving this RCIS's goals and objectives will occur at least once every 10 years in a report submitted to CDFW at the end of the RCIS 10-year approval term. Alternatively, the contents of this progress report will be included in the updated Mid-Sacramento Valley RCIS submitted to CDFW for renewal after the 10-year approval period has ended.

To the extent feasible, the RCIS progress report or updated Mid-Sacramento Valley RCIS submitted to CDFW for renewal will summarize the following:

- The net change in the amount of focal species' habitat and other conservation elements (i.e., working lands and natural communities) protected (e.g., fee title, permanent and temporary conservation and agricultural easements, species or habitat-appropriate durability agreements) in the RCIS area through MCAs. The net change in area should be provided in acres, though for certain ecological features, net change may be provided in other relevant metrics (as specified in the MCA), such as length and width of a restored riparian woodland.

- A summary of the progress made towards achieving this RCIS's conservation goals and objectives through the implementations of the conservation actions and habitat enhancement actions through MCAs, as described in Chapter 3, *Conservation Strategy.*
- A summary of the net change in quality of focal species' habitat addressed in the MCAs, using the metrics described in the MCA.

To the extent feasible, the RCIS progress report may also include a brief summary of other readily available, RCIS-related conservation and habitat enhancement actions undertaken in the RCIS area during this RCIS's 10-year approval period not conducted as part of an MCA. Regional partners are encouraged to share data and other information about actions implemented in the RCIS area with the RCIS proponent, but the RCIS proponent will not be responsible for tracking and reporting data and information from these entities. The RCIS proponent may use this information, in combination with information provided by MCA sponsors, to assess progress in achieving this RCIS's conservation goals and objectives.

Data and other information that will be used to track the effectiveness of conservation actions and habitat enhancement actions will come from MCA sponsors with mitigation sites in the RCIS area. Other sources of data and information may be used, such as the California Protected Areas Database (California Protected Areas Database 2017), the California Conservation Easement Database (California Conservation Easement Database 2016), and websites maintained by CDFW, U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers[7] that provide up-to-date information on approved conservation and mitigation banks, among other sources.

4.3.2.2 Mitigation Credit Agreement Sponsor Responsibilities

At the request of the RCIS proponent, MCA sponsors will contribute to the RCIS progress report by providing data to the RCIS proponent. MCA sponsors shall use consistent metrics to assess habitat throughout the duration of the MCA. Metrics will be determined during the MCA development and approval process.

The RCIS proponent may request from each MCA sponsor with mitigation sites in the RCIS area an MCA summary report to assist the RCIS proponent's assessment of the effectiveness of this RCIS's conservation actions and habitat enhancement actions in achieving the goals and objectives for focal species, working lands, natural communities, and other conservation elements. The RCIS proponent or CDFW may provide MCA sponsors with a progress report template to facilitate consistent and adequate reporting by MCA sponsors.

MCA sponsors, upon request of the RCIS proponent, may be asked to provide the RCIS proponent the following.

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[7] Up-to-date information on approved conservation and mitigation banks can be found at the following U.S. Fish and Wildlife Service, CDFW, and U.S. Army Corps of Engineers websites:
https://www.fws.gov/sacramento/es/Conservation-Banking/Banks/In-Area/es_conse-bank-in-area.htm
https://www.wildlife.ca.gov/Conservation/Planning/Banking/Approved-Banks
http://www.spn.usace.army.mil/Missions/Regulatory/Mitigation-Banks/Approved-Banks-for-the-San-Francisco-Regulatory-Di/

- The amount of focal species' habitat and other conservation elements (i.e., working lands and natural communities) protected, enhanced, or restored/created through MCAs at the MCA sponsor's mitigation sites in the RCIS area, and the corresponding Mid-Sacramento Valley RCIS goal(s) and objective(s) the actions contributed towards achieving. The MCA sponsors shall report the amount of land, aquatic features, and habitat for focal species using the same natural community, land cover type, and focal species habitat categories (e.g., breeding habitat, foraging habitat, upland habitat, etc.) as used by this RCIS (and described in Chapter 2, *Environmental Setting*) to enable consistent tracking of progress towards achieving this RCIS's goals and objectives.
- A list of the conservation actions and habitat enhancement actions identified in the MCA and implemented at the MCA sponsor's mitigation sites in the RCIS area.
- A summary of the net change in quality of the target focal species' habitat addressed by conservation or habitat enhancement actions on the MCA sponsor's mitigation sites in the RCIS area, using the metrics identified in the MCA(s).
- A brief summary of the pressures and stressors identified in Chapter 2, Section 2.13, *Pressures and Stressors on Focal Species and Other Conservation Elements*, that were offset (or partially offset) by implementing conservation and habitat enhancement actions through the MCA.

4.4 Optional Implementation Activities

The following subsections describe optional tasks that the RCIS proponent, with support from the Mid-Sacramento Valley RCIS Steering Committee, Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies, and other partners, may consider during implementation to support and improve RCIS implementation.

4.4.1 Implementation Committee (Optional)

The RCIS proponent may choose to partner with members of the Steering Committee, other Mid-Upper Sacramento River RFMP and Feather River RFMP member agencies, and other public agencies, organizations, landowners, and others to form an RCIS implementation committee. This implementation committee would help guide implementation, draft updates to the RCIS, and assess the progress of the Mid-Sacramento Valley RCIS. An implementing committee may be particularly valuable in instances where the RCIS supports the missions of these other organizations.

The role of the implementation committee would be to periodically assist with all aspects of implementation. The implementation committee may also choose to serve as a group to help inform and educate potential RCIS users of how the RCIS can be used and the benefits it provides. The implementation committee will not arbitrate or negotiate mitigation on behalf of project proponents. Such responsibility will remain with the entity pursuing the mitigation and the appropriate local, state, and federal regulatory agencies.

In summary, the following are potential tasks for the implementation committee (this list is not exhaustive).

- Publicize this RCIS and its successful implementation to participating agencies and other entities that may use the RCIS to inform conservation actions and habitat enhancement actions in the RCIS area.

- Answer questions from users and potential users of the RCIS.
- Develop guidance, as needed, to clarify and refine components of the RCIS.
- Assist with preparation of the progress report, or other documents for CDFW and other agencies and entities, as needed, documenting the implementation of the RCIS and MCAs, as appropriate.
- Support the RCIS proponent in undertaking periodic updates of the RCIS (at least every 10 years) based on significant new information on the focal species, other conservation elements, and their conservation (Section 4.3.1, *Updating and Extending this RCIS*).

If established, the implementation committee may meet periodically (e.g., annually) to review how this Mid-Sacramento Valley RCIS is being used, and to assess whether informational updates or amendments are needed.

4.4.2 Annual Meeting (Optional)

The implementation committee may host an annual meeting to update the general public on the progress and challenges with implementation during the previous year. It would be an opportunity to update the public on any changes that have been made to the RCIS and any new information that has been added. The agenda for the meeting could be determined by the implementation committee in cooperation with the RCIS proponent to ensure that key issues related to implementation are discussed.

4.5 Regulatory Uses of the RCIS

4.5.1 Mitigation Credit Agreements

An MCA identifies the type and number of credits a person or entity proposes to create by implementing one or more conservation actions or habitat enhancement actions, as well as the terms and conditions under which those credits may be used. Any focal species, other species, ecological resource, or natural community addressed in this RCIS may be considered for MCA credits (California Department of Fish and Wildlife 2018). A person or entity, including a state or local agency, with mitigation needs may choose to enter into an MCA with CDFW for a single, large mitigation site with multiple phases, a suite of mitigation sites, a specific region (e.g., watershed boundary or municipality) within the RCIS area, or the entire RCIS area.

Credits created through an MCA can be used to "fulfill compensatory mitigation requirements established under any state or federal environmental law, as determined by the applicable local, state, or federal regulatory agency, including compensatory mitigation requirements to compensate for take or other adverse impacts of activities authorized pursuant to the California Endangered Species Act, to reduce adverse impacts to fish or wildlife resources, or both, from activities authorized pursuant to a lake or streambed alteration agreement to less than substantial, or to mitigate significant effects on the environment pursuant to the California Environmental Quality Act" (Assembly Bill No. 2087, Legislative Counsel's Digest, February 17, 2016).

MCAs must be prepared according to the requirements of FGC 1856 and the Program Guidelines.

An MCA facilitates advance mitigation and can provide a number of significant benefits, particularly for agencies or entities with predictable long-term mitigation needs. An MCA can provide the following benefits.

- The MCA allows credit buyers to purchase credits when doing so is most cost effective or best correlates with projections of future demand, knowing those credits will provide useful mitigation values in the future (e.g., mitigation offsets for future project impacts) either to mitigate the credit buyer's own projects, or to sell to another agency/agencies or entity/entities in need of mitigation.
- Mitigation credits can be pooled across large sites or multiple sites, providing economies of scale to deliver mitigation more efficiently across many projects.
- An MCA can provide certainty and predictability to the MCA sponsor for the future costs of project mitigation under state laws.
- An MCA establishes an approved methodology for determining the type and number of credits generated by a mitigation project, which aligns expectations between CDFW and project proponents.
- An MCA gives CDFW and other resources agencies some assurance that proposed mitigation fits within a larger conservation framework (the RCIS) and that investments in resource protection, restoration, and enhancement collectively contribute to meeting regional conservation goals and objectives.

Once this Mid-Sacramento Valley RCIS is approved by CDFW, any public or private entity may prepare, for CDFW approval, an MCA for one or more conservation actions or habitat enhancement actions that measurably advance the conservation goals and objectives of this RCIS. MCA credits will typically be designed to support one or more of the RCIS focal species, and other conservation elements (e.g., wildlife connectivity, riparian), including resources regulated by resource agencies other than CDFW.

An MCA may be used to meet the requirements of federal environmental laws and regulations with the approval of applicable federal regulatory agencies. Appendix F, *Regulatory Processes*, outlines how other regulatory agencies and local CEQA lead agencies may use the RCIS to facilitate mitigation credit needs under their respective authorities. CDFW will maintain a list and status of all MCAs that are active in the RCIS area on its website.

4.5.1.1 Developing Mitigation Credit Agreements

MCAs identify the types of mitigation credits that will be created through implementation of conservation actions and habitat enhancement actions. Under the MCA, site proposals identify the amount of credits that will be created at individual sites, and provide a schedule for their release based on relevant milestones in project implementation (e.g., land protection, restoration goal achievement). Mitigation credits can be established for any conservation action or habitat enhancement action that contributes to the achievement of conservation goals and objectives outlined in the Mid-Sacramento Valley RCIS. CDFW must approve the release of all credits after the sponsor meets performance-based milestones established by the MCA.

Typically, mitigation credits will be established for the following types of conservation actions and habitat enhancement actions.

- Acquisition of land development rights to *permanently protect*[8] that land (purchase in fee title, purchase, and/or placement of a conservation easement).
- Restoration of resources such as aquatic features and natural communities, including those that create new and/or increase existing habitat function for a focal species or species whose conservation need is analyzed or otherwise provided for in the Mid-Sacramento Valley RCIS.
- Enhancement of habitat conditions or habitat connectivity, or other type of action that addresses risks or stressors to wildlife, and is implemented to achieve, at least in part, one or more conservation objectives. Habitat enhancement actions can be implemented for focal species or other species whose conservation need is analyzed or otherwise provided for in the RCIS. A habitat enhancement action would have appropriate durability but would not involve acquiring land or permanently protecting habitat.

By regulation, an MCA developed under this Mid-Sacramento Valley RCIS must conduct their conservation or enhancement actions within the RCIS area. The MCA will describe the *service area* of the mitigation credits that will be created. The service area is the area in which projects with compensatory mitigation needs can use or purchase the mitigation credits created and released under the MCA. The service area of an MCA under this Mid-Sacramento Valley RCIS must occur within the RCIS area. However, if another RCIS occurs adjacent to this RCIS, an MCA could be developed that has an *extended service area* that spans both RCIS areas, as long as the two RCISs and the MCA meet certain criteria described below.

According to CDFW,[9] an MCA service area can extend into an adjacent RCIS as long as the following conditions are met.

- The RCISs are adjacent and approved.
- The conservation goals and objectives in the two RCISs are essentially the same or compatible with respect to the extended service area of the MCA for the applicable species.
- The MCA sponsor provides, and CDFW approves, an ecological justification that the proposed extended service area is based on sound ecological principles and geographic appropriateness, including the range and key habitat features of the MCA focal species or other conservation elements (e.g., specific vegetation community, vegetation structure, soil type, hydrologic regime, ecosystem process, or other features).
- The proponents for both RCISs consent in writing to the extension of the MCA service area over both RCISs.

An RCIS is being developed in Yolo County by the Yolo Habitat Conservancy, California Department of Water Resources, California Natural Resources Agency, and other stakeholders. The Yolo Habitat Conservancy is preparing the RCIS as part of an expansion of a Local Conservation Plan (LCP). The Yolo Habitat Conservancy is preparing the joint RCIS/LCP in parallel with the Yolo Habitat Conservation Plan (HCP)/Natural Community Conservation Plan (NCCP). The Yolo HCP/NCCP is being prepared to address the conservation needs of 12 listed and special-status species in Yolo County and the natural communities and habitats upon which they depend. The Yolo RCIS/LCP is a

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[8] The Program Guidelines (California Department of Fish and Wildlife 2018) defines permanent protection to mean "(1) recording a conservation easement and (2) providing secure, perpetual funding for management of the land, monitoring, legal enforcement, and defense."

[9] CDFW provided these criteria to ICF verbally on July 27, 2017. This or similar language will be included in the upcoming MCA Guidelines that CDFW will release in 2019.

compatible, but separate, plan from the Yolo HCP/NCCP that establishes conservation priorities to help focus implementation efforts to conserve biological resources not addressed in the Yolo HCP/NCCP.

The Mid-Sacramento Valley RCIS and Yolo RCIS/LCP meet the first two criteria in the bullet list above: 1) The Yolo RCIS/LCP area borders the Mid-Sacramento Valley RCIS area along the southern boundary of the Mid-Sacramento Valley RCIS area in Colusa and Sutter Counties (Figure 1-1); and 2) the Mid-Sacramento Valley RCIS's conservation strategy was developed to be consistent with the Yolo RCIS, to facilitate MCAs that can be used for mitigation by projects within the Yolo RCIS area, and vice versa. All of the Mid-Sacramento Valley RCIS focal species are Yolo RCIS focal species, and the Mid-Sacramento Valley RCIS has conservation goals, objectives, and actions in common with the Yolo RCIS.

4.5.1.2 Mitigation Credit Agreements in Colusa County

Conservation and habitat enhancement actions described in this RCIS, and MCAs that create credits for the implementation of those actions, are intended to be implemented consistent with Colusa County General Plan policies (Colusa County 2012) and zoning code (Colusa County 2014). As described in Chapter 2, Section 2.3.1.1, *Colusa County*, the Colusa County General Plan requires that habitat and resource conservation actions (e.g., habitat protection and restoration protected under a conservation easement) shall be limited to lands designated with the County's General Plan Resource Conservation (RC) land use designation, unless all of the conditions identified in Policy AG 1-14 are met (Policy CON 1-3) (Figure 2-9).

Policy CON 1–3 Lands that are actively managed or placed under conservation easement for habitat, wetlands, species, or other natural resource or open space preservation or conservation shall be limited to lands designated Resource Conservation (RC) unless the conditions identified in Policy AG 1-14 are met.

Policy AG 1-14 specifies that resource conservation activities such as habitat creation and active habitat or species management on lands designated for agricultural uses shall require a General Plan Amendment to the Resource Conservation land use designation unless all of the following conditions are met:

a. The resource conservation activities involve active and on-going agricultural activities on the majority of the site.

b. The resource conservation activities are compatible with agricultural activities on the site and existing or potential agricultural activities in the vicinity.

c. There would not be a concentration of resource conservation lands in the immediate area.

In the Colusa County portion of the RCIS area, 85% of the area zoned for resource conservation is already protected by a conservation easement or in fee title. The remaining 15%, approximately 4,300 acres, are not yet protected by conservation easement or fee title (Figure 4-1). The balance of the RCIS area in Colusa County is dominated by farmland and grazing land and is zoned for agricultural uses (Table 2-2 and Figure 2-9). Because only a small percent of the area zoned for resource conservation remains unprotected for conservation purposes, it is important that any new conservation areas be reviewed by the County for consistency with the County's General Plan requirements.

In addition, Policy CON 1-3 also specifies that habitat and/or wildlife easements proposed in Colusa County for the loss of open space or habitat in other jurisdictions will not be recognized and are not acceptable unless the easement meets all of the following criteria:

- Prior notification to Colusa County;
- Consistency with the goals and policies of the Colusa County General Plan, particularly as related to planned growth, infrastructure, and agricultural preservation;
- Compensation to Colusa County for all lost direct and indirect revenue;
- Compatible with neighboring land uses;
- Located outside of urban and urban reserve areas;
- Secured water rights and infrastructure to economically maintain the proposed mitigation use;
- Requirements that existing agricultural operations continue to be farmed for commercial gain;
- Requirements that habitat management practices do not adversely impact adjacent agricultural operations;
- Prioritize purchase of mitigation credits by local developers; and
- Accommodation of recreational uses or public access, where appropriate.

As identified above, Colusa County's General Plan has policies limiting the use of conservation (e.g., habitat protection, habitat restoration) on areas zoned as agricultural land unless specific findings and conditions are met in order to preserve the agricultural heritage and the way-of-life in Colusa County (Policy AG 1-14). Resource conservation proposed through this RCIS or other means that will be protected through conservation easements and mitigation banks and are established primarily for habitat purposes (i.e., not typical working lands) in areas zoned for agriculture may only be developed with a general plan amendment and rezone application (Policy AG 1-14) (Colusa County 2012).

The Community Development Department's section of the County's website[10] contains informational handouts of the general plan amendment and rezoning application process. In general, general plan amendments and rezoning applications will require a Planning Commission hearing and a subsequent Board of Supervisor's hearing. This process will provide an opportunity for those most affected by a proposed use to provide input to the hearing body. The County's Community Development Department encourages early consultation with County Planning staff to identify and resolve potential issues prior to application submittal. Website links to the Colusa County General Plan, Zoning Code, and an application for general plan amendments and zoning amendments can be found on Colusa County's website.[11]

Examples of conservation actions that preclude existing agricultural activities on a majority portion of a parcel and would have to apply for a general plan amendment and rezoning include large-scale habitat restoration, such as restoring a vernal pool complex or a large freshwater emergent wetland complex on land currently used to grow rice. In certain cases, large-scale restoration may not restrict existing agricultural activities. For example, restoring a large vernal pool complex on pasture or rangeland used for grazing (e.g., by recontouring the land to restore vernal pools and

[10] https://www.countyofcolusa.org/

[11] https://www.countyofcolusa.org/index.aspx?NID=141

swales) would not preclude existing grazing uses if grazing is continued on the restored vernal pool complexes in ways that are compatible with existing agricultural practices and maintain ecosystem and habitat values in the restored vernal pool complexes.

Colusa County encourages wildlife-friendly agricultural practices, as described in Policy AG 2-16. Specifically, the following (from the Agriculture Element).

Policy AG 2-16 Promote wildlife-friendly farm practices, such as tailwater ponds, native species/grasslands restoration in field margins, hedgerows, ditch management for riparian habitat, and restoration of riparian areas in a manner consistent with ongoing agricultural activities water delivery systems, reduction of pesticides, and other appropriate measures.

To facilitate the implementation of Policy AG 2-16, the general plan authorizes conservation easements on agricultural lands where habitat management actions would not preclude existing agricultural practices (e.g., managing ricelands to provide habitat for giant garter snake, restoring small patches of native habitat such as riparian woodland, livestock grazing on working lands, etc.) (Policy AG 1-14).

In addition to Colusa County's land use requirements on the use of conservation and habitat easements and programs on agricultural lands, lands that are subject to existing Williamson Act and Farmland Security Zone contracts are also further restricted. The County's current Williamson Act and Farmland Security zone policies do not define open space or habitat conservation as a compatible use on contracted lands.

The Mid-Sacramento Valley RCIS encourages MCA sponsors to consult the current Colusa County General Plan and Colusa County zoning code and contact the Colusa County Planning Department early in the MCA development process to identify potential conflicts with the County's general plan, zoning code, and/or Williamson Act and Farmland Security zone policies.

4.5.1.3 Mitigation Credit Agreements in Sutter County

Conservation and habitat enhancement actions described in this RCIS, and MCAs that create credits for the implementation of those actions, are intended to be implemented consistent with Sutter County General Plan policies (Sutter County 2011) and zoning code (Sutter County 2016). As described in Chapter 2, Section 2.3.1.2, *Sutter County*, it is a goal of the County to "[p]reserve Sutter County's agricultural heritage and natural resources" (Sutter County General Plan, Goal LU-2). Lands in the unincorporated county fall within the following three broadly designated categories, each distinguished by the differing levels of conservation and growth: agriculture and open space, rural communities, and growth areas (Figure 2-10). The general plan defines agriculture and open space areas as those "to be set aside for the long-term conservation of agriculture, natural resources, and related uses." Policy AG 1-6, *Interrelationship with Habitat Conservation*, permits "agriculturally designated lands to be used for habitat conservation and/or mitigation with approval of a development agreement, provided such use does not interfere or adversely affect existing or planned agricultural uses or impact County flood control operations."

This RCIS's conservation strategy aligns with vision to preserve its significant natural resources and the use of land for mitigation purposes. For example:

Goal ER 4 Conserve, protect, and enhance Sutter County's unique natural open space lands and resources.

And:

Policy ER 2.4 **Wetland Mitigation Banks.** Encourage the creation and use of regional wetland mitigation banks to the extent that they do not conflict with Sutter County agricultural lands and flood control operations. (ER 2-A)

Potential MCA sponsors should take note of Policy ER 4.6, which could limit the use of Sutter County land for providing compensatory mitigation for projects.

Policy ER 4.6 **Mitigation for Other Jurisdictions.** Prohibit land mitigation within Sutter County for projects within other jurisdictions unless there is a benefit to Sutter County. Benefits can include, but are not limited to, providing flood protection for Sutter County, providing opportunities for Sutter County projects' use of the area for mitigation, or making the natural resources available for the enjoyment of Sutter County residents.

Sutter County zoning code (Sutter County 2016) classifies the use of land for habitat and resource protection and restoration.

Article 5: Use Classifications, 1500-03-050, Open Space and Recreational Use Types

D. Conversion of Agricultural Land to Habitat. Includes the conversion of land designated for agricultural use to permanent wildlife or other habitat. An Open Space Easement Agreement shall be approved by the Board of Supervisors prior to the conversion of agricultural land to habitat.

I. Resource Protection and Restoration. Includes activities commonly undertaken to preserve, restore, recreate, enhance, and manage natural, cultural and scenic resource values such as fish and wildlife habitat, rare and endangered plants, wetlands, archeological sites, and viewing areas.

The zoning code includes the following supplemental use regulations for these land use districts.

Article 5: Agricultural, Recreation, and Open Space Districts, 1500-05-030

H. Resource Protection and Restoration. Lands within the AG District may be used for habitat conservation, protection, restoration and/or mitigation with approval of a conservation easement and/or acquisition, provided such use does not substantially interfere or adversely affect existing or planned agricultural uses or impact County flood control operations. Such activities should be consistent with an adopted Habitat Conservation Plan and/or Natural Communities Conservation Plan.

T. Open Space Easement Agreement. Prior to the conversion of land designated for agricultural use to permanent wildlife or other habitat, an Open Space Easement Agreement shall be approved by the Board of Supervisors.

The Mid-Sacramento Valley RCIS encourages potential MCA sponsors to consult the current Sutter County General Plan and Sutter County zoning code and contact Sutter County Planning Services[12] early in the MCA development process to identify potential conflicts with the general plan and/or zoning code.

[12] https://www.suttercounty.org/doc/government/depts/ds/ps/cs_planning_services

4.5.2 Conservation or Mitigation Banks

A conservation or mitigation bank is privately or publicly owned land that is managed for its natural resource values, with an emphasis on the targeted resource (species or aquatic resources, respectively). Conservation banks typically protect threatened or endangered species and their habitat, and other sensitive resources, whereas mitigation banks conserve existing, restored, enhanced, or created wetland habitats that may also provide habitat for listed species (California Department of Fish and Wildlife 2014). In exchange for permanently protecting and managing the land—and in the case of mitigation banks, restoring or creating aquatic resources—the bank operator is allowed to sell credits to project proponents who need to satisfy legal requirements for compensating environmental impacts of development projects (see Appendix A, *Glossary*).

The goals of private conservation and mitigation banks are compatible with and support regional conservation strategies such as this Mid-Sacramento Valley RCIS. See Chapter 2, Section 2.6.2, *Conservation and Mitigation Banks*, for information on the conservation and mitigation banks with available credits whose service area overlaps the RCIS area.

Private parties wishing to develop and establish a new mitigation or conservation bank in the RCIS area should consult guidance and instructions provided by CDFW and the U.S. Fish and Wildlife Service.[13] The Mid-Sacramento Valley RCIS can provide guidance on where mitigation or conservation banks could be established to support the conservation of resources addressed in this RCIS.

4.5.3 In-Lieu Fee Programs

In-lieu fee programs are identified by 33 Code of Federal Regulations (CFR) 332, *Compensatory Mitigation for Losses of Aquatic Resources* (also known as the Mitigation Rule), as a preferred approach to meeting compensatory mitigation needs for adverse effects on waters of the United States, second to mitigation banks. As defined in 33 CFR 332.2, an in-lieu fee program involves the following.

> "…the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for DA [Department of the Army] permits. Similar to a mitigation bank, an in-lieu fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor. However, the rules governing the operation and use of in-lieu fee programs are somewhat different from the rules governing operation and use of mitigation banks. The operation and use of an in-lieu fee program are governed by an in-lieu fee program instrument."

The National Fish and Wildlife Foundation's Sacramento District operates an in-lieu fee program that provides mitigation credits for impacts on aquatic species and habitats covered under the Clean Water Act, Rivers and Harbor Act, Porter-Cologne Water Quality Control Act, and Endangered Species Act. The operational area for the in-lieu fee program mirrors the U.S. Army Corps of Engineers Sacramento District's jurisdictional boundary in California, covering the Central Valley, the Sierra Nevada Mountains, and the northeastern corner of the state. This in-lieu fee program area overlaps the entire RCIS area. The National Fish and Wildlife Foundation offers two categories of mitigation credits: vernal pool credits for impacts on vernal pool wetlands in 12 vernal pool service

[13] For additional information on banking see the following websites: www.dfg.ca.gov/hcpb/conplan/mitbank/mitbank.shtml and www.fws.gov/sacramento/es/cons_bank.htm.

areas, and aquatic resource credits for impacts on wetlands, other waters of the U.S., waters of the state, and aquatic species. Watershed boundaries divide the aquatic resource areas to capture the headwaters and floodplains associated with the major river systems in the Central Valley. Vernal pool service areas and aquatic resource service areas overlap the entirety of the RCIS area. The National Fish and Wildlife Foundation in-lieu fee program is approved for use by the regulatory agencies that govern the environmental acts described above (National Fish and Wildlife Foundation 2018). This RCIS can inform the siting, design, and management of wetland mitigation projects under this and any other in-lieu fee program.

4.6 Amending this RCIS

The RCIS proponent, in consultation with California Department of Water Resources, may amend the Mid-Sacramento Valley RCIS. The Program Guidelines define two types of RCIS amendments: simple and complex. A simple amendment includes small or minor changes to the document that are more than a data update (Section 4.3.1, *Updating and Extending this RCIS*), but that do not result in a substantial changes, as determined by CDFW. A complex amendment would result in a substantial change to the document, such as changes to the geographic area, focal species, or other conservation elements, as determined by CDFW.

The public notice requirements, review and approval process, and timelines for a complex amendment are the same as for developing a new RCIS. According to the Program Guidelines (California Department of Fish and Wildlife 2018):

> "An amended RCIS can be submitted by either the original RCIS proponent, CDFW, or by a third-party public agency with the express written authorization of the original RCIS proponent. If a third-party public agency wishes to amend an approved RCIS and the original RCIS proponent declines to so amend the RCIS or to authorize the third-party public agency to do so, the third-party public agency may seek authorization from CDFW to amend the RCIS. CDFW may, in its sole discretion, authorize a third-party public agency to amend an RCIS if it determines that the proposed amendment will provide a substantial conservation benefit and will not unduly prejudice the rights or interests of the original RCIS proponent. CDFW may also, in its sole discretion, amend an RCIS if it determines that an amendment is necessary to conform to new or amended federal, state, or local laws or regulations, or if it determines that the proposed amendment will provide a substantial conservation benefit and will not unduly prejudice the rights or interests of the original RCIS proponent."

4.7 Conservation Partners

This Mid-Sacramento Valley RCIS provides a framework for identifying regional conservation priorities and actions for landscapes, working lands, natural communities, and focal species. Just as importantly, this RCIS provides a platform to facilitate conservation partnerships amongst local, regional, and national entities interested in conservation. As such, a combination of conservation investments, conservation actions, habitat enhancement actions, and compensatory mitigation completed outside of an MCA will be needed to achieve this RCIS's conservation goals and objectives. This RCIS also anticipates that success in meeting the conservation goals and objectives will require flexibility, creativity, and establishment of partnerships in conservation. Tools that could be used to implement the RCIS on working lands include, but are not limited to, the following examples.

- Conduct outreach to land managers to incorporate practices that benefit focal species and other native fauna and flora.
- Offer economic and regulatory incentives to private landowners to maintain and enhance natural communities, including small patches embedded within working lands, to provide habitat for focal species and other native fauna and flora.
- Offer financial incentives to landowners to grow crops that are beneficial for focal species.
- Incorporate conservation priorities into land-use planning guidelines, allowing the opportunity for regional conservation planning context to be integrated into local decision making.

This Mid-Sacramento Valley RCIS encourages agencies and organizations that may use this RCIS to consider partnerships. The needs and goals of other agencies or organizations, or individual partners operating in the RCIS area may help support more robust and more effective implementation of priority conservation actions and habitat enhancement actions. To facilitate these partnerships, a list is provided below of entities, among others, who are currently engaged in conservation activities in the RCIS area.

- American Farmland Trust.
- American Rivers.
- Audubon California.
- California Department of Fish and Wildlife.
- California Department of Transportation.
- California Department of Water Resources.
- California Native Plant Society.
- California Natural Resources Agency.
- California Rice Commission.
- California Ricelands Waterbird Foundation.
- Caltrout.
- Central Valley Habitat Exchange.
- Central Valley Regional Water Quality Control Board.
- Colusa County Farm Bureau.
- Colusa County Resource Conservation District.
- Colusa County Water District.
- Colusa National Wildlife Refuge.
- Defenders of Wildlife.
- Ducks Unlimited.
- Environmental Defense Fund.

- Environmental Incentives.
- Glenn-Colusa Irrigation District.
- Knaggs Ranch.
- National Marine Fisheries Service.
- Point Blue Conservation Science.
- Reclamation Districts 108, 2047, 0070, 1660, and 1500.
- Sacramento River Forum.
- Sacramento River Preservation Trust.
- Sacramento River Watershed Program.
- Sacramento River West Side Levee District.
- Sierra Club.
- State of California Water Resources Control Board.
- Sutter-Butte Flood Control Agency.
- Sutter County.
- Sutter County Resource Conservation District.
- Sutter County Water Agency.
- The Nature Conservancy.
- U. S. Army Corps of Engineers.
- U. S. Fish and Wildlife Service.
- Westervelt Ecological Services.
- Yuba-Sutter Farm Bureau.

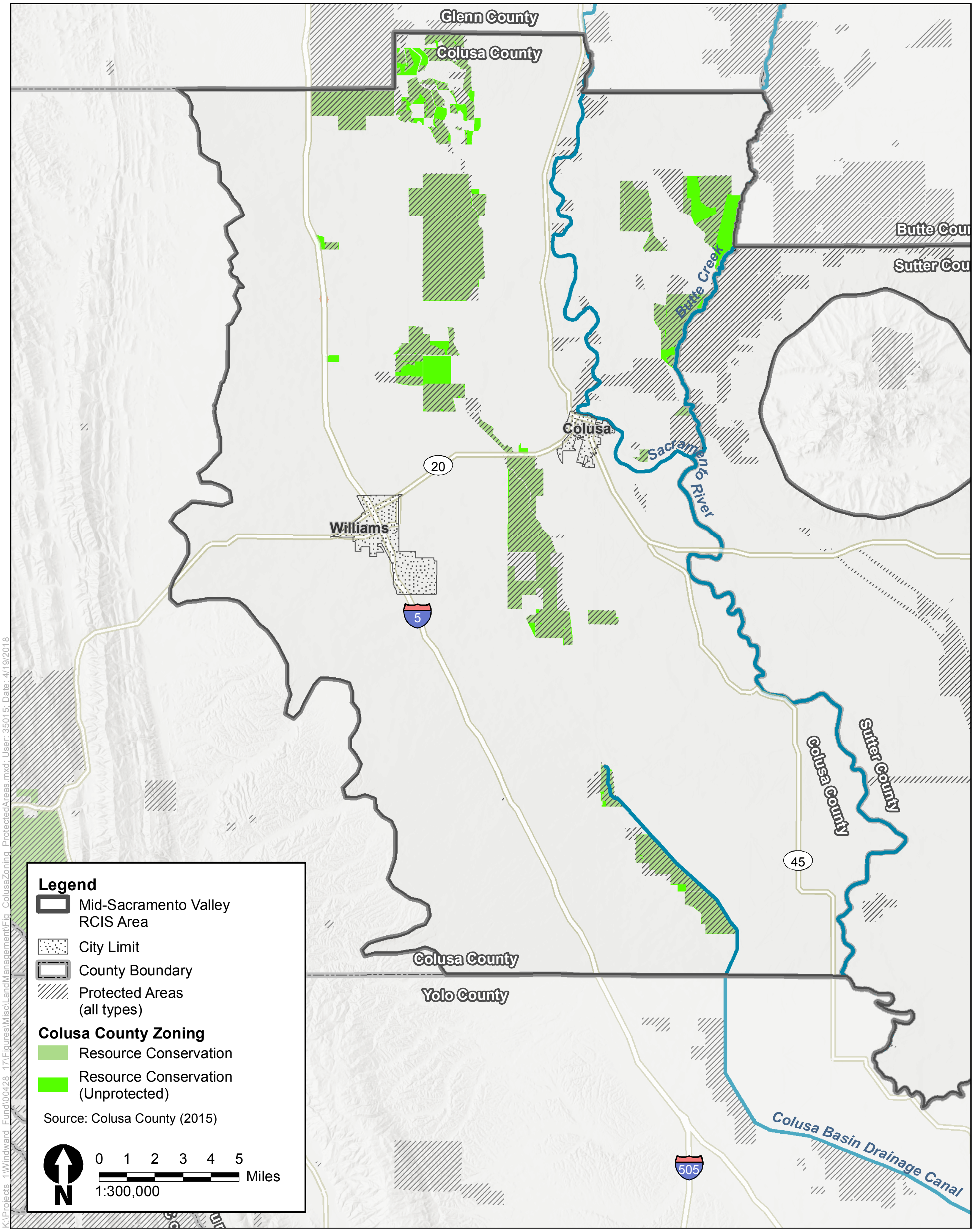

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Figure 4-1
Areas in Colusa County Zoned for Resource Conservation Protected by Conservation Easement or Fee Title

Chapter 5
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5.2 Chapter 2

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5.3 Chapter 3

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Chapter 6
Preparers and Reviewers

ICF

David Zippin, Ph.D.	RCIS Program Manager
Troy Rahmig	Deputy RCIS Program Manager
Aaron Gabbe, Ph.D.	Mid-Sacramento Valley RCIS Lead – Project Manger
Amy Poopatanapong	Wildlife Ecologist
Torrey Edell	Plant Ecologist
Todd Jones	Conservation Planner
Donna Maniscalco	Biologist
Danielle Tannourji	Plant Ecologist
Kathryn Gaffney	Conservation Planner
Kasey Allen	Lead GIS Specialist
Brent Read	GIS Specialist
Daniel Schiff	GIS Specialist
Ariana Marquis	Editor
Kristen Lundstrom	Editor
James Harmon, Ph.D.	Publications Specialist
Anthony Ha	Publications Specialist
Alan Barnard	Graphic Artist

Mid-Sacramento Valley RCIS Steering Committee

Mid-Sacramento Valley RCIS Steering Committee members are listed below, in order of last name.

Denise Carter	Colusa County
Lori Clamurro-Chew	California Department of Water Resources
Laura Hollender	California Department of Water Resources
Mike Inamine	Sutter Butte Flood Control Agency
Doug Libby	Sutter County

Carin Loy	California Department of Transportation
Meegan Nagy	Reclamation District 108
Kris Tjernell	California Natural Resources Agency (through April, 2018)

Mid-Sacramento Valley RCIS Development Team

Mid-Sacramento Valley RCIS development team members are listed below, in order of last name.

Graham Chisholm	Conservation Strategy Group
Aaron Gabbe	ICF
Bjorn Gregersen	ECORP Consulting
Dan Kaiser	Environmental Defense Fund
Meegan Nagy	Reclamation District 108
Barry O'Regan	Kjeldsen, Sinnock & Neudeck Inc.
Troy Rahmig	ICF
Katie Riley	Environmental Incentives
David Zippin	ICF

Resources Law Group

Chris Beale	Lead Attorney; Contributing Author of Appendix F, *Regulatory Process*

Reviewers

Following are people who reviewed drafts of the Mid-Sacramento Valley RCIS (in addition to those on the Steering Committee), in order of last name.

Kjellen Belcher	Environmental Defense Fund
Kristen Boysen	Environmental Incentives
Adam Henderson	California Department of Water Resources
Evan Patrick	Environmental Defense Fund
Greg Plucker	Colusa County

Appendix A
Glossary

This glossary defines terms that are used throughout this Mid-Sacramento Valley RCIS. Additional terms and extended definitions are provided in the *Regional Conservation Investment Strategies Program Guidelines* (Program Guidelines[1]), Section 2, *Standard Terminology* (California Department of Fish and Wildlife 2018).

Term	Definitions
adaptive management and monitoring strategy	A component of an RCIS that incorporates an adaptive management process that is informed by periodic monitoring of the implementation of both conservation actions and habitat enhancement actions.[2] Adaptive management means using the results of new information gathered through a monitoring program to adjust management strategies and practices to help provide for the conservation of focal species and their habitats. A monitoring strategy is the periodic evaluation of monitoring results to assess the adequacy of implementing a conservation action or habitat enhancement action and to provide information to direct adaptive management activities to determine the status of the focal species, their habitats, or other natural resources.[3]
administrative draft NCCP	A substantially complete draft of a Natural Community Conservation Plan (NCCP) that is released after January 1, 2016, to the general public, plan participants, and CDFW.
advance mitigation	Compensatory mitigation for impacts on ecological resources (species and their habitats) and other natural resources that is implemented prior to impacts occurring.
Assembly Bill 2087	A draft of a proposed law introduced by a Member of the California Assembly.[4]
biodiversity	The full array of living things considered at all levels, from genetic variants of a single species to arrays of species and arrays of genera, families, and higher taxonomic levels; includes natural communities and ecosystems.

[1] California Department of Fish and Wildlife. 2018. Regional Conservation Investment Strategies. Program Guidelines. September 12, 2018. Sacramento, CA. Available: https://www.wildlife.ca.gov/Conservation/Planning/Regional-Conservation.

[2] Fish & G. Code, § 1856, subdivisions (b)(1) and (f)(14)

[3] Adapted from Fish & G. Code, § 2805, subdivisions (a) and (g)

[4] California State Legislature Glossary of Legislative Terms, definition of "Bill." Available: http://www.legislature.ca.gov/quicklinks/glossary.html.

Term	Definitions
California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California	A statewide assessment[5] of essential habitat connectivity completed by consultants and commissioned by CDFW and Caltrans; the assessment used the best available science, data sets, and spatial analysis and modeling techniques to identify large remaining blocks of intact habitat or natural landscape and model linkages between them that need to be maintained, particularly as corridors for wildlife.
CEQA – California Environmental Quality Act	California Environmental Quality Act (California Public Resources Code, sections 21000 - 21178, and Title 14 CCR, section 753, and Chapter 3, sections 15000 - 15387)
CESA – California Endangered Species Act	California Endangered Species Act (Fish and Game Code § 2050-2115.5).
California Fish and Game Code (FGC)	State code amended by Assembly Bill 2087 to provide for a regional RCIS program (FGC 1850–1861).
climate change vulnerability	Refers to the degree to which an ecological system, natural community, habitat, or individual species is likely to be adversely affected as a result of changes in climate and is often dependent on factors such as exposure, sensitivity, and adaptive capacity.
compensatory mitigation	Actions taken to fulfill, in whole or in part, mitigation requirements under state or federal law or a court mandate.
conservation, conserve	The use of habitat and other natural resources in ways such that they may remain viable for future generations. This includes permanent protection of such resources. See “permanently protect.”
conservation action	An action identified in an RCIS that, when implemented, would permanently protect or restore, and perpetually manage, conservation elements, including focal species and their habitats, natural communities, ecological processes, and wildlife corridors. In contrast, a habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat – see *habitat enhancement action*. A conservation action is developed to achieve one or more conservation objectives. A conservation action may be implemented through a variety of conservation investments or MCAs. A conservation action that is implemented through an MCA would create conservation credits to be used as compensatory mitigation.

[5] *California Essential Habitat Connectivity Project*. Available: https://www.wildlife.ca.gov/conservation/planning/connectivity/CEHC.

Term	Definitions
conservation bank	Land managed for its natural resource values, with an emphasis on targeted resources. May include habitat restoration or creation in addition to protecting occupied habitats. See *mitigation bank.*
conservation easement	A perpetual conservation easement that complies with Chapter 4 (commencing with Section 815) of Title 2 of Part 2 of Division 2 of the Civil Code. [6]
conservation element	An element that is identified and analyzed in in an RCIS that will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Conservation elements include focal species and their habitats, natural communities, biodiversity, habitat connectivity, ecosystem functions, water resources, and other natural resources. This RCIS uses the term "other conservation element" to refer to all conservation elements except focal species. Conservation elements may benefit through both conservation investments and MCAs.
conservation goal	Broad, guiding principle that describes a desired future condition for a focal species, other species, or other conservation element. Each conservation goal is supported by one or more conservation objectives.
conservation investment	Conservation actions or habitat enhancement actions that are implemented under an approved RCIS, but the implementer does not create credits through an MCA with CDFW. Conservation investments are typically funded by public agencies and nonprofit or other philanthropic organizations.
conservation priority	A conservation or habitat enhancement action (e.g., land acquisition, restoration, or habitat enhancement) that is identified based on its importance for benefiting and contributing to the conservation of focal species and their habitats, or other conservation elements in an RCIS area.
conservation purpose	Statement or statements in an RCIS that identify focal species and other conservation elements in the RCIS area and which outline conservation actions or habitat enhancement actions that, if implemented, will sustain and restore these resources.
creation (of natural community or focal species' habitat)	The creation of a specified resource condition where none existed before. See *establishment*.

[6] "Conservation easement" includes a conservation easement as defined in Civil Code section 815.1 and an agricultural conservation easement as defined in Pub. Resources Code, § 10211.

Term	Definitions
critical habitat	Habitat designated as critical[7] refers to specific areas occupied by a federally-listed species at the time it is listed, and that are essential to the conservation of the species and that may require special management considerations or protection. Critical habitat also includes specific areas outside occupied habitat into which the species could spread and that are considered essential for recovery of the species.
CWHR – California Wildlife Habitat Relationships	System that contains the life history, geographic range, habitat relationships, and management information for over 700 regularly occurring species of amphibians, reptiles, birds, and mammals in the state; allows users to produce queries to generate lists of species by geographic location or habitat type and provides information on expert opinion–based habitat suitability ranks for each species within each habitat type.[8]
ecological function	Ecological function refers to the roles and relationships (e.g., predator and prey relationships) of organisms within an ecological system, and the processes (e.g., pollination, decomposition) that sustain an ecological system. See also, *ecosystem function*.
ecological resources	Species, habitats, biological resources, and natural resources identified in an RCA or RCIS. See *conservation element* and *natural resources*.
ecoregion, sub-ecoregion	As used in this document, ecoregion means a USDA Section[9] and sub-ecoregion means a portion of the USDA Section or USGS Hydrological Units (assigned hydrological unit codes; HUC).[10] USDA describes four geographic levels of detail in a hierarchy of regional ecosystems including domains, divisions, provinces, and sections. Sections are subdivisions of provinces based on major terrain features, such as a desert, plateau, valley, mountain range, or a combination thereof.

[7] 16 U.S.C. § 1532(5)(a)

[8] California Department of Fish and Wildlife. 2017. California Wildlife Habitat Relationships. Available: https://www.wildlife.ca.gov/Data/CWHR

[9] Goudey, C.B., and D.W. Smith, eds. 1994. Ecoregions California07_3. McClellan, CA. Remote Sensing Lab. Updated with ECOMAP 2007: Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C; McNab, W.H. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States [1:3,500,000] [CD-ROM]. Sloan, A.M., cartog. Gen. Tech. Report WO-76. Washington, DC: U.S. Department of Agriculture, Forest Service. Miles and Goudey 1997. Ecological Subregions of California. Technical Report R5-EM-TP-005, USDA Forest Service, Pacific Southwest Region, San Francisco, CA.

[10] The United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey (USGS), and the Environmental Protection Agency (EPA). The Watershed Boundary Dataset (WBD) was created from a variety of sources from each state and aggregated into a standard national layer for use in strategic planning and accountability. Available: http://datagateway.nrcs.usda.gov

Term	Definitions
ecosystem	A natural unit defined by both its living and nonliving components; a balanced system of the exchange of nutrients and energy. Compare with *habitat*.
ecosystem function	The ecosystem processes involving interactions between physical, chemical, and biological components, such as dynamic river meander, floodplain dynamism, tidal flux, bank erosion, and other processes necessary to sustain the ecosystem and the species that depend on it.
ecosystem services	The beneficial outcomes to humans from ecosystem functions such as supplying of oxygen; sequestering of carbon; moderating climate change effects; supporting the food chain; harvesting of animals or plants; providing clean water; recharging groundwater; abating storm, fire, and flood damage; pollinating and fertilizing for agriculture; and providing scenic views.
endemic	A species, subspecies, or variety found only in a specified geographic region.
enhancement	A manipulation of an ecological resource or natural resource that improves a specific ecosystem function. An enhancement does not result in a gain in protected or conserved land, but it does result in an improvement in ecological or ecosystem function.
essential connectivity areas	Those areas essential for ecological connectivity between natural landscape blocks, as depicted in the Essential Connectivity Map prepared as part of CEHC Project,[11] or other connectivity report, plan, or map approved by CDFW or that represents best available science.
establishment	The manipulation of the physical, chemical, or biological characteristics present on a site to develop an aquatic or terrestrial habitat resource for focal species. Establishment will result in a gain in resource area and/or function. See *creation*.
extended service area	See *service area.*
focal species	Sensitive species that are identified and analyzed in an RCIS and will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Focal species may benefit through both conservation investments and MCAs. See also, *sensitive species*, *special-status species*, and *non-focal species*.

[11] California Essential Habitat Connectivity Project. Available: https://www.wildlife.ca.gov/conservation/planning/connectivity/CEHC.

Term	Definitions
gap analysis	An analysis that identifies gaps between land areas that are rich in biodiversity and areas that are managed for conservation.
habitat	An ecological or environmental area that is, or may be inhabited by a species of animal, plant or other type of organism. It is also the physical and biological environment that surrounds, influences, and is utilized by a species' population and is required to support its occupancy. See also, *CWHR—California Wildlife Habitat Relationships*.
habitat connectivity	The capacity of habitat to facilitate the movement of species and ecological functions.
habitat enhancement action	An action identified in an RCIS that, when implemented, is intended to improve the quality of wildlife habitat, or to address risks or stressors to wildlife. A habitat enhancement action is developed to achieve one or more conservation objectives. A habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. In contrast, a conservation action would permanently protect or restore, and perpetually manage, conservation elements – see *Conservation Action*. Examples of habitat enhancement actions include improving in-stream flows to benefit fish species, enhancing habitat connectivity, and controlling or eradicating invasive species. A habitat enhancement action may be implemented through a variety of conservation investments or MCAs. A habitat enhancement action that is implemented through an MCA would create habitat enhancement credits intended for use as compensatory mitigation for temporary impacts.[12]
HCP – habitat conservation plan	A planning document that is required as part of an application for an incidental take permit under the federal Endangered Species Act. HCPs provide for partnerships with non-federal parties to conserve the ecosystems upon which listed species depend, ultimately contributing to their recovery. HCPs describe the anticipated effects of the proposed taking, how those impacts will be minimized or mitigated, and how the HCP is to be funded.[13]

[12] Fish & G. Code, § 1856, subdivision (d) states that "…the habitat enhancement action shall remain in effect at least until the site of the environmental impact is returned to pre-impact ecological conditions."

[13] https://www.fws.gov/endangered/esa-library/pdf/hcp.pdf

Term	Definitions
HUC – Hydrologic Unit Code	A code identifying a unique hydrologic unit.[14]
in-lieu fee program	Programs that allow payment to the government or nonprofit organization to meet the compensatory mitigation requirements for certain permits.
invasive species	Invasive species means, with regard to a particular ecosystem, a non-native organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health.[15]
land conversion	The conversion of natural and agricultural land to other land uses through the process of development.
land cover type	The dominant feature of the land surface discernible from aerial photographs and defined by vegetation, water, or human uses.
landscape matrix	The dominant land cover type in any defined (or bounded) land area.
LSA – Lake and Streambed Alteration	Lake and Streambed Alteration Program (Fish and Game Code sections 1600-1617).[16]
MCA – mitigation credit agreement	An agreement between CDFW and one or more persons or entities that identifies the types and numbers of credits the person(s) or entity(ies) proposes to create by implementing one or more conservation actions or habitat enhancement actions. An MCA includes the terms and conditions under which those credits may be used. The person or entity may create and use, sell, or otherwise transfer the credits upon CDFW's approval that the credits have been created in accordance with the MCA. To enter into an MCA with CDFW, a person or entity shall submit a draft MCA to CDFW for its review, revision, and approval. An MCA may only be created within an area where an RCIS has been approved.

[14] The United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), the United States Geological Survey (USGS), and the Environmental Protection Agency (EPA). The Watershed Boundary Dataset (WBD) was created from a variety of sources from each state and aggregated into a standard national layer for use in strategic planning and accountability. Available: http://datagateway.nrcs.usda.gov

[15] California Department of Fish and Wildlife. 2015. *California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians.* Edited by Gonzales, A. G. and Hoshi, J. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=110399&inline. Accessed: March 16, 2017.

[16] Fish & G. Code, §§ 1600 – 1617

Term	Definitions
metric	The indicator (e.g., area, habitat quality, known or estimated population size, etc.) by which the net change can be measured, using existing technology, from implementation of the proposed conservation actions or habitat enhancement actions relative to performance standards, to determine achievement of the RCIS's objectives.
mitigation bank	Land managed for its natural resource values, with an emphasis on targeted resources. Typically requires the restoration or creation of aquatic resources. See *conservation bank*.
monitoring plan	The plan for monitoring a project. It includes information needs, indicators, and monitoring methods, spatial scale and locations, timeframe, and roles and responsibilities for collecting data.
multi-benefit project	Any type of infrastructure project that also enhances fish and wildlife habitat, as well as creates additional public benefits such as sustaining agricultural production, improving water quality and water supply reliability, increasing groundwater recharge, supporting commercial fisheries, and providing public recreation and educational opportunities, or any combination thereof.
natural community	A group of organisms living together and linked together by their effects on one another and their responses to the environment they share.[17] A general term often used synonymously with vegetation community and aquatic community.
natural resources	Biological and ecological resources, including species and their habitats, waters of the State, waters of the United States, wetlands, and natural communities. See *ecological resources* and *conservation element*.
NCCP – natural community conservation plan	A plan developed pursuant to the Natural Community Conservation Planning Act. Fish and Game Code sections 2800-2835 which identifies and provides for the regional protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity.[18] An NCCP allows for take of species listed under CESA, as well as other, non-listed species.

[17] Sawyer, J.O., T. Keeler-Wolf, and J.E. Evens. 2009. *A Manual of California Vegetation*. Second Edition. Sacramento, CA: California Native Plant Society.
[18] Fish & G. Code, §§ 2800 – 2835

Term	Definitions
Non-focal species	Species that are not "focal species", as defined in these Guidelines, but which are associated with a focal species or other conservation element and will benefit from conservation actions and habitat enhancement actions set forth in the RCIS. Non-focal species may benefit through both conservation investments and MCAs. See also, *focal species*, *sensitive species*, and *special-status species*.
nonnative species	Any species introduced to California after European contact and as a direct or indirect result of human activity.[19] See *invasive species*.
objective	A concise, measurable statement of what is to be achieved and that supports a conservation goal. The objective should be based on the best available scientific information to conserve the focal species or other conservation elements for which the conservation goal and objective is developed. It should be measurable by using a standard metric or scale (i.e., number, percent), in a region (e.g., county, watershed, jurisdictional area) over a period of time (e.g., years).
other conservation element	See *conservation element*.
performance standards	Observable or measurable physical or biological attributes that are used to determine if a conservation action or habitat enhancement action has met its objectives.
performance-based milestones	Steps in the implementation of a conservation action or habitat enhancement action, such as site protection, initiating implementation, completing implementation, or achieving performance standards.
permanently protect	Permanent protection means: (1) recording a conservation easement and (2) providing secure, perpetual funding for management of the land, monitoring, legal enforcement, and defense.
population	The number of individuals of a particular taxon inhabiting a defined geographic area.
pressure	See *stressor, pressure*.
Program Guidelines – Regional Conservation Investment Strategies Program Guidelines	Guidelines for regional conservation investment strategies[20], published in support of Assembly Bill 2087.
protected area	Public or private lands managed for open space use.

[19] California Invasive Plant Council. 2006 (Updates the 1999 CalEPPC List). *Cal-IPC Invasive Plant* Inventory. www.cal-ipc.org.

[20] California Department of Fish and Wildlife. 2018. Regional Conservation Investment Strategies. Program Guidelines. September 12, 2018. Sacramento, CA. Available: https://www.wildlife.ca.gov/Conservation/Planning/Regional-Conservation.

Term	Definitions
RCIS area, strategy area	The geographic area encompassed by an RCIS.
RCIS – regional conservation investment strategy	Information and analyses to inform nonbinding and voluntary conservation actions and habitat enhancement actions that would advance the conservation of focal species and their habitats, natural communities, and other conservation elements. The RCIS provides nonbinding, voluntary guidance for the identification of conservation priorities, investments in ecological resource conservation, or identification of priority locations for compensatory mitigation for impacts on species and natural resources. RCISs are intended to provide scientific information for the consideration of public agencies and are voluntary. RCISs do not create, modify, or impose regulatory requirements or standards, regulate the use of land, establish land use designations, or affect the land use authority of, or exercise of discretion by, any public agency. RCISs are required if MCAs are to be developed.
RCIS proponent	The public agency or group of public agencies developing an RCIS for review and approval by CDFW and who is responsible for the technical and administrative updates of an RCIS.
recovery	The process by which the decline of an endangered or threatened species is halted or reversed or threats to its survival are neutralized, so that its long-term survival in nature can be ensured.[21] Entails actions to achieve the conservation and survival of a species, including actions to prevent any further erosion of a population's viability and genetic integrity. Also includes actions to restore or establish environmental conditions that enable a species to persist (i.e., the long-term occurrence of a species through the full range of environmental variation).
recovery area	Area identified in a draft or approved recovery plan for a federally listed species.
recovery plan	A document published by USFWS, NMFS, or CDFW that lists the status of a listed species and the actions necessary to remove the species from the endangered species list.

[21] U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Recovery Plan for Upland Species of the San Joaquin Valley. Portland, Or. Region 1.

Term	Definitions
rehabilitation	Manipulation of a piece of land with the goal of repairing natural or historic ecosystem functions to degraded habitat or natural resources. This results in an improvement in ecological or ecosystem functions but it does not result in a gain in area.
restore, restoration	Manipulation of a site with the goal of returning species, habitat, and ecological and ecosystem functions to a site that historically supported such species, habitat, and functions, but which no longer supports them due to the loss of one or more required ecological factors or as a result of past disturbance. Compare with *conservation*, *preserve*, and *rehabilitation*.
SCV – Survey of California Vegetation	The Survey of California Vegetation is the vegetation mapping standard developed and maintained for the state by CDFW (Fish and Game Code 1940).[22]
sensitive species	Any special-status species identified by a state or federal agency. See also, *focal species* and *special-status species*.
service area	The service area is the area in which projects with compensatory mitigation needs can use or purchase the mitigation credits created and released under the MCA. The service area of an MCA under this MUSR RCIS must occur entirely within the RCIS area. However, if another RCIS occurs adjacent to this RCIS, an MCA could be developed that has an *extended service area* that spans both RCIS strategy areas, as long as the two RCISs and the MCA meet certain criteria described below.
SGCN – Species of Greatest Conservation Need	Species of Greatest Conservation Need are selected, for each state, to indicate the status of biological diversity in the state, specifying at-risk species that have the greatest need for conservation. The latest SGCN list for the state of California is found in the California State Wildlife Action Plan 2015 Update.[23]
special-status species	For the purpose of the Program, a species identified as endangered, threatened, or candidate under state or federal law; as rare or fully protected under state law; or otherwise identified by CDFW through the approval of an RCIS. See also, *focal species* and *sensitive species*.

[22] https://www.wildlife.ca.gov/Data/VegCAMP/Mapping-Standards

[23] California Department of Fish and Wildlife. 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians. Appendix C: Species of Greatest Conservation Need. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109224&inline.

Term	Definitions
species of special concern	Species of Special Concern is an administrative designation and carries no formal legal status. The intent of designating SSCs is to: 1) focus attention on animals considered potentially at conservation risk by CDFW, other state, local and federal governmental entities, regulators, land managers, planners, consulting biologists, and others; 2) stimulate research on poorly known species; and 3) achieve conservation and recovery of these animals before they meet CESA criteria for listing as threatened or endangered.[24]
SSC – Species of Special Concern	Species of Special Concern[25] is an administrative designation and carries no formal legal status. The intent of designating SSCs is to: 1) focus attention on animals considered potentially at conservation risk by CDFW, other state, local and federal governmental entities, regulators, land managers, planners, consulting biologists, and others; 2) stimulate research on poorly known species; and 3) achieve conservation and recovery of these animals before they meet CESA criteria for listing as threatened or endangered.
Steering Committee	Representatives from Reclamation District 108, California Department of Water Resources, Sutter Butte Flood Control Agency, Colusa County, Sutter County, California Natural Resources Agency, and California Department of Transportation responsible for coordinating and developing this Santa Clara County RCIS.
strategy term	The initial 10-year period of RCIS approval. May be extended by CDFW after review.
stressor, pressure	Stressor is a degraded ecological condition of a focal species or other conservation element that resulted directly or indirectly from a negative impact of pressures such as habitat fragmentation. A pressure is an anthropogenic (human-induced) or natural driver that could result in changing the ecological conditions of a focal species or other conservation element. Pressures can be positive or negative depending on intensity, timing, and duration. Negative or positive, the influence of a pressure to the target focal species or other conservation elements is likely to be significant.

[24] Available: https://www.wildlife.ca.gov/Conservation/SSC
[25] https://www.wildlife.ca.gov/Conservation/SSC

Term	Definitions
SWAP – State Wildlife Action Plan	The California State Wildlife Action Plan (SWAP) is a CDFW publication developed to address the highest conservation priorities of the state, providing a blueprint for actions necessary to sustain the integrity of California's diverse ecosystems.[26] CDFW also created companion plans to support SWAP 2015[27] implementation through collaboration with partner agencies and organizations. The companion plans identify shared priorities among partner organizations to conserve natural resources in nine sectors that are experiencing significant pressures affecting natural resources.[28]
VegCAMP – Vegetation Classification and Mapping Program	The Vegetation Classification and Mapping Program develops and maintains California's expression of the National Vegetation Classification System.[29]
watershed	An area or ridge of land that contains a common set of streams and rivers that all drain into one location such as a marsh, stream, river, lake, or ocean.
working land	An area where people live and work in a way that allows ecosystems or ecosystem functions to be sustained (e.g. farms, ranches). Human are done in a way that minimizes disturbance on native plants and animals while retaining the working nature of the landscape.

[26] https://www.wildlife.ca.gov/SWAP/Final

[27] California Department of Fish and Wildlife. 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians. Edited by Armand G. Gonzales and Junko Hoshi. Prepared with assistance from Ascent Environmental, Inc., Sacramento, CA. Available: https://www.wildlife.ca.gov/SWAP.

[28] https://www.wildlife.ca.gov/SWAP/Final/Companion-Plans

[29] https://www.wildlife.ca.gov/Data/VegCAMP

Appendix B
Letter of Support

Combined State Agency Letter and Infrastructure Mitigation Letter

California Fish and Game Code (FGC) Section 1852(a) requires that, in order for California Department of Fish and Wildlife (CDFW) to approve a Regional Conservation Investment Strategy (RCIS), one or more state agencies must sponsor the RCIS. FGC Section 1852(a) also generally limits the number of RCISs that the CDFW can approve to eight. An RCIS is exempt from this limit, however, if the RCIS is accompanied by a letter to the CDFW Director from a state water or transportation agency. According to the CDFW RCIS Program Guidelines[1] "[t]o qualify for the exemption, the state water or transportation agency must state in the support letter that the RCIS may be used to facilitate mitigation for an infrastructure project."

Below is a combined State Agency Letter and Infrastructure Letter from the California Department of Water Resources (DWR). This letter requests that CDFW approve the Mid-Sacramento Valley Regional Conservation Investment Strategy, and states that DWR is requesting approval of the RCIS in part to facilitate mitigation for water infrastructure.

[1] California Department of Fish and Wildlife. 2018. Regional Conservation Investment Strategies. Program Guidelines. September 14. Sacramento, CA. Available: https://www.wildlife.ca.gov/Conservation/Planning/Regional-Conservation.

State of California **California Natural Resources Agency**

Memorandum

Date: October 16, 2018

To: Charlton Bonham, Director
California Department of Fish and Wildlife
1416 Ninth Street
Sacramento, California 95814

From: **Department of Water Resources**

Subject: Mid-Sacramento Valley Regional Conservation Investment Strategy

In accordance with California Fish and Game Code Section 1852(a), the California Department of Water Resources (DWR) requests that the California Department of Fish and Wildlife approve the Mid-Sacramento Valley Regional Conservation Investment Strategy (RCIS). The proposed Mid-Sacramento Valley RCIS encompasses portions of Colusa and Sutter Counties and has been developed by a collaborative group of state and local public agencies through a steering committee to help achieve improved conservation and public infrastructure outcomes in the region. DWR believes that a successfully implemented Mid-Sacramento Valley RCIS could significantly further the State's regional conservation objectives and public infrastructure goals by facilitating meaningful stakeholder engagement, by creating a common vision for regional landscape-level and species-specific conservation, and by empowering and incentivizing the design of public infrastructure projects that produce significant and measurable conservation uplift.

The State's 2017 Central Valley Flood Protection Plan and its corresponding Conservation Strategy also contributed significantly to the Mid-Sacramento Valley RCIS by incorporating the State's vision for both flood risk reduction infrastructure investments and habitat conservation priorities as part of multi-benefit projects. The Mid-Sacramento Valley RCIS also incorporates and seeks to further other State conservation and restoration goals and objectives, such as the EcoRestore initiative.

In accordance with California Streets and Highways Code Section 800.6(j), DWR is requesting approval of the Mid-Sacramento Valley RCIS in part to facilitate mitigation for water infrastructure projects, including but not limited to flood risk reduction projects and fishery conservation projects. As such, the Upper and Mid Sacramento Valley RCIS, if approved by the California Department of Fish and Wildlife, shall not count against the limit on the number of regional conservation investment strategies set in Section 1861 of the California Fish and Game Code.

If you have any questions, please contact me at (916) 653-5805.

Sincerely,

Kristopher A. Tjernell
Deputy Director
Integrated Water Management

Appendix C
Public Outreach

This appendix includes public notices regarding the Mid-Sacramento Valley RCIS, followed by written public comments, and responses to written public comments.

Public Notices

This section includes the following two public notices.

1. A combined notice published on November 3, 2017, of the intent to prepare the Mid-Sacramento Valley Regional Conservation Investment Strategy (RCIS) (previously named the Mid and Upper Sacramento River RCIS) and notice of a public meeting to be held on December 6, 2017, about the Mid-Sacramento Valley RCIS.
2. A notice published on February 15, 2018, of a public meeting to be held on March 20, 2018 about the Mid-Sacramento Valley RCIS.

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Mid and Upper Sacramento River Regional Conservation Investment Strategy

Lead Agency: Reclamation District 108 Contact Person: Meegan Nagy
Mailing Address: 975 Wilson Bend Road, PO Box 50 Phone: (530) 812-6269
City: Grimes Zip: 95950 County: Colusa

Project Location: County: Colusa and Sutter City/Nearest Community: Central Valley of Colusa Cty and part of Su
Cross Streets: Zip Code:
Longitude/Latitude (degrees, minutes and seconds): ___° ___′ ___″ N / ___° ___′ ___″ W Total Acres:
Assessor's Parcel No.: Section: Twp.: Range: Base:
Within 2 Miles: State Hwy #: Waterways:
Airports: Railways: Schools:

Document Type:

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☐ Mit Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent EIR (Prior SCH No.) ______ Other: RCIS

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other:

Governor's Office of Planning & Research

NOV 15 2017

STATE CLEARINGHOUSE

Local Action Type:

☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan
☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan
☐ Rezone ☐ Prezone ☐ Use Permit ☐ Land Division (Subdivision, etc.)
☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☒ Other: regional conserv

Development Type:

☐ Residential: Units ___ Acres ___
☐ Office: Sq.ft. ___ Acres ___ Employees ___
☐ Commercial: Sq.ft. ___ Acres ___ Employees ___
☐ Industrial: Sq.ft. ___ Acres ___ Employees ___
☐ Educational:
☐ Recreational:
☐ Water Facilities: Type ___ MGD ___
☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type ___ MW ___
☐ Waste Treatment: Type ___ MGD ___
☐ Hazardous Waste: Type
☐ Other:

Project Issues Discussed in Document:

☐ Aesthetic/Visual
☒ Agricultural Land
☐ Air Quality
☐ Archeological/Historical
☒ Biological Resources
☐ Coastal Zone
☐ Drainage/Absorption
☐ Economic/Jobs
☐ Fiscal
☒ Flood Plain/Flooding
☒ Forest Land/Fire Hazard
☐ Geologic/Seismic
☐ Minerals
☐ Noise
☐ Population/Housing Balance
☐ Public Services/Facilities
☐ Recreation/Parks
☐ Schools/Universities
☐ Septic Systems
☐ Sewer Capacity
☐ Soil Erosion/Compaction/Grading
☐ Solid Waste
☐ Toxic/Hazardous
☐ Traffic/Circulation
☒ Vegetation
☐ Water Quality
☐ Water Supply/Groundwater
☒ Wetland/Riparian
☐ Growth Inducement
☒ Land Use
☐ Cumulative Effects
☐ Other:

Present Land Use/Zoning/General Plan Designation:

Multiple

Project Description: *(please use a separate page if necessary)*
See attachment.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2010

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "X".
If you have already sent your document to the agency please denote that with an "S".

____	Air Resources Board	____	Office of Historic Preservation
____	Boating & Waterways, Department of	____	Office of Public School Construction
____	California Emergency Management Agency	____	Parks & Recreation, Department of
____	California Highway Patrol	____	Pesticide Regulation, Department of
____	Caltrans District # ____	____	Public Utilities Commission
____	Caltrans Division of Aeronautics	____	Regional WQCB # ____
____	Caltrans Planning	X	Resources Agency
____	Central Valley Flood Protection Board	____	Resources Recycling and Recovery, Department of
____	Coachella Valley Mtns. Conservancy	____	S.F. Bay Conservation & Development Comm.
____	Coastal Commission	____	San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
____	Colorado River Board	____	San Joaquin River Conservancy
____	Conservation, Department of	____	Santa Monica Mtns. Conservancy
____	Corrections, Department of	____	State Lands Commission
____	Delta Protection Commission	____	SWRCB: Clean Water Grants
____	Education, Department of	____	SWRCB: Water Quality
____	Energy Commission	____	SWRCB: Water Rights
X	Fish & Game Region # 2	____	Tahoe Regional Planning Agency
____	Food & Agriculture, Department of	____	Toxic Substances Control, Department of
____	Forestry and Fire Protection, Department of	X	Water Resources, Department of
____	General Services, Department of		
____	Health Services, Department of	____	Other: ____
____	Housing & Community Development	____	Other: ____
____	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date ____________ Ending Date ____________

Lead Agency (Complete if applicable):

Consulting Firm: ICF	Applicant: Reclamation District 108
Address: 630 K Street, Suite 400	Address: 975 Wilson Bend Road, PO Box 50
City/State/Zip: Sacramento, CA 95814	City/State/Zip: Grimes, CA 95950
Contact: Aaron Gabbe	Phone: 530-437-2221
Phone: 408-216-2810	

Signature of Lead Agency Representative: Meegan A Way **Date:** 11/13/17

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

Reclamation District 108, on behalf of a steering committee including representatives from Colusa County, Sutter County (represented by Sutter Butte Flood Control Agency), California Department of Water Resources, California Natural Resources Agency, Sutter Bypass Water Users Association, Caltrans, and other stakeholders, is preparing a Regional Conservation Investment Strategy (RCIS) for parts of Colusa County and Sutter County. The Mid-Upper Sacramento River RCIS is an outgrowth, in part, of the Mid and Upper Sacramento River Regional Flood Management Plan (RFMP). As the lead agency for preparing the Mid-Upper Sacramento River RFMP, Reclamation District 108 initiated development of the Mid-Upper Sacramento River RCIS to aid in the implementation of needed flood risk reduction measures, and to provide incentives for landowners to propose conservation actions on their properties that would benefit species in need of mitigation offsets from flood management projects. If the RCIS is approved by the California Department of Fish and Wildlife (Department) in 2018, the RCIS could be used by anyone to develop mitigation credit agreements with the Department. A mitigation credit agreement allows a landowner to use or sell mitigation credits for a variety of resources such as state-listed species.

A public meeting to provide information about the Mid-Upper Sacramento River RCIS and to give the public an opportunity to provide written and oral comments for consideration in its development is scheduled for December 6, 2017 from 6:30-8:30pm at the Colusa Casino Resort Community Room)3770 Highway 45, Colusa, CA 95932). All interested parties are invited to attend.

NOTICE OF INTENT TO PREPARE MID AND UPPER SACRAMENTO RIVER REGIONAL CONSERVATION INVESTMENT STRATEGY
and
NOTICE OF PUBLIC MEETING ABOUT MID AND UPPER SACRAMENTO RIVER REGIONAL CONSERVATION INVESTMENT STRATEGY

Published November 3, 2017

Description of Proposed Regional Conservation Investment Strategy: Reclamation District 108, on behalf of a steering committee including representatives from Colusa County, Sutter County (represented by Sutter Butte Flood Control Agency), California Department of Water Resources, California Natural Resources Agency, Sutter Bypass Water Users Association, Caltrans, and other stakeholders, is preparing a Regional Conservation Investment Strategy (RCIS) for parts of Colusa County and Sutter County.

Regional Conservation Investment Strategies are new, voluntary, landscape-scale conservation planning tools, guided by state legislation (AB 2087) that took effect January 1, 2017. An RCIS will identify conservation priorities to guide public and private conservation actions and investment, such as habitat restoration and protection. The Mid and Upper Sacramento River RCIS is part of a broader effort to implement regional advanced mitigation planning in the state to facilitate landscape-scale conservation and improve the delivery of water, transportation, and other public infrastructure projects.

The Mid-Upper Sacramento River RCIS is an outgrowth, in part, of the Mid and Upper Sacramento River Regional Flood Management Plan (RFMP). The Mid and Upper Sacramento River RFMP was developed through the participation of a range of stakeholders to address flood management in a seven-county region in northern California that comprises portions of Butte, Colusa, Glenn, Lake, Sutter, Tehama, and Yolo Counties. The result of the Mid and Upper Sacramento River RFMP planning effort is a vision for a flood-safe region that identifies challenges and opportunities for flood risk reduction, and a prioritized list of actions. The Mid and Upper Sacramento River RFMP provides a framework for integrating conservation efforts into the overall flood management system in ways that are supported locally. As the lead agency for preparing the Mid-Upper Sacramento River RFMP, Reclamation District 108 initiated development of the Mid-Upper Sacramento River RCIS to aid in the implementation of needed flood risk reduction measures, and to provide incentives for landowners to propose conservation actions on their properties that would benefit species in need of mitigation offsets from flood management projects. To achieve this goal, the steering committee is developing this RCIS within a subset of the Mid-Upper Sacramento River RFMP planning area (see Figure 1 for a draft map of the RCIS area).

The Mid and Upper Sacramento River RCIS:

- Is a voluntary, non-binding assessment of conservation priorities for a suite of focal species (see Table 1, below);
- Is being developed based on existing plans and other information, including the Mid and Upper Sacramento River RFMP, the Central Valley Flood Protection Plan, and the Central Valley Flood Protection Plan Conservation Strategy, among others;
- Promotes implementation of conservation actions such as habitat protection, restoration, and enhancement measures including efforts to enhance landscape connectivity for wildlife;
- Coordinates various types of conservation investments, such as:
  - local, state, and federal government conservation projects;
  - private foundation and conservation organization (e.g., Central Valley Habitat Exchange) projects;
  - mitigation projects by private entities and public agencies;
- In addition to focal species, also considers sensitive habitats, and addresses working lands, proposed infrastructure, and development projects;
- Will be submitted to the California Department of Fish and Wildlife (Department) in 2018 for their review, publication as a draft for public review, and approval.

Table 1. Proposed Focal Species for Mid and Upper Sacramento River RCIS

		Status[a]		
Scientific Name	**Common Name**	**Federal**	**State**	**Global**
Invertebrate				
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	FT	–	G3T2 S2
Fish				
Acipenser medirostris	Green sturgeon	FT	–	G3 S1S2
Oncorhynchus mykiss	Central Valley steelhead	FT	–	G5T2Q S2
Onchorhynchus tshawytscha	Sacramento River winter-run Chinook salmon	FE	SE	G5 S1
Onchorhynchus tshawytscha	Central Valley spring-run Chinook salmon	FT	ST	G5 S1
Onchorhynchus tshawytscha	Central Valley fall/late fall-run Chinook salmon	SOC	SSC	G5 S2
Reptiles				
Thamnophis gigas	Giant garter snake	FT	ST	G2 S2

Scientific Name	Common Name	Status[a] Federal	State	Global
Emys marmorata	Western pond turtle	UR	SOC	G3G4
Birds				
Buteo swainsoni	Swainson's hawk	–	ST	G5 S3
Agelaius tricolor	Tricolored blackbird	UR	SCE	G2G3 S1S2
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	FT	SE	G5T2T3 S1
Riparia riparia	Bank swallow	–	ST	G5 S2

[a] Status

Federal

SE = listed as endangered under the federal Endangered Species Act.

ST = listed as threatened under the federal Endangered Species Act.

SC = listed as a candidate species, which is a species for which the U.S. Fish and Wildlife Service has on file sufficient information to warrant a listing.

UR = under review. Species that have been petitioned for listing and for which a 90 day finding has not been published or for which a 90 day substantial has been published but a 12 Month finding have not yet been published in the Federal Register. Also includes species that are being reviewed through the candidate process, but the Candidate Notice of Review has not yet been signed.

– = no listing.

SOC = Species of concern.

State (CDFW July 2016, Special Animals List, Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406)

FE = listed as endangered under the California Endangered Species Act.

FT = listed as threatened under the California Endangered Species Act.

SSC = listed as a California Species of Special Concern by the California Department of Fish and Wildlife

FP = listed as a fully protected by the California Department of Fish and Wildlife

SC = listed as a candidate species. A candidate species is one that the California Fish and Game Commission has formally declared a candidate species.

Global Conservation Status (Nature Serve 2015. Available http://explorer.natureserve.org/granks.htm)

G1 = critically imperiled- high risk of extinction due to extreme rarity (often 5 or fewer populations)

G2 = imperiled- high risk of extinction due to very restricted range, very few populations (often 20 or fewer populations)

G3 = vulnerable- moderate risk of extinction due to restricted range and very few populations (often 80 or fewer populations)

G4 = apparently secure- uncommon but not rare

G5 = secure- common, widespread and abundant

G#G# = Range rank; numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.

Q = Questionable taxonomy; taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid.

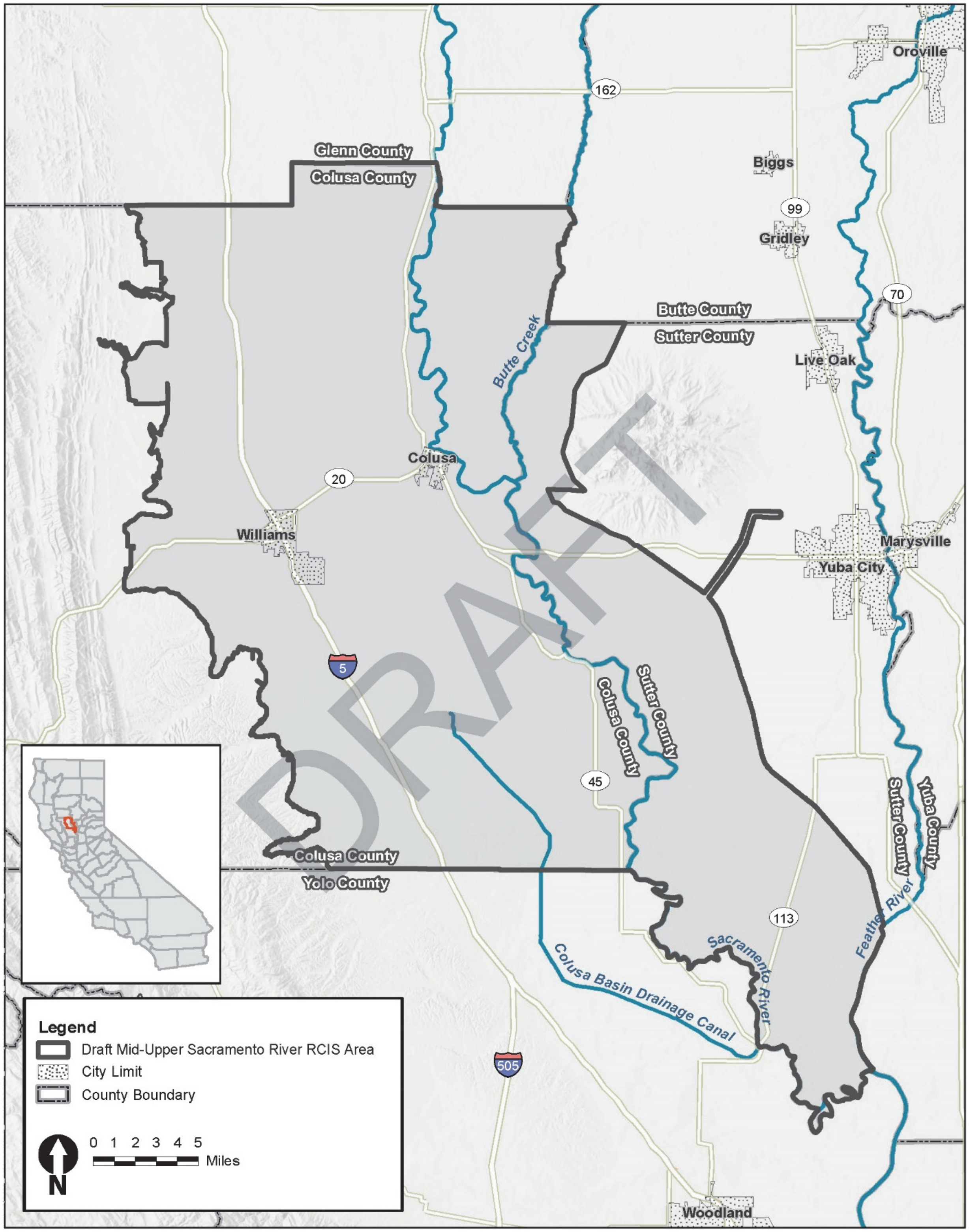
T# = Infraspecific taxon; the status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

Rules for assigning T-ranks follow the same principles outlined for global conservation.

Once the Mid and Upper Sacramento River RCIS is finalized, it can help expedite delivery of public infrastructure projects by facilitating regional advance mitigation planning: a process in which the environmental mitigation for impacts from multiple projects is pooled and conducted in advance, resulting in larger conservation projects that have greater benefits, while expediting delivery of public infrastructure projects such as flood protection or transportation projects and minimizing impacts on agriculture and other land uses. Conservation goals and objectives and conservation priorities described in the Mid and Upper Sacramento River RCIS will guide and coordinate future conservation actions throughout the RCIS strategy area in eastern Colusa County and western Sutter County. If the Mid and Upper Sacramento River RCIS is approved by the Department, the RCIS could be used by anyone to develop mitigation credit agreements with the Department. A mitigation credit agreement allows a landowner to use or sell mitigation credits for a variety of resources such as state-listed species.

Location: The geographic area covered by the Mid and Upper Sacramento River RCIS includes portions of Colusa County and Sutter County, on the floor of Central Valley (see Figure 1 for a draft map of the RCIS area).

Figure 1. Geographic Area Covered by the Mid and Upper Sacramento River RCIS



Public Meeting: Pursuant to Fish and Game Code section 1854(c)(3), the steering committee for the Mid and Upper Sacramento River RCIS will sponsor a public meeting to provide information about the Mid and Upper Sacramento River RCIS and to give the public an opportunity to provide written and oral comments for consideration in its development. Interested parties are invited to attend.

Meeting Date and Time: December 6, 2017, 6:30 to 8:30 PM

Meeting Location: Colusa Casino Resort, Community Room, 3770 Highway 45, Colusa, CA 95932

Contact Person: Kim Floyd: email – kim@floydcommunications.com; phone – (916) 838-2666

* * *

NOTICE OF PUBLIC MEETING ABOUT MID-SACRAMENTO VALLEY REGIONAL CONSERVATION INVESTMENT STRATEGY

Published February 15, 2018

Description of Proposed Regional Conservation Investment Strategy: Reclamation District 108, on behalf of a steering committee including representatives from Colusa County, Sutter County, Sutter Butte Flood Control Agency, California Department of Water Resources, California Natural Resources Agency, Sutter Bypass Water Users Association, Caltrans, and other stakeholders, is preparing a Regional Conservation Investment Strategy (RCIS) for parts of Colusa County and Sutter County.

Regional Conservation Investment Strategies are new, voluntary, landscape-scale conservation planning tools, guided by state legislation (AB 2087) that took effect January 1, 2017. An RCIS will identify conservation priorities to guide public and private conservation actions and investment, such as habitat restoration and protection. The Mid-Sacramento Valley RCIS is part of a broader effort to implement regional advanced mitigation planning in the state to facilitate landscape-scale conservation and improve the delivery of flood protection, transportation, and other public infrastructure projects.

Development of the Mid-Sacramento Valley RCIS began as an outgrowth, in part, of the Mid and Upper Sacramento River Regional Flood Management Plan (RFMP). The Mid and Upper Sacramento River RFMP was developed through the participation of a range of stakeholders to address flood management in a seven-county region in northern California that comprises portions of Butte, Colusa, Glenn, Lake, Sutter, Tehama, and Yolo Counties. The result of the Mid and Upper Sacramento River RFMP planning effort is a vision for a flood-safe region that identifies challenges and opportunities for flood risk reduction, and a prioritized list of actions. The Mid and Upper Sacramento River RFMP provides a framework for integrating conservation efforts into the overall flood management system in ways that are supported locally. As the lead agency for preparing the Mid-Upper Sacramento River RFMP, Reclamation District 108 initiated development of the Mid-Sacramento Valley RCIS to aid in the implementation of needed flood risk reduction measures, and to provide incentives for landowners to propose conservation actions on their properties that would benefit species in need of mitigation offsets from flood management projects. To achieve this goal, the steering committee began development of the RCIS within a subset of the Mid-Upper Sacramento River RFMP planning area in Colusa County and Sutter County, with a small extension of the RCIS area into the Feather River RFMP planning area in Sutter County.

A public meeting was held on December 6, 2017, to provide information about the RCIS and to give the public an opportunity to provide written and oral comments for consideration in its development. After the public meeting, the steering committee elected to expand the RCIS area further east in Sutter County to include California Department of Water Resources facilities and more of the Feather River RFMP planning area (see Figure 1 for a draft map of the RCIS area). **A second public meeting will be held on March 20, 2018 from 2:00 – 3:30 PM (see last page of this notice for address and directions) to provide oral or written comments for consideration in its development**.

The Mid-Sacramento Valley RCIS:

- Is a voluntary, non-binding assessment of conservation priorities for a suite of focal species (see Table 1, below);
- Is being developed based on existing plans and other information, including the Mid and Upper Sacramento River RFMP, the Feather River RFMP, the Central Valley Flood Protection Plan, and the Central Valley Flood Protection Plan Conservation Strategy, among others;
- Promotes implementation of conservation actions such as habitat protection, restoration, and enhancement measures, including efforts to enhance landscape connectivity for wildlife;
- Coordinates various types of conservation investments, such as:
    - local, state, and federal government conservation projects;
    - private foundation and conservation organization (e.g., Central Valley Habitat Exchange) projects;
    - mitigation projects by private entities and public agencies;
- In addition to focal species, also considers sensitive habitats, and addresses working lands, proposed infrastructure, and development projects;
- Will be submitted to the California Department of Fish and Wildlife (Department) in 2018 for their review, publication as a draft for public review, and approval.

Table 1. Draft Focal Species for the Mid-Sacramento Valley RCIS

		Status[a]		
Scientific Name	**Common Name**	**Federal**	**State**	**Global**
Invertebrate				
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	FT	–	G3T2 S2
Fish				
Acipenser medirostris	Green sturgeon	FT	–	G3 S1S2
Oncorhynchus mykiss	Central Valley steelhead	FT	–	G5T2Q S2

Scientific Name	Common Name	Status[a]		
		Federal	State	Global
Onchorhynchus tshawytscha	Sacramento River winter-run Chinook salmon	FE	SE	G5 S1
Onchorhynchus tshawytscha	Central Valley spring-run Chinook salmon	FT	ST	G5 S1
Onchorhynchus tshawytscha	Central Valley fall/late fall-run Chinook salmon	SOC	SSC	G5 S2
Reptiles				
Thamnophis gigas	Giant garter snake	FT	ST	G2 S2
Emys marmorata	Western pond turtle	UR	SOC	G3G4
Birds				
Buteo swainsoni	Swainson's hawk	–	ST	G5 S3
Agelaius tricolor	Tricolored blackbird	UR	SCE	G2G3 S1S2
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	FT	SE	G5T2T3 S1
Riparia riparia	Bank swallow	–	ST	G5 S2

[a] Status

Federal

SE = listed as endangered under the federal Endangered Species Act.

ST = listed as threatened under the federal Endangered Species Act.

SC = listed as a candidate species, which is a species for which the U.S. Fish and Wildlife Service has on file sufficient information to warrant a listing.

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Global Conservation Status (Nature Serve 2015. Available http://explorer.natureserve.org/granks.htm)

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G2 = imperiled- high risk of extinction due to very restricted range, very few populations (often 20 or fewer populations)

G3 = vulnerable- moderate risk of extinction due to restricted range and very few populations (often 80 or fewer populations)

G4 = apparently secure- uncommon but not rare

G5 = secure- common, widespread and abundant

G#G# = Range rank; numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.

Q = Questionable taxonomy; taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid.

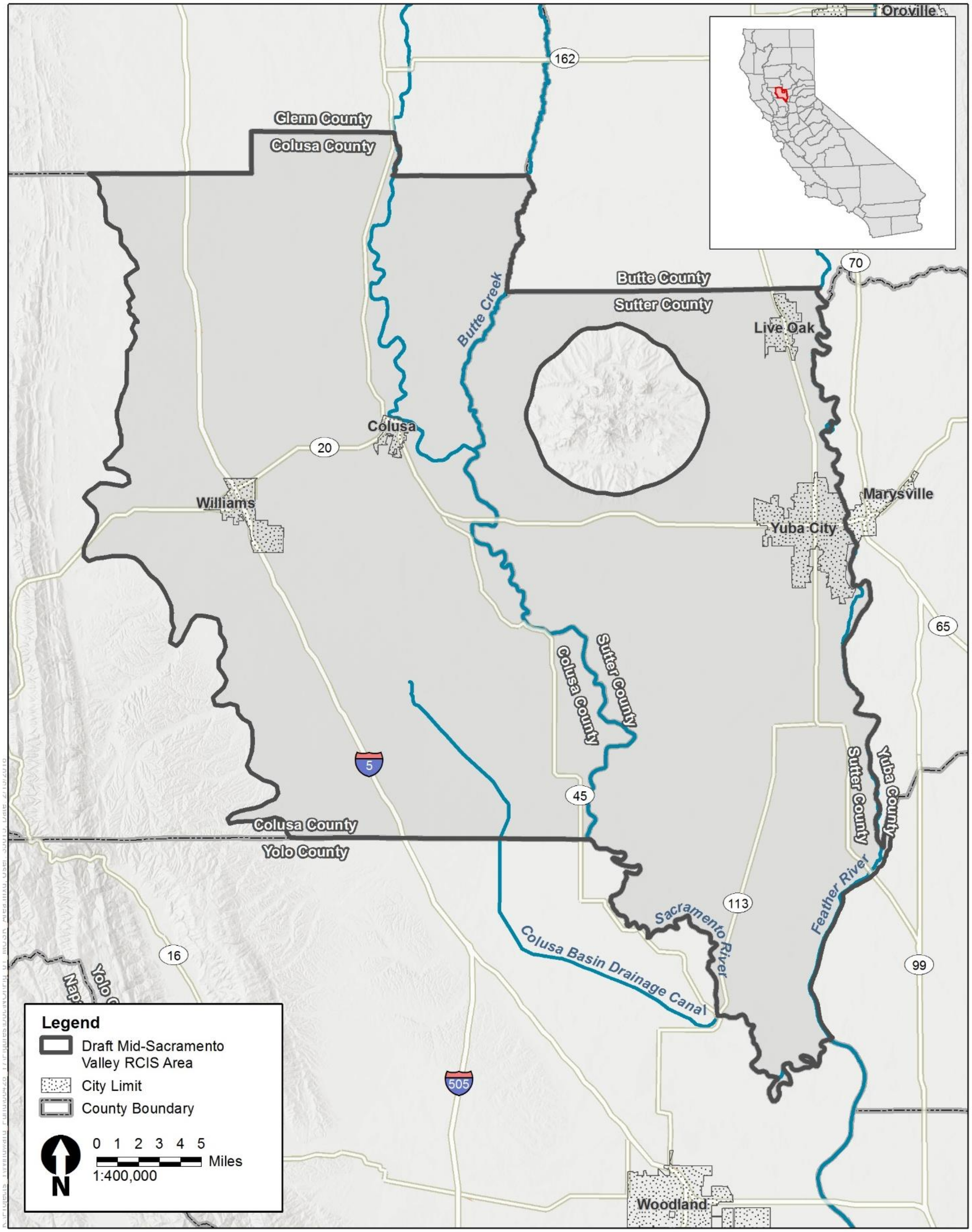
T# = Infraspecific taxon; the status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

Rules for assigning T-ranks follow the same principles outlined for global conservation.

Once the Mid-Sacramento Valley RCIS is finalized, it can help expedite delivery of public infrastructure projects by facilitating regional advance mitigation planning: a process in which the environmental mitigation for impacts from multiple projects is pooled and conducted in advance, resulting in larger conservation projects that have greater benefits, while expediting delivery of public infrastructure projects such as flood protection or transportation projects and minimizing impacts on agriculture and other land uses. Conservation goals, objectives, and priorities described in the Mid-Sacramento Valley RCIS will guide and coordinate future conservation actions throughout the RCIS area in eastern Colusa County and much of Sutter County west and north of the Feather River. If the Mid-Sacramento Valley RCIS is approved by the Department, the RCIS could be used by anyone to develop mitigation credit agreements with the Department. A mitigation credit agreement allows a landowner to use or sell mitigation credits for a variety of resources such as state-listed species.

Location: The geographic area covered by the Mid-Sacramento Valley RCIS includes portions of Colusa County and Sutter County, on the floor of Central Valley (see Figure 1 for a draft map of the RCIS area).

Figure 1. Geographic Area Covered by the Mid-Sacramento Valley RCIS



Public Meeting: Pursuant to Fish and Game Code section 1854(c)(3), the steering committee for the Mid-Sacramento Valley RCIS will sponsor a public meeting to provide information about the Mid-Sacramento Valley RCIS and to give the public an opportunity to provide oral or written comments for consideration in its development. Interested parties are invited to attend.

Meeting Date and Time: Tuesday, March 20, 2018, 2:00 to 3:30 PM

Meeting Location: Reclamation District 108 Office, 975 Wilson Bend Road, Grimes CA 95950

Please follow these directions:

Take I-5 to the first Woodland exit, Road 102 (Knights Landing exit). Head east to Knights Landing. Right before the Sacramento River Bridge, you will see a sign for HWY 45 heading north. Turn left onto HWY 45 and stay on HWY 45 for approximately 15-16 miles. In the middle of a 45 degree turn, you will see Wilson Bend Road (there is a District sign on the corner, and it is less than 2 miles north of County Line Road). Turn right onto Wilson Bend Road. Go about 4 miles and you will see the District Office on the left. Park in front of the older part of the office and walk back to the new front door.

Contact Person: Meegan Nagy, Deputy Manager, Reclamation District 108: email – MNagy@rd108.org; phone – (530) 812-6269

* * *

Written Public Comments

This section contains the written comments received on the Draft Mid-Sacramento Valley RCIS. California Department of Fish and Wildlife's (CDFW) RCIS Program Guidelines (Program Guidelines) (California Department of Fish and Wildlife 2018a) requires that the RCIS proponent provides an adequate opportunity for interested persons and entities to provide oral and written comments. The Program Guidelines also require the RCIS proponent to "respond to written comments submitted during the public meeting(s) and during the public comment period which begins after CDFW deems the draft RCIS complete and pursuant to public notice."

During the two public meetings held by the RCIS proponent, on December 6, 2017 and March 20, 2018, the RCIS proponent provided comment cards and requested that individuals or parties wishing to provide comments shall provide written comments in order for those comments to be included in this RCIS with the RCIS proponent's response.

This section is organized by presentation of each comment letter, ordered by date the comment letter was received (earliest to latest). Each comment within the comment letter is assigned a unique number, noted in the right margin. For example, the code "A-3" indicates the third distinct comment (indicated by the "3") in letter designated A. Immediately following the comment letter is a summary of the comment and the RCIS proponent's response including a description of how each comment was addressed in the RCIS.

The RCIS proponent received written public comments from the persons and entities listed in Table C-1 before submitting this RCIS to CDFW for completeness review on October 12, 2018. Table C-1 shows the commenting agency/organization/individual, comment letter signatory, and the date of the letter.

Table C-1. List of Comment Letters

Letter	Agency/Organization/Individual	Comment Letter Signatory	Date
A	Central Valley Regional Water Quality Control Board	Stephanie Tadlock—Environmental Scientist	December 8, 2017
B	Defenders of Wildlife	Kim Delfino—California Program Director	April 20, 2018
C	California Native Plant Society	Greg Suba—Conservation Program Director	April 20, 2018

Letter A – Central Valley Regional Water Quality Control Board

A

Cc: MN
Scan + emailed

STATE OF CALIFORNIA

GOVERNOR'S OFFICE of PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

December 18, 2017

Meegan Nagy
Reclamation District 108
975 Wilson Bend Road
PO Box 50
Grimes, CA 95950

Subject: Mid and Upper Sacramento River Regional Conservation Investment Strategy
SCH#: 2017112041

Dear Meegan Nagy:

The State Clearinghouse submitted the above named Notice of Intent to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on December 15, 2017, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

1400 10th Street P.O. Box 3044 Sacramento, California 95812-3044
(916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH# 2017112041
Project Title Mid and Upper Sacramento River Regional Conservation Investment Strategy
Lead Agency Reclamation District 108

Type NOI Notice of Intent

Description Note: RCIS

Reclamation District 108, on behalf of a steering committee including representatives from Colusa County, Sutter County, DWR, Resources Agency, Sutter Bypass Water Users Assoc., Caltrans, and other stakeholders, is preparing a Regional Conservation Investment Strategy for parts of Colusa County and Sutter County. The Mid-Upper Sacramento River RCIS is an outgrowth, in part, of the Mid and Upper Sacramento River Regional Flood Management Plan. As the lead agency for Mid-Upper Sacramento River RFMP, Reclamation District 108 initiated development of the Mid-Upper Sacramento River RCIS to aid in the implementation of needed flood risk reduction measures, and to provide incentives for landowners to propose conservation actions on their properties that would benefit species in need of mitigation offsets from flood management projects. If the RCIS is approved by CDFW in 2018, the RCIS could be used by anyone to develop mitigation credit agreements with the Department. A mitigation credit agreement allows a landowner to use or sell mitigation credits for a variety of resources such as state-listed species.

Lead Agency Contact

Name Meegan Nagy
Agency Reclamation District 108
Phone 530-812-6269 **Fax**
email
Address 975 Wilson Bend Road
PO Box 50
City Grimes **State** CA **Zip** 95950

Project Location

County Colusa, Sutter
City Colusa
Region
Cross Streets
Lat / Long
Parcel No.
Township **Range** **Section** **Base**

Proximity to:

Highways
Airports
Railways
Waterways
Schools
Land Use Mult

Project Issues Agricultural Land; Biological Resources; Flood Plain/Flooding; Forest Land/Fire Hazard; Vegetation; Wetland/Riparian; Landuse

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Reviewing Agencies Resources Agency; Central Valley Flood Protection Board; Department of Fish and Wildlife, Region 2; Department of Parks and Recreation; Department of Water Resources; Caltrans, District 3 N; Regional Water Quality Control Bd., Region 5 (Sacramento); Native American Heritage Commission

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Date Received 11/16/2017 **Start of Review** 11/16/2017 **End of Review** 12/15/2017

Note: Blanks in data fields result from insufficient information provided by lead agency.

Central Valley Regional Water Quality Control Board

Not clear 12/15/17

8 December 2017

Governor's Office of Planning & Research

DEC 12 2017

STATE CLEARINGHOUSE

Meegan Nagy
Reclamation District 108
975 Wilson Bend Road
Grimes, CA 95950

CERTIFIED MAIL
91 7199 9991 7036 6996 5221

COMMENTS TO REQUEST FOR REVIEW FOR THE NOTICE OF INTENT FOR THE DRAFT ENVIRONMENTAL IMPACT REPORT, MID AND UPPER SACRAMENTO RIVER REGIONAL CONSERVATION INVESTMENT STRATEGY PROJECT, SCH# 2017112041, COLUSA AND SUTTER COUNTIES

Pursuant to the State Clearinghouse's 16 November 2017 request, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) has reviewed the *Request for Review for the Notice of Intent for the Draft Environment Impact Report* for the Mid and Upper Sacramento River Regional Conservation Investment Strategy Project, located in Colusa and Sutter Counties.

Our agency is delegated with the responsibility of protecting the quality of surface and groundwaters of the state; therefore our comments will address concerns surrounding those issues.

I. Regulatory Setting

Basin Plan

The Central Valley Water Board is required to formulate and adopt Basin Plans for all areas within the Central Valley region under Section 13240 of the Porter-Cologne Water Quality Control Act. Each Basin Plan must contain water quality objectives to ensure the reasonable protection of beneficial uses, as well as a program of implementation for achieving water quality objectives with the Basin Plans. Federal regulations require each state to adopt water quality standards to protect the public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act. In California, the beneficial uses, water quality objectives, and the Antidegradation Policy are the State's water quality standards. Water quality standards are also contained in the National Toxics Rule, 40 CFR Section 131.36, and the California Toxics Rule, 40 CFR Section 131.38. 1

The Basin Plan is subject to modification as necessary, considering applicable laws, policies, technologies, water quality conditions and priorities. The original Basin Plans were adopted in 1975, and have been updated and revised periodically as required, using Basin Plan amendments. Once the Central Valley Water Board has adopted a Basin Plan amendment in noticed public hearings, it must be approved by the State Water Resources Control Board (State Water Board), Office of Administrative Law (OAL) and in some cases, the United States Environmental Protection Agency (USEPA). Basin Plan amendments only become effective after they have been approved by the OAL and in some cases, the USEPA. Every three (3) years, a review of the Basin Plan is completed that assesses the appropriateness of existing standards and evaluates and prioritizes Basin Planning issues.

For more information on the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins*, please visit our website: http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/.

Antidegradation Considerations

All wastewater discharges must comply with the Antidegradation Policy (State Water Board Resolution 68-16) and the Antidegradation Implementation Policy contained in the Basin Plan. The Antidegradation Policy is available on page IV-15.01 at: http://www.waterboards.ca.gov/centralvalleywater_issues/basin_plans/sacsjr.pdf

In part it states:

> *Any discharge of waste to high quality waters must apply best practicable treatment or control not only to prevent a condition of pollution or nuisance from occurring, but also to maintain the highest water quality possible consistent with the maximum benefit to the people of the State.*
>
> *This information must be presented as an analysis of the impacts and potential impacts of the discharge on water quality, as measured by background concentrations and applicable water quality objectives.*

The antidegradation analysis is a mandatory element in the National Pollutant Discharge Elimination System and land discharge Waste Discharge Requirements (WDRs) permitting processes. The environmental review document should evaluate potential impacts to both surface and groundwater quality.

II. Permitting Requirements

Construction Storm Water General Permit

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit), Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, disturbances to the ground, such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

For more information on the Construction General Permit, visit the State Water Resources Control Board website at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml.

Phase I and II Municipal Separate Storm Sewer System (MS4) Permits[1]

The Phase I and II MS4 permits require the Permittees reduce pollutants and runoff flows from new development and redevelopment using Best Management Practices (BMPs) to the maximum extent practicable (MEP). MS4 Permittees have their own development standards, also known as Low Impact Development (LID)/post-construction standards that include a hydromodification component. The MS4 permits also require specific design concepts for LID/post-construction BMPs in the early stages of a project during the entitlement and CEQA process and the development plan review process.

For more information on which Phase I MS4 Permit this project applies to, visit the Central Valley Water Board website at: http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/municipal_permits/.

For more information on the Caltrans Phase I MS4 Permit, visit the State Water Resources Control Board at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/caltrans.shtml.

For more information on the Phase II MS4 permit and who it applies to, visit the State Water Resources Control Board at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/phase_ii_municipal.shtml

Industrial Storm Water General Permit

Storm water discharges associated with industrial sites must comply with the regulations contained in the Industrial Storm Water General Permit Order No. 2014-0057-DWQ.

For more information on the Industrial Storm Water General Permit, visit the Central Valley Water Board website at: http://www.waterboards.ca.gov/centralvalley/water_issues/storm_water/industrial_general_permits/index.shtml.

[1] Municipal Permits = The Phase I Municipal Separate Storm Water System (MS4) Permit covers medium sized Municipalities (serving between 100,000 and 250,000 people) and large sized municipalities (serving over 250,000 people). The Phase II MS4 provides coverage for small municipalities, including non-traditional Small MS4s, which include military bases, public campuses, prisons and hospitals.

Clean Water Act Section 404 Permit

If the project will involve the discharge of dredged or fill material in navigable waters or wetlands, a permit pursuant to Section 404 of the Clean Water Act may be needed from the United States Army Corps of Engineers (USACOE). If a Section 404 permit is required by the USACOE, the Central Valley Water Board will review the permit application to ensure that discharge will not violate water quality standards. If the project requires surface water drainage realignment, the applicant is advised to contact the Department of Fish and Game for information on Streambed Alteration Permit requirements.

If you have any questions regarding the Clean Water Act Section 404 permits, please contact the Regulatory Division of the Sacramento District of USACOE at (916) 557-5250.

Clean Water Act Section 401 Permit – Water Quality Certification

If an USACOE permit (e.g., Non-Reporting Nationwide Permit, Nationwide Permit, Letter of Permission, Individual Permit, Regional General Permit, Programmatic General Permit), or any other federal permit (e.g., Section 10 of the Rivers and Harbors Act or Section 9 from the United States Coast Guard), is required for this project due to the disturbance (i.e., discharge of dredge or fill material) of waters of the United States (such as streams and wetlands), then a Water Quality Certification must be obtained from the Central Valley Water Board prior to initiation of project activities. There are no waivers for 401 Water Quality Certifications.

Waste Discharge Requirements (WDRs)

Discharges to Waters of the State

If USACOE determines that only non-jurisdictional waters of the State (i.e., "non-federal" waters of the State) are present in the proposed project area, the proposed project may require a Waste Discharge Requirement (WDR) permit to be issued by Central Valley Water Board. Under the California Porter-Cologne Water Quality Control Act, discharges to all waters of the State, including all wetlands and other waters of the State including, but not limited to, isolated wetlands, are subject to State regulation.

Land Disposal of Dredge Material

If the project will involve dredging, Water Quality Certification for the dredging activity and Waste Discharge Requirements for the land disposal may be needed.

Local Agency Oversite

Pursuant to the State Water Board's Onsite Wastewater Treatment Systems Policy (OWTS Policy), the regulation of septic tank and leach field systems may be regulated under the local agency's management program in lieu of WDRs. A county environmental health department may permit septic tank and leach field systems designed for less than 10,000 gpd. For more information on septic system regulations, visit the Central Valley Water Board's website at:
http://www.waterboards.ca.gov/centralvalley/water_issues/owts/sb_owts_policy.pdf

For more information on the Water Quality Certification and WDR processes, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/help/business_help/permit2.shtml.

Dewatering Permit

If the proposed project includes construction or groundwater dewatering to be discharged to land, the proponent may apply for coverage under State Water Board General Water Quality Order (Low Risk General Order) 2003-0003 or the Central Valley Water Board's Waiver of Report of Waste Discharge and Waste Discharge Requirements (Low Risk Waiver) R5-2013-0145. Small temporary construction dewatering projects are projects that discharge groundwater to land from excavation activities or dewatering of underground utility vaults. Dischargers seeking coverage under the General Order or Waiver must file a Notice of Intent with the Central Valley Water Board prior to beginning discharge.

For more information regarding the Low Risk General Order and the application process, visit the Central Valley Water Board website at:

http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2003/wqo/wqo2003-0003.pdf

For more information regarding the Low Risk Waiver and the application process, visit the Central Valley Water Board website at:

http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/waivers/r5-2013-0145_res.pdf

Regulatory Compliance for Commercially Irrigated Agriculture

If the property will be used for commercial irrigated agricultural, the discharger will be required to obtain regulatory coverage under the Irrigated Lands Regulatory Program. There are two options to comply:

1. **Obtain Coverage Under a Coalition Group.** Join the local Coalition Group that supports land owners with the implementation of the Irrigated Lands Regulatory Program. The Coalition Group conducts water quality monitoring and reporting to the Central Valley Water Board on behalf of its growers. The Coalition Groups charge an annual membership fee, which varies by Coalition Group. To find the Coalition Group in your area, visit the Central Valley Water Board's website at: http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/app_approval/index.shtml; or contact water board staff at (916) 464-4611 or via email at IrrLands@waterboards.ca.gov.

2. **Obtain Coverage Under the General Waste Discharge Requirements for Individual Growers, General Order R5-2013-0100**. Dischargers not participating in a third-party group (Coalition) are regulated individually. Depending on the specific site conditions, growers may be required to monitor runoff from their property, install monitoring wells, and submit a notice of intent, farm plan, and other

action plans regarding their actions to comply with their General Order. Yearly costs would include State administrative fees (for example, annual fees for farm sizes from 10-100 acres are currently $1,084 + $6.70/Acre); the cost to prepare annual monitoring reports; and water quality monitoring costs. To enroll as an Individual Discharger under the Irrigated Lands Regulatory Program, call the Central Valley Water Board phone line at (916) 464-4611 or e-mail board staff at IrrLands@waterboards.ca.gov.

Low or Limited Threat General NPDES Permit

If the proposed project includes construction dewatering and it is necessary to discharge the groundwater to waters of the United States, the proposed project will require coverage under a National Pollutant Discharge Elimination System (NPDES) permit. Dewatering discharges are typically considered a low or limited threat to water quality and may be covered under the General Order for *Dewatering and Other Low Threat Discharges to Surface Waters* (Low Threat General Order) or the General Order for *Limited Threat Discharges of Treated/Untreated Groundwater from Cleanup Sites, Wastewater from Superchlorination Projects, and Other Limited Threat Wastewaters to Surface Water* (Limited Threat General Order). A complete application must be submitted to the Central Valley Water Board to obtain coverage under these General NPDES permits.

For more information regarding the Low Threat General Order and the application process, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2013-0074.pdf

For more information regarding the Limited Threat General Order and the application process, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2013-0073.pdf

NPDES Permit

If the proposed project discharges waste that could affect the quality of the waters of the State, other than into a community sewer system, the proposed project will require coverage under a National Pollutant Discharge Elimination System (NPDES) permit. A complete Report of Waste Discharge must be submitted with the Central Valley Water Board to obtain a NPDES Permit.

For more information regarding the NPDES Permit and the application process, visit the Central Valley Water Board website at:
http://www.waterboards.ca.gov/centralvalley/help/business_help/permit3.shtml

If you have questions regarding these comments, please contact me at (916) 464-4644 or Stephanie.Tadlock@waterboards.ca.gov.

Stephanie Tadlock

Stephanie Tadlock
Environmental Scientist

cc: State Clearinghouse unit, Governor's Office of Planning and Research, Sacramento

Comments and Responses

A. Central Valley Regional Water Quality Control Board

Summary of Comment A-1

The Central Valley Water Board submitted a letter to the RCIS proponent describing the Central Valley Water Board's responsibility for protecting the quality of surface and groundwaters of the state. The letter describes the regulatory setting that the Central Valley Water Board operates within, and relevant waters-related permitting requirements. The entire comment letter is treated as a single comment.

Response to Comment A-1

This RCIS is a non-binding voluntary conservation strategy intended to inform conservation investments and guide advance mitigation. As described in Chapter 1, *Introduction*, Section 1.2.1, *Voluntary Strategy*, "[n]othing in the Mid-Sacramento Valley RCIS is intended to, nor shall it be interpreted to conflict with state law or local ordinances. Therefore, actions carried out as a result of this RCIS will be in compliance with all applicable state and local requirements." Therefore, any conservation action or habitat enhancement action implemented through this RCIS must be in compliance with all laws and requirements regulating surface and groundwaters of the state.

Letter B – Defenders of Wildlife

B

California Program Office
980 Ninth Street, Suite 1730 | Sacramento, California 95814 | tel 916.313.5800
www.defenders.org

April 20, 2018

Via email: Aaron.Gabbe@icf.com

Mid-Sacramento Valley RCIS
c/o ICF
630 K Street, Suite 400
Sacramento, Ca 95814
ATTN: Aaron Gabbe/Stefanie Lyster

RE: Comments on the Mid Sacramento Valley RCIS Information Presented in the March 20, 2018 Public Meeting

Dear Mr. Gabbe and Ms. Lyster,

Thank you for your presentation at the March 20th public meeting for the Mid-Sacramento Valley Regional Conservation Investment Strategy (MSV RCIS). Defenders of Wildlife (Defenders) appreciates Reclamation District 108's (RD 108) vision and leadership in developing the MSC RCIS. Defenders strongly supports the development of RCISs as science-based conservation strategies and believes an RCIS would benefit the mid-Sacramento Valley.

The RCIS program is intended to build on existing conservation investments and addresses challenges presented by inadequate habitat connectivity, development, invasive species, climate change and community growth. When deployed across California, the RCIS Program will help California develop sustainable communities, preserve open space and working agricultural lands, as well as improve conservation outcomes for vulnerable species and at-risk habitats.

Our organization has worked for decades to improve the health of the Sacramento River and its watershed and are dedicated to protecting and restoring fish and wildlife populations and habitats that would be encompassed by the MSV RCIS plan area. Based on the information provided at the 1
public meeting, we are providing comments in support of the development of a meaningful RCIS that benefits the region and is consistent with the California Department of Fish and Wildlife's (CDFW) 2018 RCIS Guidelines (RCIS Guidelines).

These comments are submitted on behalf of Defenders of Wildlife (Defenders); a non-profit environmental organization with 1.8 million supporters nationally, including 270,000 in California. Defenders is dedicated to protecting all wild animals and plants in their natural communities.

National Headquarters | 1130 17th Street, N.W. | Washington, D.C. 20036-4604 | tel 202.682.9400 | fax 202.682.1331 | **www.defenders.org**

MSV RCIS Conservation Purpose

As indicated by the name, RCIS are first and foremost conservation strategies to identify and prioritize conservation actions and habitat enhancements within an RCIS area that, if implemented, will sustain and restore the RCIS's conservation elements including focal species and their habitats and other natural resources.[1] DFW has made it clear in their guidelines that an RCIS is not to be limited only to species and natural resources anticipated to fulfill compensatory mitigation needs. 2
The MSV RCIS should advance the conservation of focal species, habitat, and other natural resources within the planning area and provide guidance for the identification of wildlife and habitat conservation priorities, and investments in ecological resource conservation.

RCIS Planning Area Boundary

The proposed planning area currently spans the boundary of the Great Valley and Northern California Interior Coast Ranges USDA Ecoregions eastward to the Feather River. The planning area should be expanded beyond the Feather River. It makes no sense to only include the one bank of a river and not the other in a conservation plan. We recommend the planning area be extended to the east to the boundary between the Great Valley and Sierra Nevada Foothill USDA Ecoregion, which would be consistent with the western boundary of the planning area. Or, at the very least, the RCIS should include the east bank of the Feather River and the current 500-year flood plain or to some other natural boundary east of the river. 3
A similar recommendation was made by the Independent Science Advisor for the Yuba and Sutter County NCCP/HCP.

> *"Including both banks, along with contiguous lands, likely to contribute to flood control, conservation, or ecological restoration actions, is essential to covering riparian and aquatic species, as well as to comprehensively accommodate any needed levee improvements[2]."*

The proposed planning area currently excludes the Sutter Buttes. The Sutter Buttes is a unique biological island within the valley landscape and are ecologically significant. Consideration must be given to including the Sutter Buttes in the planning area. Should the Sutter Buttes not be included within the plan area, the MSV RCIS must address any effects of the RCIS on the biological values of the Sutter Buttes and on the movement of species and ecological processes between the Sutter Buttes and other habitats in and beyond the plan boundaries.[3] The implementation of the MSV RCIS should benefit the ecological values of the Sutter Buttes and must not adversely impact those values.

Focal Species

The list of focal species provided at the public meeting on March 20th appeared to be limited to only those species that are anticipated to require mitigation related to flood control projects. The

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1 CDFW 2018 Regional Conservation Strategies Program Guidelines, Section 4.2.1
https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=154288&inline

2 Report of Independent Science Advisors for the Yuba and Sutter County Natural Community Conservation Plan/Habitat Conservation Plan (NCCP?HCP). February 2006. pg. 3
https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=6396

3 Ibid. pg 4

proposed focal species list is not consistent with the current RCIS Guidelines that require the focal 4
species list to include:

<u>Indicator Species</u>
At least one indicator species for each major and unique vegetation community type and ecosystem function. The choice of indicator species "…*should enable the development of goals, objectives, and actions that would effectively and efficiently benefit most of the other species sharing the same habitat and conditions.*"

<u>Taxonomic Group Representation</u>
The focal species list must include at least one mammal, bird, reptile, amphibian, fish, invertebrate, and plant. The focal species list provided at the March 20th meeting was quite limited and did not include any mammals, amphibians, or plants.

<u>Wide-ranging Species</u>
The focal species list must include at least one species which represents wildlife connectivity needs in the plan area and connectivity must be considered at multiple scales. The MSV RCIS plan area contains extensive aquatic and terrestrial ecosystems. The focal species list must include representative species for connectivity of each ecosystem.

The focal species list must be expanded to provide the diversity of species required by the RCIS Guidelines. Guidance for focal species selection is provided in Section 4.2.9.3 of the RCIS Guidelines and must be followed. At a minimum the focal species list should include Yuba Sutter Regional Conservation Plan[4] proposed species list and the recommended species in Section 2.2 of the Plan's Independent Science Advisor's report[5]. The MSV RCIS plan area has extensive riparian and wetland ecosystems so we also recommend inclusion of river otter (*Lontra canadensis)* to the focal species list. As an apex predator, river otters are a key indicator of ecosystem status.

Natural Communities and Working Lands
The MSV RCIS must follow the requirements of the RCIS Guidelines to provide a range of natural
communities and working landscape which support or benefit the suite of focal species. The natural 5
communities and working lands selected must enable conservation planning for the focal species and not simply be limited to those areas anticipated for mitigation needs. The proposed natural communities list in the Yuba Sutter Regional Conservation Plan should provide a starting point for the MSV RCIS.[6]

Habitat Connectivity
The outline for the MSV document provided on slide 30 of the presentation on March 20th does not 6
appear to address habitat connectivity. The MSV RCIS must address and provide for habitat

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[4] https://www.wildlife.ca.gov/Conservation/Planning/NCCP/Plans/Yuba-Sutter
[5] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=6396
[6] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=65783&inline=1

connectivity for both aquatic and terrestrial species. Existing protected lands and other conservation plans must be incorporated into the connectivity analysis. The connectivity strategy must anticipate and provide resiliency against future development stressors and climate change.

Climate Change
Using best available science, the MSV RCIS must identify climate change vulnerability of the focal species and natural communities within the plan area and identify areas that may be resilient to climate change impacts. Again, MSV must also identify and provide for long term habitat 7
connectivity that is resilient to climate change as part of its conservation strategy.

Conservation Plan Consistency
As required by the RCIS Guidelines, the MSV RCIS must be consistent with NCCPs, HCPs, and recovery plans within the plan area and take into consideration other NCCPs, HCPs, and recovery 8
plans within the region. At a minimum the recovery goals and objectives of the 2017 Recovery Plan for the Garter Snake[7] must be incorporated into the MSV RCIS as required by Section 4.2.4.2 of the RCIS Guidelines.

Protected Lands
The MSV RCIS must identify and provide a summary of protected lands within or adjacent to the plan area including conservation easements, federal, state, and land trust protected lands, and 9
mitigation and conservation banks. These protected lands should form a base point for conservation planning and must inform the development of the MSV conservation strategy.

Conservation Strategy
The MSV RCIS conservation strategy must sustain and benefit the focal species and their habitat, and the natural communities within the plan area and must not be limited to strategies and actions driven by anticipated mitigation needs. The MSV RCIS must include a description of all stressors to selected focal species and their habitat, and meaningful goals and specific, measurable, achievable, relevant and time bound (i.e., "SMART") conservation objectives to address focal species and their 10
habitats considering historic, current and projected stressors. The strategy also must identify information gaps, address how its provisions comply with local authorities, and discuss development into the foreseeable future and the identification of regional mitigation banks within the planning area.

Conservation Actions
Conservation actions must be based on meaningful goals and specific, measurable, achievable, relevant and time bound (i.e., "SMART") conservation objectives to address focal species 11
considering historic, current and projected stressors. Conservation actions must be perpetual and

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[7] U.S. Fish and Wildlife Service. 2017. Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. vii + 71 pp. http://www.fws.gov/endangered/species/recovery-plans.html

durable and result in the permanent protection of conservation elements. At a minimum, for land identified for conservation, those lands must be permanently protected with a conservation easement that meets the requirements of CA Civil Code 815 et seq. A conservation easement must be recorded at the County where it is located before it can be considered to be a conservation action. To ensure conservation lands and conservation easements are responsibly held and managed they be must held by an accredited land trust.[8] Should the conservation land or conservation easement be intended to meet a mitigation requirement then the land trust must also be approved by CDFW to hold and manage mitigation lands.[9] Moreover, if lands are to be used for mitigation for permanent impacts, the protection for those lands must also be permanent. Any conservation action must be accompanied by sufficient funding to provide for the long-term management and enforcement to ensure the action is durable in perpetuity.

Habitat Enhancement Actions

Habitat enhancement actions must be based on meaningful goals and specific, measurable,
achievable, relevant and time bound (i.e., "SMART") conservation objectives to address focal
species in light of historic, current and projected stressors. Habitat enhancement actions require the 12
expenditure of time, resources, and funding. Lands where habitat enhancement actions will be
implemented must also be permanently protected otherwise it would result in the expenditure of
resources without long-term benefit. Any habitat enhancement action must be accompanied by
sufficient funding to provide for the long-term management to ensure the action is durable.

Mapping

Conservation planning is both data and mapping intensive. Other RCIS and landscape scale
conservation planning processes have benefited from a uniform mapping platform which facilitated
both plan development and engagement of agencies and the public. We strongly recommend a
publicly accessible mapping web portal such as Data Basin[10] be incorporated into the development 13
of the MSV RCIS to enable meaningful participation in the planning process.

Steering Committee Composition

Per slide 8 of the March 20th public presentation, we note the MSV RCIS Steering Committee is
primarily composed of agencies and lacks a diversity of conservation organizations knowledgeable
on the species within the planning area and ecosystem planning. Organizations such as California
Native Plant Society, Audubon, Point Blue, Center for Biological Diversity, Defenders of Wildlife,
and others bring a wealth of knowledge and technical expertise to the RCIS planning process. We
request the Steering Committee be expanded to take advantage of conservation organizations deep
technical knowledge and expertise. Or, as an alternative to expanding the Steering Committee, the 14
Steering Committee could create an Advisory Committee to assist in this planning effort.

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88 http://www.landtrustaccreditation.org/index.php

9 https://www.wildlife.ca.gov/Conservation/Planning/Endowments

10 www.datatbasin.org

Transparency
Public participation can bring a wealth of knowledge to the development of an RCIS. How public
comment is addressed and incorporated into the draft and final RCIS must be transparent and
documented per Sections 4.6.1.4 and 4.6.4, which requires that comments be incorporated into the 15
body of both the draft and final RCIS and a list of all comments received and how they were
addressed must be provided. For purposes of the draft RCIS, written comments received (such as
ours) should be provided to DFW when the draft RCIS is submitted for a determination of
completeness. We look forward to seeing our comments and those of other stakeholders addressed
and incorporated into the draft RCIS.

Conclusion
The MSV RCIS must be consistent with the CDFW's 2018 RCIS Guidelines. We recommend the
MSV RCIS project team closely review the Guidelines and revise the purpose, approach and content 16
of the draft document to ensure consistency. We appreciate RD 108's leadership and efforts in
developing the MSV RCIS and look forward to participating in the process. Please contact Kate
Kelly (kate@kgconsulting.net) with any questions.

Sincerely,

Kim Delfino
California Program Director

Kate Kelly
Consultant

B. Defenders of Wildlife

Summary of Comment B-1

Defenders of Wildlife (Defenders) appreciates RD 108's vision and leadership in developing this RCIS and supports the RCIS program.

Defenders has worked for decades to improve the health of the Sacramento River and its watershed, and protecting and restoring populations and habitats within the RCIS area.

Defenders is providing comments on this RCIS based on information provided at the March 20, 2018 public meeting, and in support of the development of a meaningful RCIS that benefits the region and is consistent with California Department of Fish and Wildlife's 2018 RCIS Program Guidelines.

Response to Comment B-1

We appreciate Defenders support. Thank you for taking the time to attend our public meeting to learn more about the development of the RCIS.

Summary of Comment B-2

Defenders describes an overarching conservation purpose for the Mid-Sacramento Valley RCIS, and explains that the RCIS should not be limited to species and natural resources anticipated to fulfill compensatory mitigation needs, as made clear by CDFW's Program Guidelines.

Response to Comment B-2

The Mid-Sacramento Valley RCIS was developed to address a broad range of conservation elements, to reflect the conservation and advance mitigation needs of the RCIS area. The Mid-Sacramento Valley RCIS is organized hierarchically (i.e., landscapes, working lands and natural communities, and focal species), to address resources at multiple levels in an effort to address comprehensive conservation needs in the RCIS area. Many conservation elements addressed in this RCIS were not anticipated to be used to fulfill compensatory mitigation needs, but rather, were developed to sustain and restore important ecological processes, natural communities, focal species, and address pressures and stressors in the RCIS area. Examples include:

1. A conservation strategy for habitat connectivity (Chapter 3, *Conservation Strategy*, Section 3.6.1, *Conservation Strategy for Habitat Connectivity*).
2. A conservation strategy to protect, enhance, and restore ecological processes and conditions, including hydrologic and geomorphic processes, fire regimes, and pollinators (Section 3.6.2, *Conservation Strategy for Ecological Processes and Conditions*).
3. A conservation strategy to address threats posed by invasive species (Section 3.6.3, *Conservation Strategy for Invasive Species*).
4. Conservation strategies for working lands and natural communities (Section 3.7, *Conservation Strategy for Working Landscapes and Natural Communities*).

Summary of Comment B-3

Defenders recommends that the RCIS area be expanded eastward to at least include the eastern bank of the Feather River and the current 500-year floodplain, and preferably, to the eastern edge of the Great Central Valley.

Defenders also recommends including the Sutter Buttes. If the Sutter Buttes are not included, the RCIS should at least address any effects of the RCIS on the biological values of the Sutter Buttes and on movement of species and ecological processes between the RCIS area and the Sutter Buttes and beyond.

Response to Comment B-3

The Mid-Sacramento Valley RCIS Steering Committee considered many factors when determining the RCIS area (see Chapter 1, *Introduction*, Section 1.6.1. *Mid-Sacramento Valley RCIS Area*). Those included, among others, ecoregional boundaries, jurisdictional boundaries (e.g., county boundaries), and Regional Flood Management Planning boundaries (to reflect RCIS proponent and Steering Committee member agency areas of service).

The Sutter Buttes were not included in the RCIS area to maintain ecological focus of the RCIS area on the Central Valley, and to be consistent with the in-development Yuba-Sutter Habitat Conservation Plan. The conservation strategy for habitat connectivity (Section 3.6.1) includes an objective and action to address landscape connectivity within and adjacent to the RCIS area (including the Sutter Buttes).

The Mid-Sacramento Valley RCIS Steering Committee does not anticipate that the implementation this RCIS would adversely impact the ecological values of the Sutter Buttes because implementation of this RCIS is intended to protect, enhance, and restore ecological values within the RCIS area surrounding the Sutter Buttes.

Summary of Comment B-4

Defenders states that the RCIS's focal species is not consistent with the current RCIS Program Guideline focal species selection requirements, and describes the criteria in the 2018 Program Guidelines for selecting focal species.

Response to Comment B-4

The focal species selection process and focal species addressed by this Mid-Sacramento Valley RCIS is consistent with the requirements in the September 2018 Program Guidelines (California Department of Fish and Wildlife 2018a).

The Steering Committee acknowledges that the focal species selection process was informed by species anticipated to have near-term mitigation needs. The Steering Committee elected to retain the focal species list developed in 2017 to reflect the vision of the Steering Committee member agencies and stakeholders. The Mid-Sacramento Valley RCIS includes landscape and working lands and natural community conservation strategies which, if implemented, would provide conservation benefits for many native species not included in this RCIS as focal species.

Summary of Comment B-5

Defenders states that the Mid-Sacramento Valley RCIS must follow the RCIS guidelines to include a range of natural communities and working lands.

Response to Comment B-5

The Mid-Sacramento Valley RCIS includes conservation strategies for working lands and natural communities (Section 3.7). These conservation strategies were developed to address the conservation needs of natural communities in the RCIS area and the conservation benefits provided by working lands, rather than just to support anticipated mitigation needs.

Summary of Comment B-6

Defenders states that the Mid-Sacramento Valley RCIS must address and provide for habitat connectivity for aquatic and terrestrial species, and provide resiliency against future development and climate change.

Response to Comment B-6

The Mid-Sacramento Valley RCIS includes a conservation strategy for habitat connectivity that addresses terrestrial and aquatic connectivity (Section 3.6.1).

Summary of Comment B-7

Defenders states that the Mid-Sacramento Valley RCIS must identify focal species' climate change vulnerabilities, and provide a strategy for resilience to impacts of climate change.

Response to Comment B-7

The Mid-Sacramento Valley RCIS describes the vulnerability of focal species and other conservation elements, including natural communities, to climate change in Chapter 2, *Environmental Setting,* Section 2.13.3, *Climate Change*. Also, each focal species conservation strategy has a section that summarizes threats to that focal species from climate change, and describes the opportunities this RCIS provides for adaptation to climate change. The RCIS also includes a landscape-level conservation strategy to improve resilience to the effects of climate change (Section 3.6.4), and a conservation strategy for habitat connectivity (Section 3.6.1).

Summary of Comment B-8

Defenders states that the Mid-Sacramento Valley RCIS must be consistent with NCCPs, HCPs and recovery plans overlapping the RCIS.

Response to Comment B-8

The Mid-Sacramento Valley RCIS describes how the RCIS is consistent with approved recovery plans and conservation strategies overlapping the RCIS area (Section 3.9, *Consistency with Approved Recovery Plans and Conservation Strategies*). At the time of RCIS development, there were no available administrative draft NCCPs or approved NCCPs that overlap with the RCIS area, and no approved federal habitat conservation plan that overlaps with the RCIS area.

The Mid-Sacramento Valley RCIS conservation strategy for giant garter snake is consistent with, and complements, the 2017 Recovery Plan for Giant Garter Snake, as required by the Program Guidelines (California Department of Fish and Wildlife 2018a).

Summary of Comment B-9

Defenders states that the Mid-Sacramento Valley RCIS must identify and summarize protected lands within or adjacent to the RCIS area, and that these protected lands should inform the development of the conservation strategy.

Response to Comment B-9

The Mid-Sacramento Valley RCIS identifies and summarizes protected lands within and adjacent to the RCIS area, as required by the Program Guidelines (California Department of Fish and Wildlife 2018a). The conservation strategy includes objectives to expand and connect natural communities and habitats, including those on protected lands (Section 3.6.1, *Conservation Strategy for Habitat Connectivity*). Furthermore, the conservation strategy for focal species applies the overarching principle to preserve large blocks of intact habitats and focus protection in areas that expand and connect existing protected areas (Section 3.8, *Conservation Strategy for Focal Species*).

Summary of Comment B-10

Defenders states that the Mid-Sacramento Valley RCIS's conservation strategy.

Response to Comment B-10

As described above in response to comment B-2, the Mid-Sacramento Valley RCIS is organized hierarchically (i.e., landscapes, working lands and natural communities, and focal species), to address resources at multiple levels in an effort to address comprehensive conservation needs in the RCIS area, beyond those that may be driven by anticipated mitigation needs.

Section 2.13, *Pressures and Stressors on Focal Species and other Conservation Elements* describes pressures and stressors on focal species and their habitats. The measureable conservation objectives at all levels (i.e., landscapes, working lands and natural communities, and focal species) were developed to address and respond to the pressures on focal species and other conservation elements, as required by the Program Guidelines (California Department of Fish and Wildlife 2018a).

Section 2.12, *Gaps in Scientific Information* describes gaps in scientific information.

Section 1.2.1, *Voluntary Strategy*, includes the following statement to ensure that the RCIS does not affect land use authority of any public agency: "[b]y authorizing CDFW to approve RCISs, it is not the intent of the California State Legislature to regulate the use of land, establish land use designations, or to affect, limit, or restrict the land use authority of any public agency. Nothing in the Mid-Sacramento Valley RCIS is intended to, nor shall it be interpreted to conflict with state law or local ordinances."

Section 2.3, *Development and Major Infrastructure* describes existing major water, transportation, and transmission infrastructure facilities in the RCIS area, and accounts for reasonably foreseeable development of major infrastructure facilities, including, but not limited to, renewable energy and housing (e.g., by addressing county and city general plans), as required by the Program Guidelines (California Department of Fish and Wildlife 2018a).

Section 2.6.2, *Conservation and Mitigation Banks* provides a summary of mitigation banks and conservation banks approved by CDFW or the U.S. Fish and Wildlife Service area that are located within the RCIS area or whose service area overlaps with the RCIS area, as required by the Program Guidelines (California Department of Fish and Wildlife 2018a).

Summary of Comment B-11

Defenders states that the Mid-Sacramento Valley RCIS's conservation actions must be based on SMART objectives to address stressors. The comment also stresses that conservation actions must be perpetual and durable, and result in the permanent protection through conservation easements.

Response to Comment B-11

This Mid-Sacramento Valley RCIS's actions are the strategies intended to be employed to accomplish the conservation goals and objectives for landscapes, working lands, natural communities, and focal species.

As described in Section 3.2.3, *Actions and Priorities*, the actions described in the conservation strategies in this RCIS are not identified as either conservation actions or habitat enhancement actions (rather, they are referred to as "actions"), to retain flexibility in how the action may be implemented under an MCA, as many of the actions can be implemented on land or water permanently and protected under a conservation easement (i.e., conservation action), or on land or water and protected under an appropriate, non-permanent durability agreement (i.e., habitat enhancement action). For example, an action to grow crops that provide high-quality foraging habitat for Swainson's hawk may be implemented on permanently protected land, with the land managed in perpetuity to provide foraging habitat for Swainson's hawk, or on land protected under an appropriate durability agreement that does not provide permanent protection.

The implementation of conservation actions, conservation easements, and use of lands for mitigation, as guided by this voluntary RCIS, must be consistent with current regulations and requirements.

Summary of Comment B-12

Defenders states that habitat enhancement actions must be based on SMART objectives to address stressors, and must be implemented on permanently protected land.

Response to Comment B-12

This Mid-Sacramento Valley RCIS's actions are the strategies intended to be employed to accomplish the conservation goals and objectives for landscapes, working lands, natural communities, and focal species.

The implementation of habitat enhancement actions, as guided by this voluntary RCIS, must be consistent with current regulations and requirements, and are not determined (e.g., where, and the type of protection provided to the land where habitat enhancement actions are implemented) by the contents of this RCIS.

In many cases, when informed by the best available science, habitat enhancement actions can provide important benefits to populations of species of conservation need. For example, paying a grower to delay harvesting her/his crops until Tricolored Blackbirds nesting in those crop fields have fledged and dispersed is a critical tool to protect the reproductive success of Tricolored Blackbirds in landscapes dominated by working lands[1].

Note that the Program Guidelines (California Department of Fish and Wildlife 2018a) define a habitat enhancement action as "[a]n action identified in an RCIS that, when implemented is intended to improve the quality of wildlife habitat, or to address risks or stressors to wildlife. A habitat enhancement action is developed to achieve one or more conservation objectives. A habitat enhancement action would have long-term durability but would not involve acquiring land or permanently protecting habitat. In contrast, a conservation action would permanently protect or restore, and perpetually manage, conservation elements – see Conservation Action. Examples of habitat enhancement actions include improving in-stream flows to benefit fish species, enhancing habitat connectivity, and controlling or eradicating invasive species. A habitat enhancement action may be implemented through a variety of conservation investments or MCAs. A habitat enhancement action that is implemented through an MCA would create habitat enhancement credits intended for use as compensatory mitigation for temporary impacts."

Summary of Comment B-13

Defenders strongly recommends that mapping data be made publically available through a web portal during the RCIS development process.

Response to Comment B-13

The Mid-Sacramento Valley RCIS Steering Committee considered making the mapping data used to develop this Mid-Sacramento Valley RCIS publicly accessible through a mapping web portal during the RCIS development process. The Steering Committee determined not to make the mapping data publically available through a web portal because the data were in draft form during the development process, and subject to revisions. Updating the mapping data for a web portal was beyond the scope of this RCIS development process.

Summary of Comment B-14

Defenders notes that the Mid-Sacramento Valley RCIS Steering Committee lacks a diversity of conservation organizations and requests that the Steering Committee be expanded to include such conservation organizations, or create an advisory committee to assist in the planning effort.

Response to Comment B-14

The Mid-Sacramento Valley RCIS Steering Committee acknowledges the knowledge and expertise possessed by staff of conservation organizations.

Environmental Defense Fund and Environmental Incentives are important members of the Mid-Sacramento Valley RCIS Steering Committee and participate in Steering Committee meetings. These conservation organizations have a number of species experts with experience working in the Mid-Sacramento Valley RCIS area.

[1] http://ca.audubon.org/press-release/nearly-75000-tricolored-blackbirds-protected-2017

Environmental Defense Fund and Environmental Incentives have been developing habitat quantification tools, provided through the Central Valley Habitat Exchange, to align with future mitigation credit agreements that may be developed through the Mid-Sacramento Valley RCIS. These habitat quantification tools were developed with technical input from staff of many conservation organizations that have expertise in this RCIS's focal species and conservation elements in the RCIS area.

The Steering Committee elected to not expand the Steering Committee, or create an advisory committee, as it felt comfortable with the expertise on the development team. The Steering Committee also elected to keep the size of the Steering Committee to a moderate level, to facilitate an efficient RCIS development process.

Summary of Comment B-15

Defenders emphasizes the value of the public participation process, and stresses the importance of how public comments are addressed and incorporated into the draft and final RCIS, which must be transparent and documented consistent with the RCIS Program Guidelines.

Response to Comment B-15

Responses to written comments received during development of the draft Mid-Sacramento Valley RCIS and during the public review period are included in this appendix (Appendix C, *Public Outreach*). As required by the Program Guidelines (California Department of Fish and Wildlife 2018a), the Steering Committee is including all written comments provided to the RCIS proponent or CDFW on this Mid-Sacramento Valley RCIS, a summary of each comment, the Steering Committee's response, on behalf of the RCIS proponent, and a description of how each comment was addressed in the RCIS. This appendix was provided to CDFW along with the draft Mid-Sacramento Valley RCIS submitted to CDFW for completeness review.

Summary of Comment B-16

This comment concludes that the RCIS project team closely review the RCIS Program Guidelines and revise sections of the RCIS to be consistent with the Program Guidelines.

Response to Comment B-16

The Mid-Sacramento Valley RCIS Steering Committee, development team, and consultant preparing this RCIS (Chapter 6, *Preparers and Reviewers*) carefully reviewed the Program Guidelines and prepared this RCIS to be consistent with the Program Guidelines (California Department of Fish and Wildlife 2018a). The development team and consultant preparing this RCIS also coordinated with CDFW to ensure that this RCIS is consistent with applicable Program Guideline requirements.

Letter C – California Native Plant Society

C

CALIFORNIA NATIVE PLANT SOCIETY

April 20, 2018

Mid-Sacramento Valley RCIS
c/o ICF
630 K Street, Suite 400
Sacramento, Ca 95814
ATTN: Aaron Gabbe/Stefanie Lyster

Via email: Aaron.Gabbe@icf.com

RE: Mid Sacramento Valley RCIS March 20, 2018 Public Meeting

Dear Aaron:
The California Native Plant Society would like to offer the following comments and recommendations regarding the development of a Mid Sacramento Valley Regional Conservation Investment Strategy (RCIS).

The California Native Plant Society (CNPS) is a non-profit environmental organization with 10,000 members in 35 Chapters across California and Baja California, Mexico. CNPS' mission is to protect California's native plant heritage and preserve it for future generations through application of science, research, education, and conservation. CNPS works closely with decision-makers, scientists, and local planners to advocate for well-informed policies, regulations, and land management practices.

We have reviewed the materials available online that were presented at the March 20, 2018 public meeting and recommend that native plant species and sensitive natural communities be considered and incorporated into the RCIS. Both are absent from among the focal species and communities currently listed for RCIS consideration. If once considered there are rare plant species and sensitive natural communities that occur within the RCIS area but are not included as focal species / communities, the for the sake of completeness and transparancy the plan should include some rationale for why rare native plant species and communities within the plan area are not to be included. 1

We recommend that ICF analyze CRPR 1B, 2B, and 4 plant taxa that occur within the RCIS plan area, as documented in the most recent version of the California Natural Diversity Database (CNDDB), for potential candidacy as RCIS focal plant species. The RCIS must consider all CRPR 1B taxa, and should also consider all CRPR 2B and 4 taxa whose occurrences within the RCIS plan area are at the outer limits of their known geographic range or are occurring on an atypical soil type. These plant taxa represent the highest native plant species conservation priorities for the plan area. Mitigation credit agreements over lands representing habitat for these high priority plant species would benefit both project proponents and native plant biodiversity in the RCIS area. 2

Since much of the RCIS area land is in private ownership where few if any botanical surveys have been performed, there may be occurrences of rare plant species that have yet to be documented. Incorporating focal plant species into the RCIS will provide the vehicle for mitigation credits for these rare plant species should they occur within a future project area.

Among the plants of greatest concern in the Mid-Sacramento Valley RCIS area are those associated with vernal pool complexes, and those occurring in other freshwater wetlands, on wet banks, and in freshwater marshes since these are most likely to be affected by flood control-related activities. 3

Rare plants that are known to occur and have been documented within the RCIS plan area include:

Table 1. Candidate RCIS plant focal species known to occur with the RCIS area

NAME		RANK				
Scientific name	Common name	G-rank	S-rank	CRPR	CESA	FESA
Hibiscus lasiocarpos var. *occidentalis*	Woolly rose-mallow	G5T3	S3	1B.2	None	None
Atriplex cordulata cordulata	Heartscale	G3T2	S2	1B.2	None	None
Atriplex persistens	Vernal pool smallscale	G2	S2	1B.2	None	None
Atriplex depressa	brittlescale	G2	S2	1B.2	None	None
Puccinella simplex	California alkali grass	G3	S2	1B.2	None	None
Extriplex joaqinana	San Joaquin spearscale	G2	S2	1B.2	None	None
Pseudobahia bahiifolia	Hartweg's golden sunburst	G2	S2	1B.1	E	E
Navarretia leucocephala ssp. *bakeri*	Baker's navarretia	G4T2	S2	1B.1	None	None
Layia septentrionalis	Colusa layia	G2	S2	1B.2	None	None
Astragalus tener var. *ferrisiae*	Ferris' milkvetch	G2T1	S1	1B.1	None	None
Chlorpyron palmatum	palmate-bracted salty bird's-beak	G1	S1	1B.1	E	E
Neostapfia colusana	Colusa grass	G1	S1	1B.1	E	T
Delphinium recurvatum	recurved larkspur	G2	S2	1B.2	None	None
Sagittaria sanfordii	Sanford's arrowhead	G3	S3	1B.2	None	None

In addition to plants known to occur within the plan area, there are plants that have the potential to occur within the plan area. These include plants listed as having the potential to occur within the Mid and Upper Sacramento River Flood Management Plan area (see Mid and Upper Sacramento River Flood Management Plan, Appendix D attached), and plants listed as potential covered species in the Yuba-Sutter Regional Conservation Plan[1] (attachment B), where the latter are predominantly vernal pool complex native plant species. 4

Lands within the RCIS area mapped as annual grasslands may likely contain remnant components of higher quality native grasslands. Areas with native grasslands should be a high priority conservation target for mitigation credit agreements. 5

[1] https://www.wildlife.ca.gov/Conservation/Planning/NCCP/Plans/Yuba-Sutter (accessed April 20, 2018)

We cannot envision an RCIS without rare native plants or plant communities included as focal species or natural communities. The Mid-Sacramento Valley RCIS is currently deficient in that it includes no native plant species on the candidate focal species list. 6

We would be glad to assist further in this process as the Mid-Sacramento Valley RCIS develops.
Sincerely,

Greg Suba
Conservation Program Director

APPENDIX D
POTENTIAL SPECIAL STATUS SPECIES PRESENT IN MUSR STUDY AREA

Category	Scientific Name	Common Name	Federal List	California List	California Native Plant Society Rank
Bird	Buteo swainsoni	Swainson's hawk	-	Threatened	
Bird	Haliaeetus leucocephalus	bald eagle	Delisted	Endangered	
Bird	Coccyzus americanus occidentalis	western yellow-billed cuckoo	Proposed Threatened	Endangered	
Bird	Laterallus jamaicensis coturniculus	California black rail	-	Threatened	
Bird	Grus canadensis tabida	greater sandhill crane	-	Threatened	
Bird	Riparia riparia	bank swallow	-	Threatened	
Fish	Lavinia exilicauda chi	Clear Lake hitch	-	Candidate Threatened	
Fish	Spirinchus thaleichthys	longfin smelt	Candidate	Threatened	
Fish	Thaleichthys pacificus	eulachon	Threatened	None	
Fish	Oncorhynchus tshawytscha	Chinook salmon - Sacramento River winter-run ESU	Endangered	Endangered	
Fish	Oncorhynchus tshawytscha	Chinook salmon - Central Valley spring-run ESU	Threatened	Threatened	
Fish	Oncorhynchus tshawytscha	Chinook salmon - Central Valley spring-run ESU	Threatened	Threatened	
Invertebrate	Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Threatened	None	
Invertebrate	Branchinecta conservatio	Conservancy fairy shrimp	Endangered	None	
Invertebrate	Lepidurus packardi	vernal pool tadpole shrimp	Endangered	None	
Invertebrate	Branchinecta lynchi	vernal pool fairy shrimp	Threatened	None	
Plant	Imperata brevifolia	California satintail	-	-	2B.1
Plant	Trichocoronis wrightii var. wrightii	Wright's trichocoronis	-	-	2B.1
Plant	Fritillaria eastwoodiae	Butte County fritillary	-	-	3.2
Plant	Juncus leiospermus var. leiospermus	Red Bluff dwarf rush	-	-	1B.1
Plant	Carex comosa	bristly sedge	-	-	2B.1
Plant	Rhynchospora californica	California beaked-rush	-	-	1B.1
Plant	Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	-	-	1B.2
Plant	Sagittaria sanfordii	Sanford's arrowhead	-	-	1B.2
Plant	Cuscuta obtusiflora var. glandulosa	Peruvian dodder	-	-	2B.2
Plant	Heteranthera dubia	water star-grass	-	-	2B.2
Plant	Stuckenia filiformis ssp. alpina	slender-leaved pondweed	-	-	2B.2
Plant	Campylopodiella stenocarpa	flagella-like atractylocarpus	-	-	2B.2

APPENDIX D
POTENTIAL SPECIAL STATUS SPECIES PRESENT IN MUSR STUDY AREA

Category	Scientific Name	Common Name	Federal List	California List	California Native Plant Society Rank
Plant	Wolffia brasiliensis	Brazilian watermeal	-	-	2B.3
Plant	Brasenia schreberi	watershield	-	-	2B.3
Plant	Gratiola heterosepala	Boggs Lake hedge-hyssop	-	Endangered	1B.2
Plant	Chloropyron palmatum	palmate-bracted salty bird's-beak	Endangered	Endangered	1B.1
Plant	Limnanthes floccosa ssp. californica	Butte County meadowfoam	Endangered	Endangered	1B.1
Plant	Orcuttia pilosa	hairy Orcutt grass	Endangered	Endangered	1B.1
Plant	Pseudobahia bahiifolia	Hartweg's golden sunburst	Endangered	Endangered	1B.1
Plant	Tuctoria greenei	Greene's tuctoria	Endangered	Rare	1B.1
Plant	Neostapfia colusana	Colusa grass	Threatened	Endangered	1B.1
Plant	Orcuttia tenuis	slender Orcutt grass	Threatened	Endangered	1B.1
Plant	Chamaesyce hooveri	Hoover's spurge	Threatened	None	1B.2
Plant	Agrostis hendersonii	Henderson's bent grass	-	-	3.2
Plant	Limnanthes floccosa ssp. floccosa	woolly meadowfoam	-	-	4.2
Plant	Plagiobothrys lithocaryus	Mayacamas popcornflower	-	-	1A
Plant	Astragalus tener var. ferrisiae	Ferris' milk-vetch	-	-	1B.1
Plant	Atriplex minuscula	lesser saltscale	-	-	1B.1
Plant	California macrophylla	round-leaved filaree	-	-	1B.1
Plant	Lasthenia glabrata ssp. coulteri	Coulter's goldfields	-	-	1B.1
Plant	Navarretia leucocephala ssp. bakeri	Baker's navarretia	-	-	1B.1
Plant	Legenere limosa	legenere	-	-	1B.1
Plant	Monardella venosa	veiny monardella	-	-	1B.1
Plant	Paronychia ahartii	Ahart's paronychia	-	-	1B.1
Plant	Atriplex cordulata var. cordulata	heartscale	-	-	1B.2
Plant	Atriplex depressa	brittlescale	-	-	1B.2
Plant	Atriplex joaquinana	San Joaquin spearscale	-	-	1B.2
Plant	Atriplex persistens	vernal pool smallscale	-	-	1B.2
Plant	Atriplex subtilis	subtle orache	-	-	1B.2
Plant	Balsamorhiza macrolepis	big-scale balsamroot	-	-	1B.2

APPENDIX D
POTENTIAL SPECIAL STATUS SPECIES PRESENT IN MUSR STUDY AREA

Category	Scientific Name	Common Name	Federal List	California List	California Native Plant Society Rank
Plant	Calycadenia micrantha	small-flowered calycadenia	-	-	1B.2
Plant	Castilleja rubicundula var. rubicundula	pink creamsacs	-	-	1B.2
Plant	Centromadia parryi ssp. parryi	pappose tarplant	-	-	1B.2
Plant	Chamaesyce ocellata ssp. rattanii	Stony Creek spurge	-	-	1B.2
Plant	Clarkia gracilis ssp. albicaulis	white-stemmed clarkia	-	-	1B.2
Plant	Delphinium recurvatum	recurved larkspur	-	-	1B.2
Plant	Fritillaria pluriflora	adobe-lily	-	-	1B.2
Plant	Juncus leiospermus var. ahartii	Ahart's dwarf rush	-	-	1B.2
Plant	Layia septentrionalis	Colusa layia	-	-	1B.2
Plant	Lepidium latipes var. heckardii	Heckard's pepper-grass	-	-	1B.2
Plant	Sidalcea robusta	Butte County checkerbloom	-	-	1B.2
Plant	Silene verecunda ssp. verecunda	San Francisco campion	-	-	1B.2
Plant	Trifolium jokerstii	Butte County golden clover	-	-	1B.2
Plant	Cryptantha crinita	silky cryptantha	-	-	1B.2
Plant	Cryptantha dissita	serpentine cryptantha	-	-	1B.2
Plant	Hesperolinon adenophyllum	glandular western flax	-	-	1B.2
Plant	Hesperolinon bicarpellatum	two-carpellate western flax	-	-	1B.2
Plant	Tracyina rostrata	beaked tracyina	-	-	1B.2
Plant	Lupinus antoninus	Anthony Peak lupine	-	-	1B.3
Plant	Didymodon norrisii	Norris' beard moss	-	-	2B.2
Plant	Downingia pusilla	dwarf downingia	-	-	2B.2
Reptile	Thamnophis gigas	giant garter snake	Threatened	Threatened	
Amphibian	Ambystoma californiense	California tiger salamander	Threatened	Threatened	
Mammal	Corynorhinus townsendii	Townsend's big-eared bat	-	Candidate Threatened	
Mammal	Martes pennanti	fisher - West Coast DPS	Candidate	Candidate Threatened	

SOURCE: Species list from California Natural Diversity Database, 2014

Plan Name	Common Name	Scientific Name
Yuba Sutter		
	Ahart's dwarf rush	*Juncus leiospermus var. ahartii*
	Bald eagle	*Haliaeetus leucocephalus*
	Bank swallow	*Riparia riparia*
	Boggs Lake hedge-hyssop	*Gratiola heterosepala*
	Burrowing owl	*Athene cunicularia*
	California black rail	*Laterallus jamaicensis coturniculus*
	Dwarf downingia	*Downingia pusilla*
	Giant garter snake	*Thamnophis gigas*
	Greater sandhill crane	*Grus canadensis tabida*
	Legenere	*Legenere limosa*
	Steelhead - Central Valley ESU	*Oncorhynchus mykiss irideus*
	Swainson's hawk	*Buteo swainsoni*
	Tricolored blackbird	*Agelaius tricolor*
	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*
	Vernal pool fairy shrimp	*Branchinecta lynchi*
	Vernal pool tadpole shrimp	*Lepidurus packardi*
	Western pond turtle	*Emys marmorata*
	Western spadefoot	*Spea hammondii*
	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*

C. California Native Plant Society

Summary of Comment C-1

CNPS requests that the Mid-Sacramento Valley RCIS Steering Committee consider including native plant species as focal species, and addressing sensitive natural communities in the RCIS.

Response to Comment C-1

The Mid-Sacramento Valley RCIS Steering Committee considered including native plants as focal species and sensitive natural communities in the RCIS. The focal species selection process is discussed in Chapter 1, *Introduction*, Section 1.6.3, Focal Species. Rationales for including and not including species as focal species are provided in Appendix D, *Evaluation of Species for Inclusion as Focal Species*.

The Mid-Sacramento Valley RCIS is organized hierarchically (i.e., landscapes, working lands and natural communities, and focal species), to address resources at multiple levels in an effort to address comprehensive conservation needs in the RCIS area, commensurate with the level of detail and information available to develop the conservation strategy. The Steering Committee elected to use natural community conservation strategies (e.g., conservation strategies for vernal pool complex, riparian) to address the suite of native species that occur in those communities, rather than selecting focal plant species.

The RCIS includes conservation strategies for the natural communities described in this RCIS, including sensitive natural communities in Chapter 3, *Conservation Strategy*. Table 2-4, *Extent of Natural Communities, Cultivated Agriculture, Other Agriculture, and Urban/Developed Land Cover Types in the RCIS Area*, identifies Mid-Sacramento Valley RCIS land cover types that are identified as a rare or sensitive natural community by the Area of Conservation Emphasis (California Department of Fish and Wildlife 2018b) and the Manual of California Vegetation (Sawyer et al. 2009).

Summary of Comment C-2

CNPS recommends analyzing for inclusion in the RCIS, CRPR 1B, 2B, and 4 plant taxa. CNPS also notes that plant species, as well as agencies or entities needing mitigation credits, would benefit from the inclusion of plants as focal species.

Response to Comment C-2

The Steering Committee considered California Native Plant Society plants ranked 1B and 2B, but not 4. The Steering Committee discussed potential mitigation needs anticipated over the next 10 years, and concluded that mitigation needs are not anticipated for plant species over this time period. Appendix D, *Evaluation of Species for Inclusion as Focal Species*, identifies the species evaluated for inclusion as focal species, and provides a rationale for including them, or not, as focal species.

Summary of Comment C-3

Plant species associated with vernal pool complexes, freshwater wetlands, and marshes are among the plants of greatest concern in the Mid-Sacramento Valley RCIS area.

Response to Comment C-3

As described above, the natural community-level conservation strategies for grasslands (which includes a conservation goal, and objectives and conservation actions and habitat enhancement actions), wetlands, and riverine and riparian are intended to protect, enhance, and restore these natural communities and native species that occur within them, including plant species associated with vernal pool complexes, freshwater wetlands, and marshes.

Summary of Comment C-4

CNPS recommends evaluating for inclusion a list of species known to occur, and that have been documented to occur, in the RCIS area, as well as plant species of concern that have the potential to occur in the RCIS area.

Response to Comment C-4

The Steering Committee included the plants identified in Table 1 in the comment letter in its evaluation of species for inclusion as focal species. The Steering Committee also considered for inclusion as focal species the plants identified in the Mid and Upper Sacramento River Flood Management Plan (Appendix D, attached to the comment letter), and plants proposed for coverage by the Yuba-Sutter Regional Conservation Plan (attachment B in the comment letter). See Appendix D, *Evaluation of Species for Inclusion as Focal Species*, for information used to evaluate these species for inclusion as focal species, and a rationale for why they were not included as focal species.

Summary of Comment C-5

Areas mapped within the RCIS area as annual grasslands (which are primarily comprised of nonnative grasses) may include remnant patches of higher quality native grasslands. Protecting remnant native patches should be of high priority.

Response to Comment C-5

As implied by the comment, the Mid-Sacramento Valley RCIS land cover data do not distinguish remnant patches of native grasslands within annual grasslands; however, the RCIS includes a conservation priority to protect remaining large, contiguous patches of grassland and vernal pool complex, and patches of native grasslands may be included within protected annual grasslands.

Summary of Comment C-6

The Mid-Sacramento Valley RCIS does not include plant focal species. CNPS cannot envision an RCIS that does not include rare native plants or plant communities as focal species or natural communities. CNPS offers assistance on this process.

Response to Comment C-6

The Mid-Sacramento Valley RCIS Steering Committee appreciates the California Native Plant Society's comments and concerns. The consultant preparing the RCIS fielded a phone call from CNPS about including focal species in this RCIS, and welcomes additional feedback on this RCIS.

C.2 References

California Department of Fish and Wildlife. 2018a. Regional Conservation Investment Strategies. Program Guidelines. September 14. Sacramento, CA. Available: https://www.wildlife.ca.gov/Conservation/Planning/Regional-Conservation.

California Department of Fish and Wildlife. 2018b. Areas of Conservation Emphasis (ACE). ACE-III BIOS online viewer. Version 5.62.16. Accessed February 20, 2018. Available at: https://map.dfg.ca.gov/ace/California Department of Fish and Wildlife. 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians. Edited by Armand G. Gonzales and Junko Hoshi, PhD. Prepared with assistance from Ascent Environmental, Inc., Sacramento, CA.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation – Second Edition. California Native Plant Society Press, Sacramento, CA. 1,300 pp.

Appendix D
Evaluation of Species for Inclusion as Focal Species

Introduction

Table D-1 lists species of wildlife, fish, and plant species, evaluated for inclusion as focal species in this Mid-Sacramento Valley RCIS. Evaluation for inclusion of a given species as a focal species followed a two-step process, which is discussed in Chapter 1, *Introduction*, Section 1.6.3.1, *Focal Species Selection*, shown in Table D-1, and below.

Step 1: Identify Focal Species. This step was used to populate Table D-1 with a comprehensive list of native declining and vulnerable species that occur or may occur in the RCIS area. Species included on this list are those that may benefit from conservation investments and/or creation of credits through an MCA and indicator species that are not declining or vulnerable but whose protection confers additional conservation benefits to important habitats (e.g., riparian) or ecological processes (e.g., corridors for movement through the landscape).

Step 2: Apply Screening Criteria to Select Focal Species. This step applies screening criteria to the list of potential focal species to determine which species should be considered for inclusion as focal species in this Mid-Sacramento Valley RCIS. The criteria are divided into *Required* and *Optional* criteria. Many species meet one or a few of the focal species selection criteria. To pare the list of potential focal species to a manageable number of species to be included in the Mid- Sacramento Valley RCIS as focal species, those species that meet all of the three of the following *Required* criteria and meet at least two of the three *Optional* criteria were selected as focal species. Some species that met focal species selection criteria were not selected as focal species if it was determined that their conservation needs would be met by conservation strategies developed for other species selected as focal species, as well as other conservation elements at the level of landscapes, working lands and natural communities. A rationale for not including these species is provided in the “evaluation notes” column.

Required Screening Criteria

- **Status.** The species is listed by state or federal resource agencies as threatened, endangered, or a candidate for such listing; or the species is reasonably expect to be considered for listing within 10 years of RCIS approval; or, the species identified as a CDFW animal Species of Special Concern; or is described as a Species of Greatest Conservation Need (SGCN) or Climate Vulnerable (CV) in the State Wildlife Action Plan; or is recognized by the California Native Plant Society as Rare, Threatened, or Endangered in California and elsewhere (1B) or Rare, Threatened or Endangered in California, but more common elsewhere (2B).
- **Occurrence.** The species is known or likely to occur in the Mid-Sacramento Valley RCIS area. Occurrence data should be based on credible evidence. Species only known to occur on protected and managed lands in the RCIA area, such as national wildlife refuges, may not be selected as focal species if meeting other criteria, as the known extent of the species in the RCIS area is already benefiting from conservation actions (e.g., habitat protection, and likely, habitat management).

- **Data.** Drawing on best available science and emerging data, sufficient data on the species' life history, habitat requirements, and occurrence within the Mid-Sacramento Valley RCIS area are available to develop conservation goals and objectives, assess stressors and pressures, and propose viable conservation actions[1].

Optional Screening Criteria

- **Indicator species.** A species whose presence or absence is indicative of a particular natural community, or set of environmental conditions.
- **Wide-ranging species.** Species that require large, contiguous, or connected blocks of habitat, whereby the species could effectively inform conservation planning and habitat enhancement actions involving habitat connectivity and other important ecological processes within the Mid-Sacramento Valley RCIS area.
- **Near Term Mitigation Needs.** Species that would be of greatest benefit from implementation of mitigation actions, and potentially served by the development of mitigation credit agreements, in the near term[2]. In addition to using species' status as a guide to identifying species that may have near-term mitigation needs, the steering committee provided guidance on species their agencies and organizations anticipate future permit requirements for compensatory mitigation for in the RCIS area.

[1] Sufficient data may include published literature cited in Step 1, species recovery plans, or other species-specific conservation or planning documents.

[2] Near term mitigation needs are generally dependent on the species' status. For example, species are more likely to need mitigation if they are listed by state or federal resource agencies as threatened or endangered or are a candidate for such listing.

Table D-1. Mid-Sacramento Valley RCIS Potential Focal Species

Species	Status[a] State/ CNPS	Federal	SWAP Species of Conservation Need[c]	Climate Vulnerable[d]	Criteria[b] (columns shaded gray are required screening criteria) Occurs in RCIS Area	Data	Near Term Mitigation Needs	Indicator Species	Wide-Ranging Species	Recommend as Focal Species[e]	Indicator of	Evaluation Notes
Invertebrates												
Antioch Dunes anthichid beetle *Anthicus antiochensis*	–	–	Y	N	Y	N	N	Y	N	N	Interior sand dunes and riverine processes (e.g., presence of sand bars)	Single historical occurrence record (1987) of multiple individuals in the on the Feather River in the RCIS area. The species will benefit from the implementation of the conservation strategy for ecological processes.
Vernal pool fairy shrimp *Branchinecta lynchi*	–	FT	Y	N	Y	Y	N	Y	N	N	Vernal pool ecosystem health and function	Only one occurrence found within the RCIS area. This species may benefit from the implementation of the conservation strategy for vernal pools.

Vernal pool tadpole shrimp *Lepidurus packardi*	–	FE	Y	N	Y	Y	N	Y	N	N	Vernal pool ecosystem health and function	Only one occurrence found within the RCIS area. This species may benefit from the implementation of the conservation strategy for vernal pools.
California linderiella	–	–	N	N	Y	N	N	Y	N	N	Vernal pool ecosystem	No Federal or State listing. This species may benefit from the

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Linderiella occidentalis											health and function	implementation of the conservation strategy for vernal pools.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Conservancy fairy shrimp *Branchinecta conservatio*		FE	Y	N	N	Y	N	Y	N	N	Vernal pool ecosystem health and function	No occurrences in RCIS area. This species may benefit from the implementation of the conservation strategy for vernal pools.
Crotch bumble bee *Bombus crotchii*	–	–	Y	N	Y	N	N	Y	Y	N	Ecosystem health and productivity	No Federal or State listing; limited occurrences in RCIS area.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Sacramento anthicid beetle *Anthicus sacramento*	–	–	Y	N	Y	Y	N	Y	N	N	Riverine process (e.g., presence of sand bars)	This species may benefit from the implementation of conservation strategies developed for ecological processes and conditions and the riverine and riparian natural community.
Sacramento tiger beetle *Cicindela hirticollis abrupta*	–	–	N	N	Y	N	N	N	N	N	N	Occurrence likely extirpated from the RCIS area.
Valley elderberry long-horn beetle *Desmocerus californicus dimorphus*	–	FT	Y	N	Y	Y	Y	Y	Y	Y	Riparian floodplain ecosystem health and function; sensitive to fragmentatio n	Found within RCIS area; species of conservation need; occurs in floodplain.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Fish												
Eulachon *Thaleichthys pacificus*	–	FT	Y	Y	Y	Y	N	N	Y	N	N	Single occurrence record from the RCIS area, though general habitat not found within RCIS area, and RCIS area is primarily south of its range. Occurs thought the North Pacific from the Bering Sea to Monterey Bay.
Delta smelt *Hypomesus transpacificus*	SE	FT	Y	Y	N	Y	N	Y	Y	N	Stream health and function, including in-stream habitat	No recent (>20 years) occurrences in RCIS area.
Longfin smelt *Spirinchus thaleichthys*	ST	FC	Y	Y	Y	Y	N	Y	Y	N	Stream and estuarine health and function, including in-stream habitat	This species may benefit from the implementation of conservation strategies developed for ecological processes and conditions, the riverine and riparian natural community, and focal fish species.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Pacific lamprey *Entosphenus tridentatus*	SCC	–	–	Y	Y	Y	N	Y	Y	N	Stream health and function, including in-stream habitat and connectivity	This species may benefit from the implementation of conservation strategies developed for ecological processes and conditions, the riverine and riparian natural community, and focal fish species.
River lamprey *Lampetra ayresii*	SCC	–	–	Y	Y	Y	N	Y	Y	N	Stream health and function, including in-stream habitat and connectivity	This species may benefit from the implementation of conservation strategies developed for ecological processes and conditions, the riverine and riparian natural community, and focal fish species.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
White sturgeon *Acipenser transmontanus*	SCC	–	–	Y	Y	Y	N	Y	Y	N	Stream health and function, including in-stream habitat and connectivity	This species may benefit from the implementation of conservation strategies developed for ecological processes and conditions, the riverine and riparian natural community, and focal fish species.
Sacramento splittail *Pogonichthys macrolepidotus*	SSC	FD	Y	N	Y	Y	N	Y	Y	N	Stream health and function, including in-stream habitat	Occurrence record from 1995, but considered extant in the RCIS area. This species may benefit from the implementation of conservation strategies developed for ecological processes and conditions, the riverine and riparian natural community, and focal fish species.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Green sturgeon *Acipenser medirostris*	–	FT	Y	Y	Y	Y	Y	Y	Y	Y	Stream health and function, including in-stream habitat and connectivity	Found within RCIS area; in need of mitigation; considered species of great conservation need.
Central Valley steelhead *Oncorhynchus mykiss*	–	FT	Y	Y	Y	Y	Y	Y	Y	Y	Stream health and function, including in-stream habitat and connectivity	Found within RCIS area; in need of mitigation; indicator species.
Sacramento River winter-run Chinook salmon *Onchorhynchus tshawytscha*	SE	FE	N	Y	Y	Y	Y	Y	Y	Y	Stream health and function, including in-stream habitat and connectivity	Found within RCIS area; in need of mitigation; indicator species.
Central Valley spring-run Chinook salmon *Onchorhynchus tshawytscha*	ST	FT	Y	Y	Y	Y	Y	Y	Y	Y	Stream health and function, including in-stream habitat and connectivity	Found within RCIS area; in need of mitigation; indicator species.
Central Valley fall/late fall-run Chinook salmon *Onchorhynchus tshawytscha*	SSC	SOC	N	Y	Y	Y	Y	Y	Y	Y	Stream health and function, including in-stream habitat and connectivity	Found within RCIS area; in need of mitigation; indicator species.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Amphibians												
California tiger salamander *Ambystoma californiense*	ST	FT	Y	Y	N	Y	N	Y	Y	N	Wetland, pond, and vernal pool complex ecosystem health and function	No extant occurrences within the RCIS area. An occurrence record from 1965 at the Grey Lodge Waterfowl Management Area is considered extirpated. Climate change is expected to alter suitable habitat for this species and change habitat distribution.
California red-legged frog *Rana (aurora) draytonii*	ST	FT	Y	N	N	Y	N	Y	Y	N	Wetland and pond ecosystem health and function	No occurrences within the RCIS area. Climate change is expected to alter suitable habitat for this species and change habitat distribution.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	State/ CNPS	Federal	SWAP Species of Conservation Need[c]	Climate Vulnerable[d]	Occurs in RCIS Area	Data	Near Term Mitigation Needs	Indicator Species	Wide-Ranging Species	Recommend as Focal Species[e]	Indicator of	Evaluation Notes
Western spadefoot *Spea hammondii*	SSC	UR	Y	N	N	Y	N	Y	Y	N	Wetland and vernal pool complex ecosystem health and function	No occurrences within the RCIS area. Climate change is expected to alter suitable habitat for this species and change habitat distribution.
Reptiles												
Giant garter snake *Thamnophis gigas*	ST	FT	Y	N	Y	Y	Y	Y	Y	Y	Water availability in wetlands, canals, ditches, and ricelands.	Found within RCIS area; in need of mitigation.
Western pond turtle *Emys marmorata*	SSC	UR	Y	N	Y	Y	Y	Y	Y	Y	Wetland and pond ecosystem health and function	This species is wide ranging because it requires upland habitat adjacent to aquatic habitat for estivation and dispersal, especially during drought years.
Birds												
Black-crowned night heron *Nycticorax nycticorax*	–	–	N	–	Y	Y	N	N	N	N	N	Not State or Federally listed species; not a species of conservation concern.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Burrowing owl *Athene cunicularia*	SSC	–	Y	N	Y	Y	N	Y	N	N	Grassland communities with ground squirrel populations	Species of conservation concern; however there are no near-term mitigation needs anticipated.
Northern spotted owl *Strix occidentalis caurina*	ST	FT	Y	N	N	Y	N	N	Y	N	N	No occurrences in RCIS area.
Great blue heron *Ardea herodias*	–	–	N	--	Y	Y	N	N	N	N	N	Not State or Federally listed species; not a species of conservation concern.
Great egret *Ardea alba*	–	–	N	--	N	Y	Y	N	N	N	N	Not State or Federally listed species; not a species of conservation concern.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Greater sandhill crane *Grus canadensis tabida*	ST	–	Y	N	Y	Y	N	N	Y	N	N	This species winters the RCIS area. Does not nest in the RCIS area. Within California, this subspecies of sandhill crane nests primarily in northeastern California. This species not considered climate vulnerable in SWAP.
Lawrence's goldfinch *Spinus lawrencei*	–	–	N	–	N	Y	N	N	N	N	N	Not State or Federally listed species.
Bald eagle *Haliaeetus leucocephalus*	SE/FP	FD, BGPA	Y	N	Y	Y	N	N	N	N	N	Single nesting occurrence in RCIS area in recent years (2014).
Snowy egret *Egretta thula*	–	–	N	–	Y	Y	N	Y	N	N	N	Not State or Federally listed species.
Song sparrow (Modesto population) *Melospiza melodia*	SSC	–	N	--	Y	Y	N	N	N	N	N	Limited occurrences in RCIS area; not considered to be a species of great conservation need.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Osprey *Pandion haliaetus*	–	–	N	–	Y	Y	N	N	N	N	N	Occurrences within RCIS, however, not a species of great conservation need or immediate mitigation.
Swainson's hawk *Buteo swainsoni*	ST	–	Y	Y	Y	Y	Y	N	Y	Y	N	Found within RCIS area; in need of mitigation.
Northern harrier *Circus cyaneus*	SSC	–	Y	N	Y	Y	N	N	Y	N	N	Not State or Federally listed species.
Tricolored blackbird *Agelaius tricolor*	ST	UR	Y	N	Y	Y	Y	Y	Y	Y	Freshwater wetland and pond health and function	Found within RCIS area; in need of mitigation.
California black rail *Laterallus jamaicensis coturniculus*	ST/FP	–	Y	Y	N	Y	N	Y	N	N	Tidal marsh and perennial emergent wetland health and function	No occurrences found within the RCIS area.
White-faced ibis *Plegadis chihi*	–	–	N	--	Y	Y	N	N	N	N	N	Not State or Federally listed species; not a species of great conservation need or immediate mitigation.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Mountain plover *Charadrius montanus*	SSC	–	Y	N	Y	Y	N	N	Y	N	N	Does not nest in the RCIS area; not State or Federally listed species.
Aleutian Canada goose *Branta canadensis leucopareia*	–	delisted	N	–	Y	Y	N	N	N	N	N	No special status; delisted due to recovery. No immediate need for mitigation.
Western snowy plover *Charadrius alexandrinus nivosus*	ST	FT	N	Y	N	Y	N	Y	Y	N	Coastal dune ecosystem health and function	Does not nest within RCIS area.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	SE	FT	Y	Y	Y	Y	Y	Y	Y	Y	Riparian ecosystem health and function; sensitive to fragmentation	State and Federally listed; considered species of conservation need; near term mitigation requirements.
Bank swallow *Riparia riparia*	ST	–	Y	N	Y	Y	Y	Y	N	Y	River health, process, and function	State and Federally listed; considered species of conservation need; near term mitigation requirements.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	State/ CNPS	Federal	SWAP Species of Conservation Need[c]	Climate Vulnerable[d]	Occurs in RCIS Area	Data	Near Term Mitigation Needs	Indicator Species	Wide-Ranging Species	Recommend as Focal Species[e]	Indicator of	Evaluation Notes
Least Bell's vireo *Vireo bellii pusillus*	SE	FE	Y	Y	N	Y	N	N	N	N	Riparian ecosystem health and function	One historic occurrence documented from 1878 on the Sutter/Yuba county line. Likely extirpated as breeder within the RCIS area.
Mammals												
Fisher *Pekania pennanti*	SSC	–	Y	N	N	Y	N	N	N	N	N	No occurrence documented in the RCIS area; no near term mitigation needs.
North American porcupine *Erethizon dorsatum*	CT/ SSC	–	N	N	Y	Y	N	N	N	N	N	No near term mitigation needs; single occurrence in RCIS area just west of the Feather River.
River otter *Lontra canadensis*	–	–	N	N	Y	Y	N	Y	N	N	Riverine health and function	Not Species of Special Concern or SWAP Species of Conservation Need; salmonids, green sturgeon, and bank swallow selected as riverine indicator species; no near term mitigation needs.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	–	Y	N	N	Y	N	N	N	N	N	No occurrence documented in the RCIS area; no near term mitigation needs.
San Joaquin pocket mouse *Perognathus inornatus*	–	–	Y	N	Y	N	N	N	N	N	N	No recent occurrence records from the RCIS area; single historic occurrence record from 1912.
Yuma myotis *Myotis yumanensis*	–	–	N	--	Y	N	N	N	Y	N	N	Not State or Federally listed species; no recent occurrence records from RCIS area.
Western small footed myotis *Myotis ciliolabrum*	–	–	N	–	Y	N	N	N	Y	N	N	Not State or Federally listed species; no recent occurrence records from RCIS area.
Pallid bat *Antrozous pallidus*	SSC	–	Y	N	N	N	N	N	Y	N	N	No occurrences within RCIS area; flood management activities not likely to impact species.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Western red bat *Lasiurus blossevillii*	SSC	–	N	–	Y	N	N	N	Y	N	N	Not State or Federally listed species; no recent occurrence records from the RCIS area.
Hoary bat *Lasiurus cinereus*	–	–	N	–	Y	N	N	N	Y	N	N	Not State or Federally listed species; no recent occurrences in RCIS area.
Marysville California kangaroo rat *Dipodomys californicus eximius*	SSC	–	Y	N	N	N	N	N	Y	N	N	May be extirpated from RCIS area.
American badger *Taxidea taxus*	SSC	–	Y	N	Y	Y	N	N	Y	N	N	Not State or Federally listed species. No near term mitigation needs.
Plants												
Adobe-lily *Fritillaria pluriflora*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Ahart's dwarf rush *Juncus leiospermus* var. *ahartii*	1B	–	N	N/E	N	Y	N	N	N	N	Wetland health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands.
Ahart's paronychia *Paronychia ahartii*	1B	–	Y	N/E	N	Y	N	N	N	N	Wetland and vernal pools health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands and vernal pools.
Anthony Peak lupine *Lupins antoninus*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area; current status uncertain.
Beakred tracyina *Tracyina rostrata*	1B	–	N	N/E	N	N	N	N	N	N	N	This species is not known to occur in Colusa or Sutter Counties; current status uncertain.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Brittlescale *Atriplex depressa*	1B	–	N	N/E	Y	Y	N	N	N	N	N	Only known to occur on protected and managed land (National Wildlife Refuges) in the RCIS area.
Baker's navarretia *Navarretia leucocephala ssp. bakeri*	1B	–	Y	N/E	Y	Y	N	N	N	N	N	Three historic occurrences in the RCIS area; current status uncertain. This species may benefit from the implementation of the conservation strategy for vernal pools.
Big-scale balsamroot *Balsamorhiza macrolepis*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Boggs' lake hedge-hyssop *Gratiola heterosepala*	FE/1B	–	Y	N/E	N	Y	N	N	N	N	Wetland health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands and vernal pool complexes.
Brazilian watermeal *Wolffia brasiliensis*	2B	–	N	N/E	Y	N	N	N	N	N	N	This species may benefit from the implementation of the conservation strategy for wetlands.
Bristly sedge *Carex comosa*	2B	–	N	N/E	N	Y	N	N	N	N	Wetland health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Butte County checkerbloom *Sidalcea robusta*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area.
Butte County fritillaria *Fritillaria eastwoodiae*	3	–	N	N/E	N	N	N	N	N	N	N	Is not known occur in RCIS area.
Butte County golden clover *Trifolium jokerstii*	SE/1B		N	N/E	N	Y	N	Y	N	N	Vernal pools health and function	This species is not known to occur in Colusa or Sutter counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for vernal pools.
Butte County meadowfoam *Limnanthes floccosa* ssp. *californica*	SE/1B	FE	N	N/E	N	Y	N	N	N	N	Wetland and vernal pool health and function	This species is not known to occur in Colusa or Sutter counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands and vernal pools.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)								
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
California alkali grass *Puccinellia simplex*	1B	–	N	N/E	Y	N	N	N	N	N	N	Only known to occur on protected and managed land (National Wildlife Refuges) in the RCIS area.
California beaked-rush *Rhynchospora californica*	1B	–	Y	N/E	N	Y	N	N	N	N	Wetland health and function	This species is not known to occur in Colusa or Sutter counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands.
California satintail *Imperata brevifolia*	2B.1	–	N	N/E	N	Y	N	N	N	N	Wetland health and function	This species is not known to occur in Colusa or Sutter counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands and riverine/riparian habitat.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Chaparral harebell *Campanula exigua*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area.
White-stemmed clarkia *Clarkia gracilis* ssp. *albicaulis*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area.
Colusa grass *Neostapfia colusana*	SE/1B	FT	Y	N/E	N	Y	N	Y	N	N	Wetland and vernal pool health and function	One historic (1898) occurrence in the RCIS area, likely extirpated from the RCIS area. This species may benefit from the implementation of the conservation strategy for vernal pools.
Colusa layia *Layia septentrionalis*	1B	–	N	N/E	N	N	N	N	N	N	N	Historic occurrences in the RCIS area; likely no longer occurs in the RCIS area.
Coulter's goldfields *Lasthenia glabrata ssp. coulteri*	1B	–	Y	N/E	N	N	N	N	N	N	N	One historic occurrence (1926) in the RCIS area; likely no longer occurs in the RCIS area.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	State/ CNPS	Federal	SWAP Species of Conservation Need[c]	Climate Vulnerable[d]	Occurs in RCIS Area	Data	Near Term Mitigation Needs	Indicator Species	Wide-Ranging Species	Recommend as Focal Species[e]	Indicator of	Evaluation Notes
Dwarf downingia *Downingia pusilla*	2B	–	N	N/E	N	Y	N	Y	N	N	Vernal pool health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for vernal pools.
Ferris milk-vetch *Astragalus tener var. ferrisiae*	1B	–	Y	N/E	N	N	N	N	N	N	N	Historic occurrences in the RCIS area, considered possibly extirpated from the RCIS area.
Flagella-like atractylocarpus *Campylopodiella stenocarpa*	2B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the Colusa or Sutter Counties.
Glandular western flax *Hesperolinon adenophyllum*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known to occur in the Colusa or Sutter Counties.
Greene's tuctoria *Tuctoria greenei*	Rare/ 1B	FE	Y	N/E	N	Y	N	Y	N	N	Wetland and vernal pool health and function	Is not known to occur in the RCIS area.
Hairy orcutt grass *Orcuttia pilosa*	SE/1B	FE	Y	N/E	N	Y	N	N	N	N	N	Is not known to occur in the RCIS area.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Hartweg's golden sunburst *Pseudobahia bahiifolia*	SE/1B	FE	Y	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Henderson's bent grass *Agrostis hendersonii*	3.2	–	N	N/E	N	Y	N	N	N	N	Wetland, vernal pool, and grassland health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands, vernal pools, and grasslands.
Pappose tarplant *Centromadia parryi* ssp. *parryi*	1B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Heartscale *Atriplex cordulata* var. *cordulata*	1B	–	N	N/E	Y	N	N	N	N	N	N	One occurrence in RCIS area along highway, non-specific occurrence, and likely will not need mitigation.
Heckard's pepper-grass *Lepidium latipes* var. *heckardii*	1B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.

Species	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
	State/ CNPS	Federal	SWAP Species of Conservation Need[c]	Climate Vulnerable[d]	Occurs in RCIS Area	Data	Near Term Mitigation Needs	Indicator Species	Wide-Ranging Species	Recommend as Focal Species[e]	Indicator of	Evaluation Notes
Hoover's spurge *Euphorbia hooveri*	1B	FT	Y	N/E	N	N	N	Y	N	N	Vernal pool ecosystem health and function.	Is not known to occur in the RCIS area.
Palmate bracted salty bird's-beak *Chloropyron palmatum*	SE/1B	FE	Y	N/E	Y	Y	N	Y	N	N	Alkali wetland and grassland ecosystem health and function.	Only known to occur on protected and managed land (National Wildlife Refuges) in the inventory area; not likely to need near-term mitigation.
Lengenere *Legenere limosa*	1B	–	Y	N/E	N	Y	N	Y	N	N	Vernal pool health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for vernal pools.
Lesser saltscale *Atriplex minuscula*	1B	–	Y	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Recurved larkspur *Delphinium recurvatum*	1B	–	N	N/E	N	Y	N	N	N	N	N	Two historic occurrences in the RCIS area; likely extirpated.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	1B	–	Y	N/E	N	Y	N	N	N	N	Wetland health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands.
Peruvian dodder *Cuscuta obtusiflora* var. *glandulosa*	2B	–	N	N/E	N	N	N	N	N	N	N	One historic occurrence in the RCIS area, likely no longer occurs in the RCIS area.
Pink creamsacs *Castilleja rubicundula* var. *rubicundula*	1B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Round-leaved filaree *California macrophylla*	1B	–	Y	N/E	N	N	N	N	N	N	N	Historic occurrences of this species in the RCIS area; likely no longer occurs in the RCIS area.
San Francisco campion *Silene verecunda ssp. verecunda*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known occur in RCIS area.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
San Joaquin spearscale *Extriplex joaquinana*	1B	–	N	N/E	Y	Y	N	N	N	N	N	Most known occurrence are on protected land (National Wildlife Refuges) in the RCIS area; others are historic and likely no longer occur in the RCIS area. Not likely to need near-term mitigation.
Sanford's arrowhead *Sagittaria sanfordii*	1B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Serpentine cryptantha *Cryptantha dissita*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known to occur in the Colusa or Sutter Counties.
Silky cryptantha *Cryptantha crinita*	1B	–	N	N/E	N	Y	N	N	N	N	N	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for riverine/riparian habitat.

	Status[a]				Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Slender-leaved pondweed *Stuckenia filiformis* ssp. *alpina*	2B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Slender Orcutt grass *Orcuttia tenuis*	SE/1B	FT	Y	N/E	N	Y	N	N	N	N	Wetland and vernal pool health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for wetlands and vernal pool.
Small-flowered calycadenia *Calycadenia micrantha*	1B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Stony Creek spurge *Euphorbia ocellata* spp. *rattanii*	1B	–	N	N/E	N	Y	N	Y	N	N	Vernal pools health and function	This species is not known to occur in Colusa or Sutter Counties; current status uncertain. This species may benefit from the implementation of the conservation strategy for vernal pools.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Subtle orache *Atriplex subtilis*	1B	–	N	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.
Two-carpellate western flax *Hesperolinon bicarpellatum*	1B	–	N	N/E	N	Y	N	N	N	N	N	Is not known to occur in the Colusa or Sutter Counties.
Vernal pool smallscale *Atriplex persistens*	1B	–	N	N/E	Y	Y	N	Y	N	N	Vernal pool ecosystem health and function	One historical record (1920) likely extirpated. Extant occurrence in the RCIS area on protected and managed land (National Wildlife Refuges); not likely to need near-term mitigation.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Water star-grass *Heteranthera dubia*	2B	–	N	N/E	Y	N	N	N	N	N	N	One historical occurrence 3 miles north of Williams (1976). Site reviewed in 2013; no plants observed, but surveyor believes plant may be present. Exact location unknown. Occurrences still considered extant. Also occurs along Glenn-Colusa Canal.
Watershield *Brasenia schreberi*	2B	–	N	N/E	N	N	N	N	N	N	N	Historic occurrence in the RCIS area; likely no longer occurs in the RCIS area.
Woolly rose-mallow *Hibiscus lasiocarpos* var. *occidentalis*	1B	–	N	N/E	Y	Y	N	N	N	N	N	Many recent occurrences in the RCIS, some along the Sutter Bypass and in the adjacent floodplain. Near-term mitigation needs not anticipated.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	**State/ CNPS**	**Federal**	**SWAP Species of Conservation Need[c]**	**Climate Vulnerable[d]**	**Occurs in RCIS Area**	**Data**	**Near Term Mitigation Needs**	**Indicator Species**	**Wide-Ranging Species**	**Recommend as Focal Species[e]**	**Indicator of**	**Evaluation Notes**
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	2B	–	N	N/E	N	N	N	N	N	N	N	Historic occurrences in the RCIS area. One from 1997 is likely extirpated; likely no longer occurs in the RCIS area.
Veiny monardella *Monardella venosa*	1B	–	Y	N/E	N	N	N	N	N	N	N	Is not known to occur in the RCIS area.

Notes

[a] Status

State Status

FP = Fully Protected.
SE = State listed as endangered.
ST = State listed as threatened.
SC = listed as a candidate species. A candidate species is one that the California Fish and Game Commission has formally declared a candidate species.
SR = State listed as rare.
SSC = California special concern species (July 2005 list).

Federal Status

BGPA = Bald Eagle and Golden Eagle Protection Act.
FE = Federally endangered.
FT = Federally threatened.
FC = Candidate for federal listing.
FPT = Federally proposed for threatened listing.
FPD = Federally proposed for delisting.
FD = Federally delisted.
UR = Under review. Species that have been petitioned for listing and for which a 90 day finding has not been published or for which a 90 day substantial has been published but a 12 Month finding have not yet been published in the Federal Register. Also

State Wildlife Action Plan (SWAP) Species of Great Conservation Need

Y = Listed as species of great conservation need in SWAP.
N = Not listed as species of great conservation need in SWAP.

[b] Criteria

Occurs in RCIS Area: The species is known or likely to occur in the strategy area. Occurrence data should be based on credible evidence.

Data: Drawing on best available science and emerging data, sufficient data on the species' life history, habitat requirements, and occurrence within the strategy area are available to set conservation goals and objectives, assess stressors and pressures, and propose viable conservation actions.

Near Term Mitigation Needs: Species anticipated to need mitigation by potential projects in the RCIS area in the near-term.

Indicator Species: A species whose presence or absence is indicative of a particular habitat, community, or set of environmental conditions.

Wide-Ranging Species: Species that require large, contiguous, or connected blocks of habitat, whereby these species could effectively inform habitat enhancement actions involving habitat connectivity and other important ecological processes within the MUSR RCIS area.

[c] State Wildlife Action Plan Criteria

Criterion 1 – Listed species.
Criterion 2 – Species with a conservation concern (similar to CDFW's species of concern).
Criterion 3 – Climate vulnerable species.

Status[a]					Criteria[b] (columns shaded gray are required screening criteria)							
Species	State/ CNPS	Federal	SWAP Species of Conservation Need[c]	Climate Vulnerable[d]	Occurs in RCIS Area	Data	Near Term Mitigation Needs	Indicator Species	Wide-Ranging Species	Recommend as Focal Species[e]	Indicator of	Evaluation Notes

includes species that are being reviewed through the candidate process, but the Candidate Notice of Review has not yet been signed.

SOC = Species of Concern (National Marine Fisheries Service designation).

California Native Plant Society (CNPS) Ranking

1A = Presumed extinct in California.

1B = Rare or endangered in California and elsewhere.

2 = Rare or endangered in California, more common elsewhere.

3 = Plants about which more information is needed.

4 = Plants of limited distribution.

For additional information on SWAP criteria for species, see Chapter 1, Introduction, Section 1.6.3.1, Focal Species Selection.

[d] Climate Vulnerable (as identified in the SWAP).

Y = listed as climate vulnerable by SWAP.

N = not listed as climate vulnerable by SWAP.

-- = not included as a SWAP species of greatest conservation need

N/E = plants were not evaluated for climate vulnerability in SWAP.

[e] Recommended Focal Species Status.

Y = recommended as focal species in RCIS.

N = not recommended as focal species in RCIS.

State Wildlife Action Plan Species of Greatest Conservation Need

The SWAP identifies species of greatest conservation needs based on the following three criteria.

Criterion 1 – Listed species

Criterion 1 requires that the species is listed as threatened, endangered or a candidate species in California under the ESA or CESA.

Criterion 2 – Species with a conservation concern

Criterion 2 is defined as species with a conservation concern, which is similar to California Species of Special Concern. Although this designation carries no legal protection, it is intended to focus attention on the species and stimulate research on those species in an effort to address the declining trends before the species meeting the criteria for state or federal listing. Species where take or harvest is prohibited by CDFW or NMFS are included under Criterion 2 (e.g., marine plants, fish), as well as plants with a California Rare Plant Rank of 1B.2. Invertebrates with a NatureServe Ranking of S1, which designates those species as critically imperiled.

Criterion 3 – Climate vulnerable species

Criterion 3 includes species CDFW considered in the SWAP to be highly vulnerable to climate change. Plants were not addressed under Criterion 3.

The SWAP, which encompasses these three criterion, is addressed in the species evaluation table (Appendix D, Table D-1) in the SWAP column. If a species is included in SWAP, it received a yes (Y) in the SWAP column, and if it is not included in SWAP they received a no (N). Species identified in the SWAP as climate vulnerable received a yes (Y) in the climate vulnerable column. In the status column, if a species is not federally or state listed but is considered a SWAP Species of Greatest Conservation Need, the species could be included as a focal species (if it met the optional criteria) because the SWAP listing indicates the species is seriously imperiled in California and may be state or federally listed in the next 10 years.

The SWAP was also used to inform those species included as indicator species. Indicator species are species that occur in specialized habitats, are sensitive to habitat modification, and occur in habitats that have declined and may continue to decline in the future. Many of the indicator species that occur in the RCIS area are associated with aquatic habitat, such as fish and amphibians. In addition species that occur in specialized grassland habitat, such as alkali plants, mountain plover, and American badger are also included as indicator species. Most of the indicator species are also expected to be affected by climate change. The SWAP includes a climate change vulnerability assessment, which determined the climate vulnerability evaluation in Appendix D, Table D-1.

Appendix E

Focal Species Habitat Models

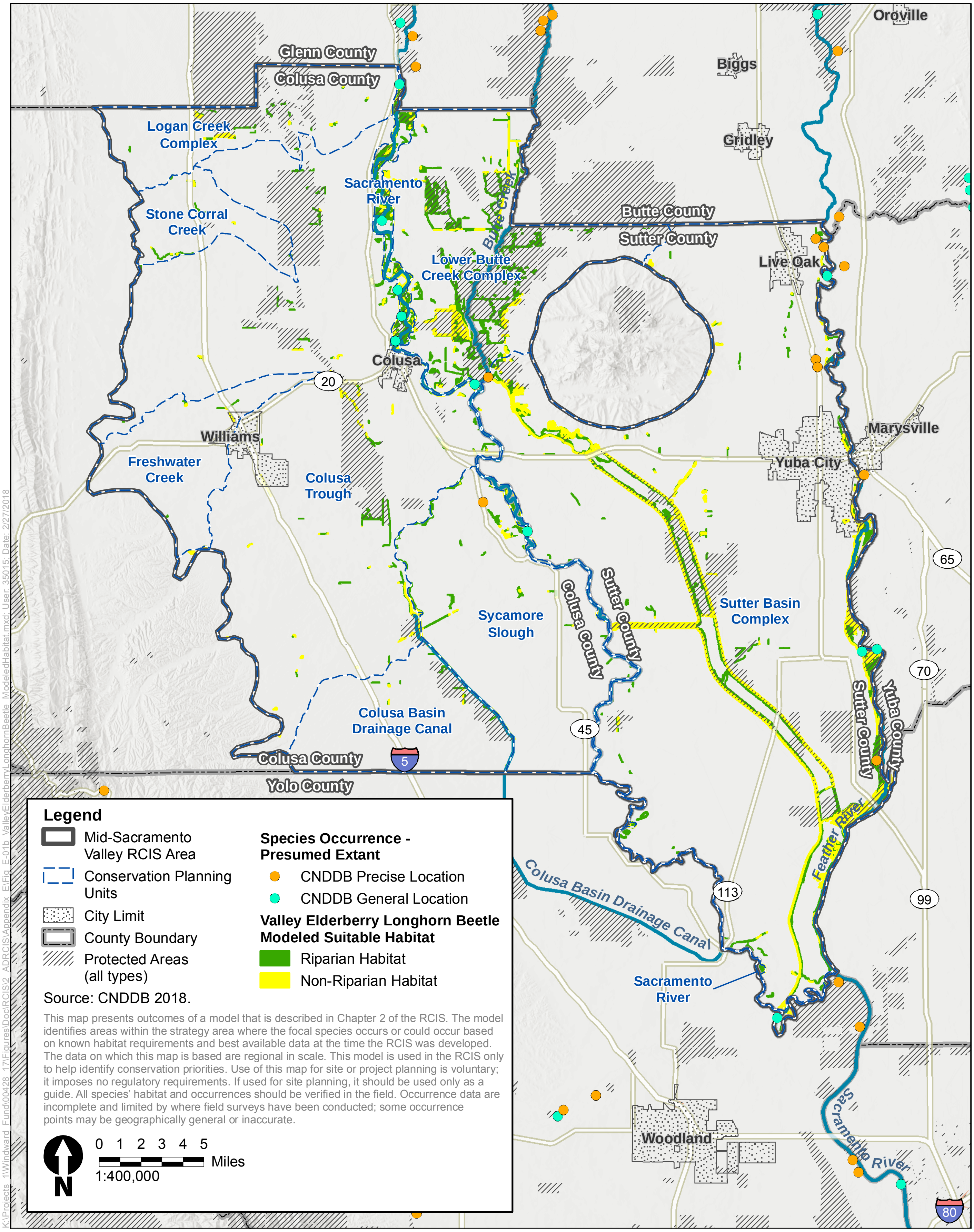

Figure E-1
Valley Elderberry Longhorn Beetle Modeled Suitable Habitat

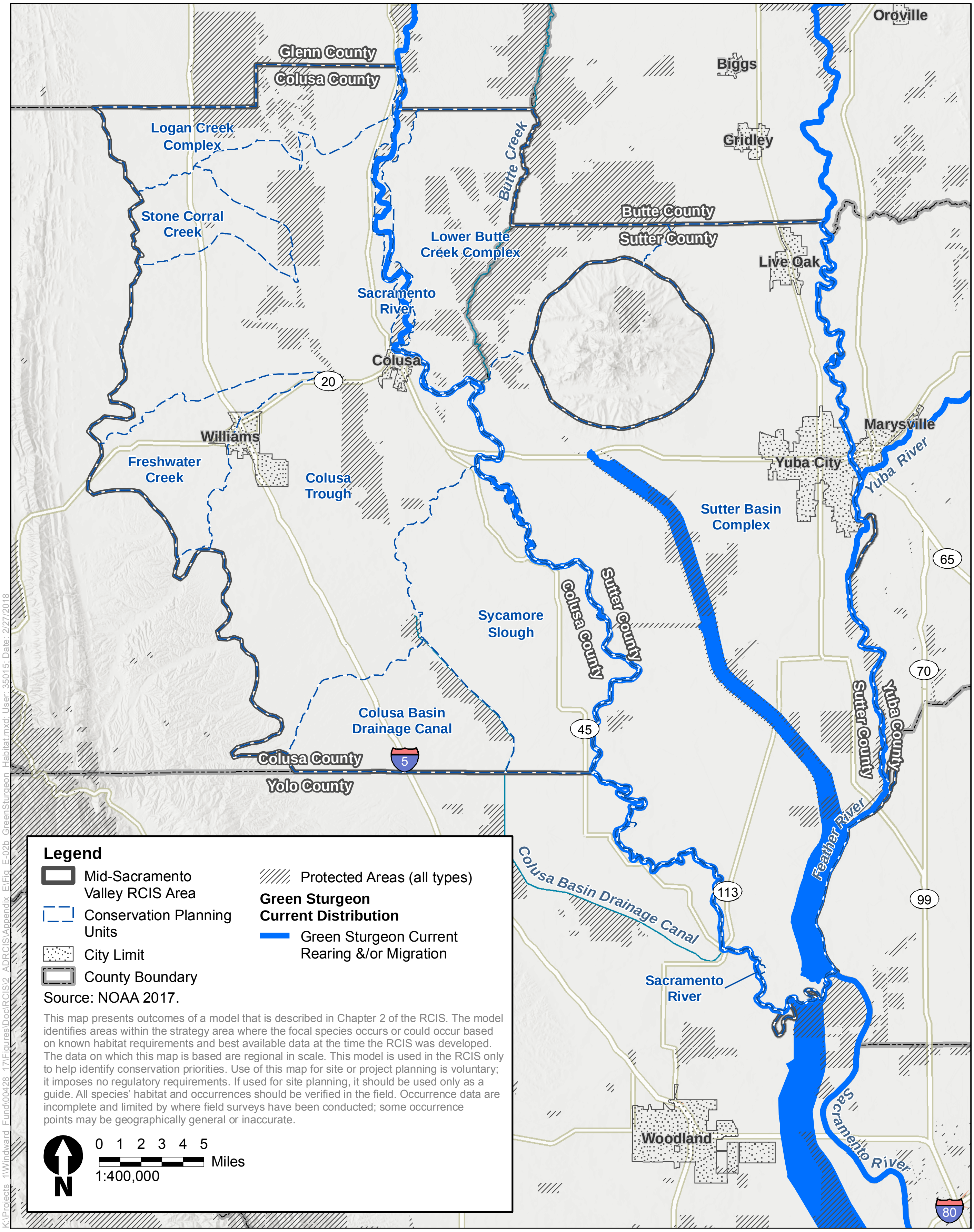

Figure E-2
Green Sturgeon Distribution in the Strategy Area

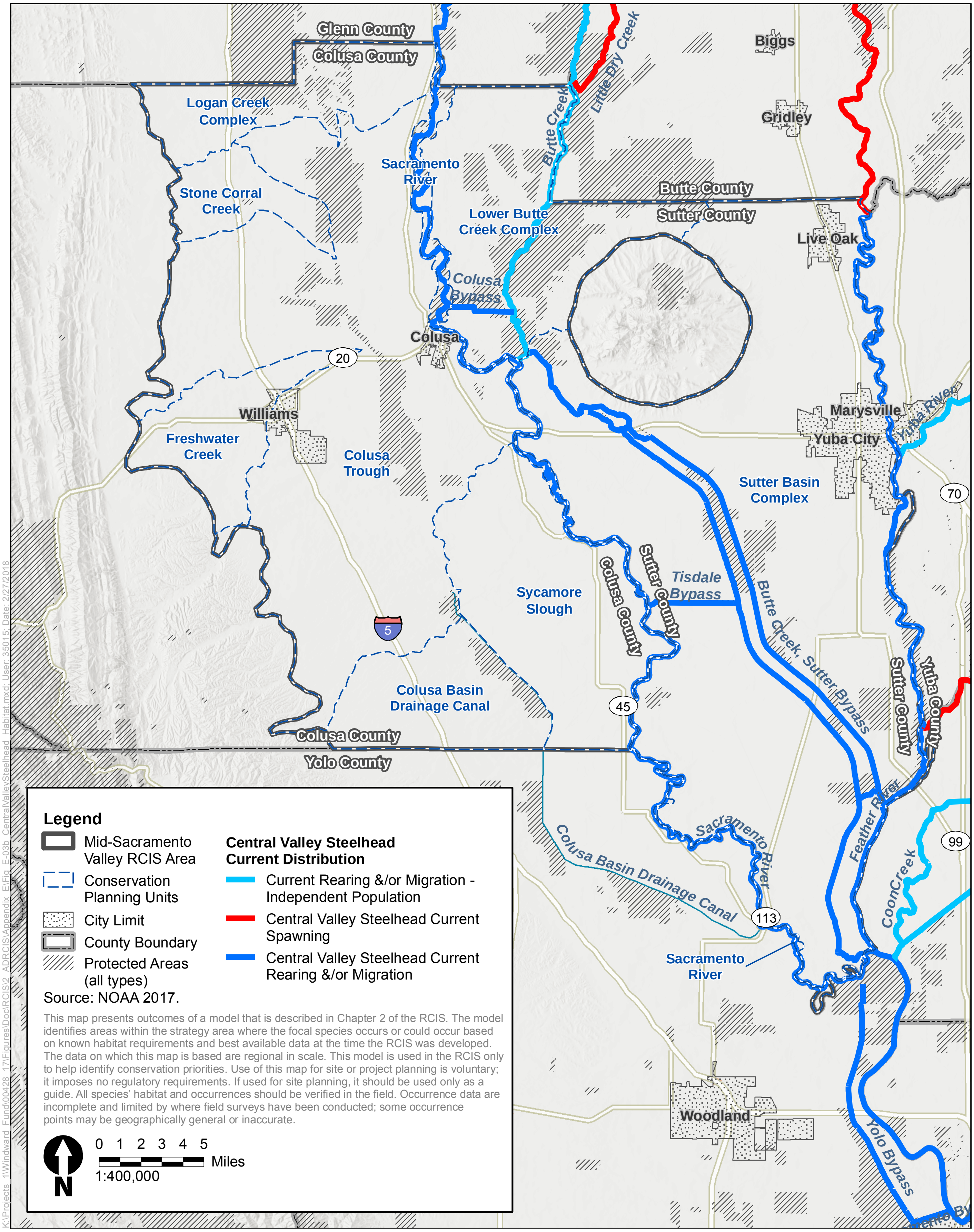

Figure E-3
Central Valley Steelhead Distribution in the Strategy Area

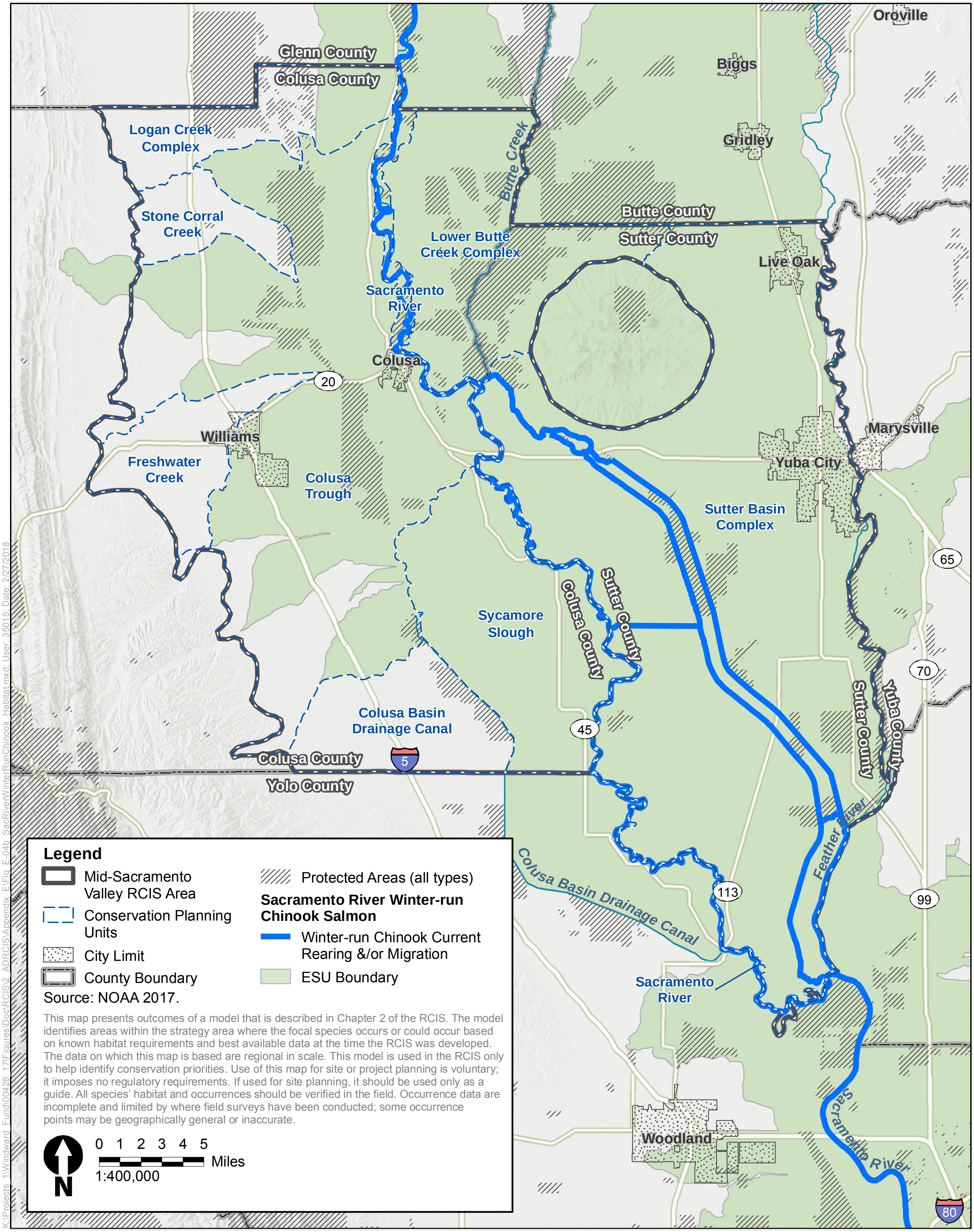

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Figure E-4
Sacramento River Winter-run Chinook Salmon Distribution in the Strategy Area

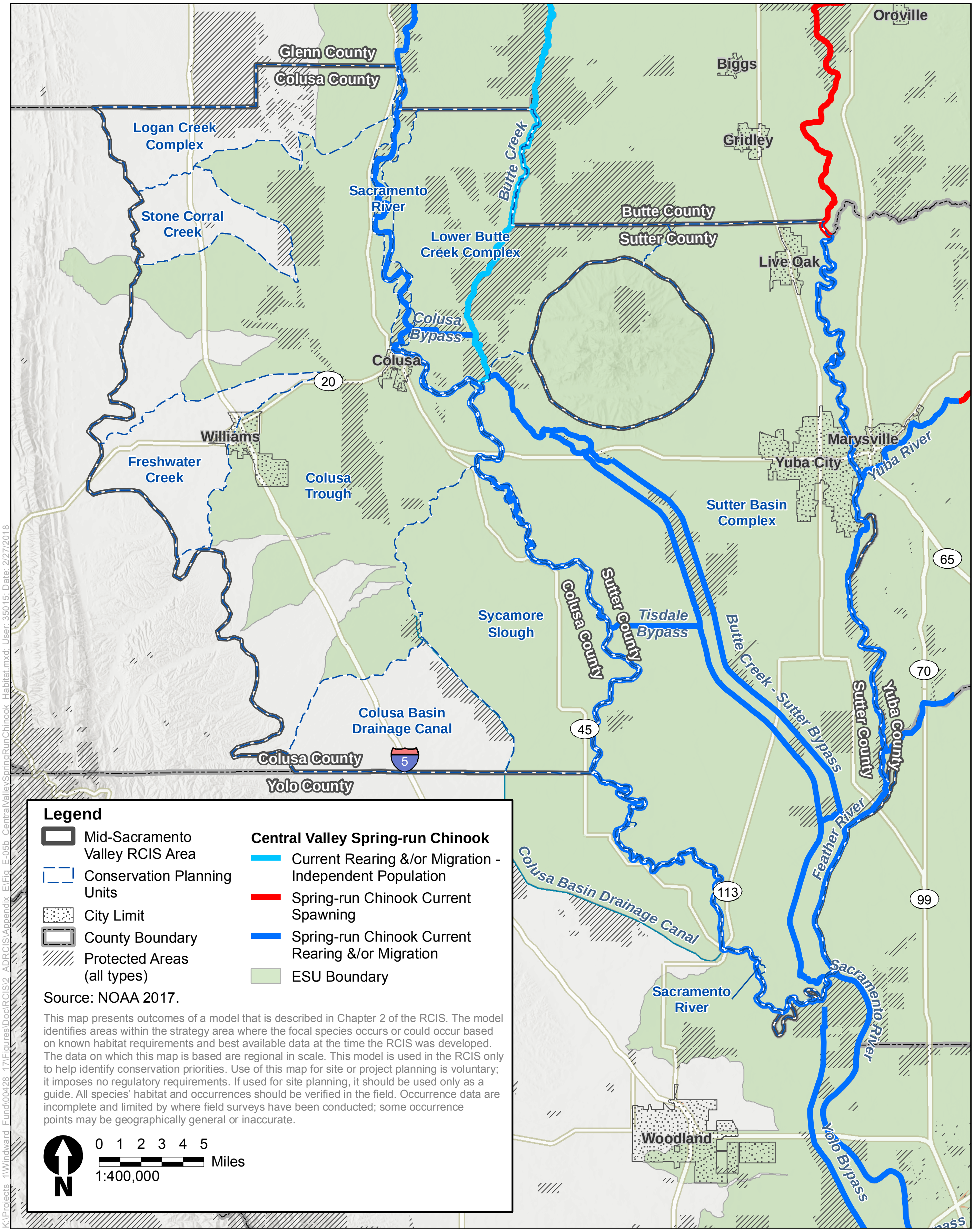

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Figure E-5
Central Valley Spring-run Chinook Salmon Distribution in the Strategy Area

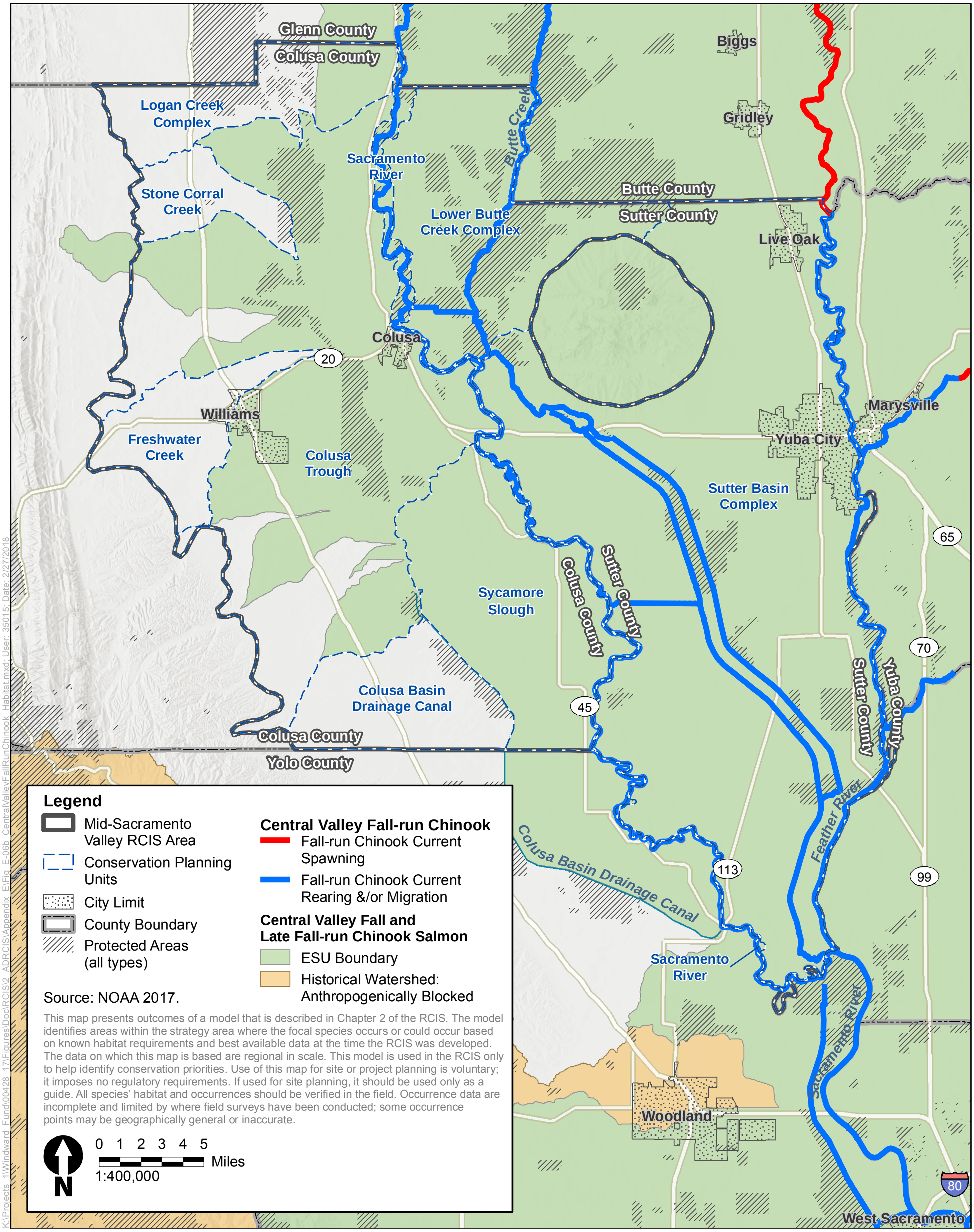

Figure E-6
Central Valley Fall/Late Fall Chinook Salmon Distribution in the Strategy Area

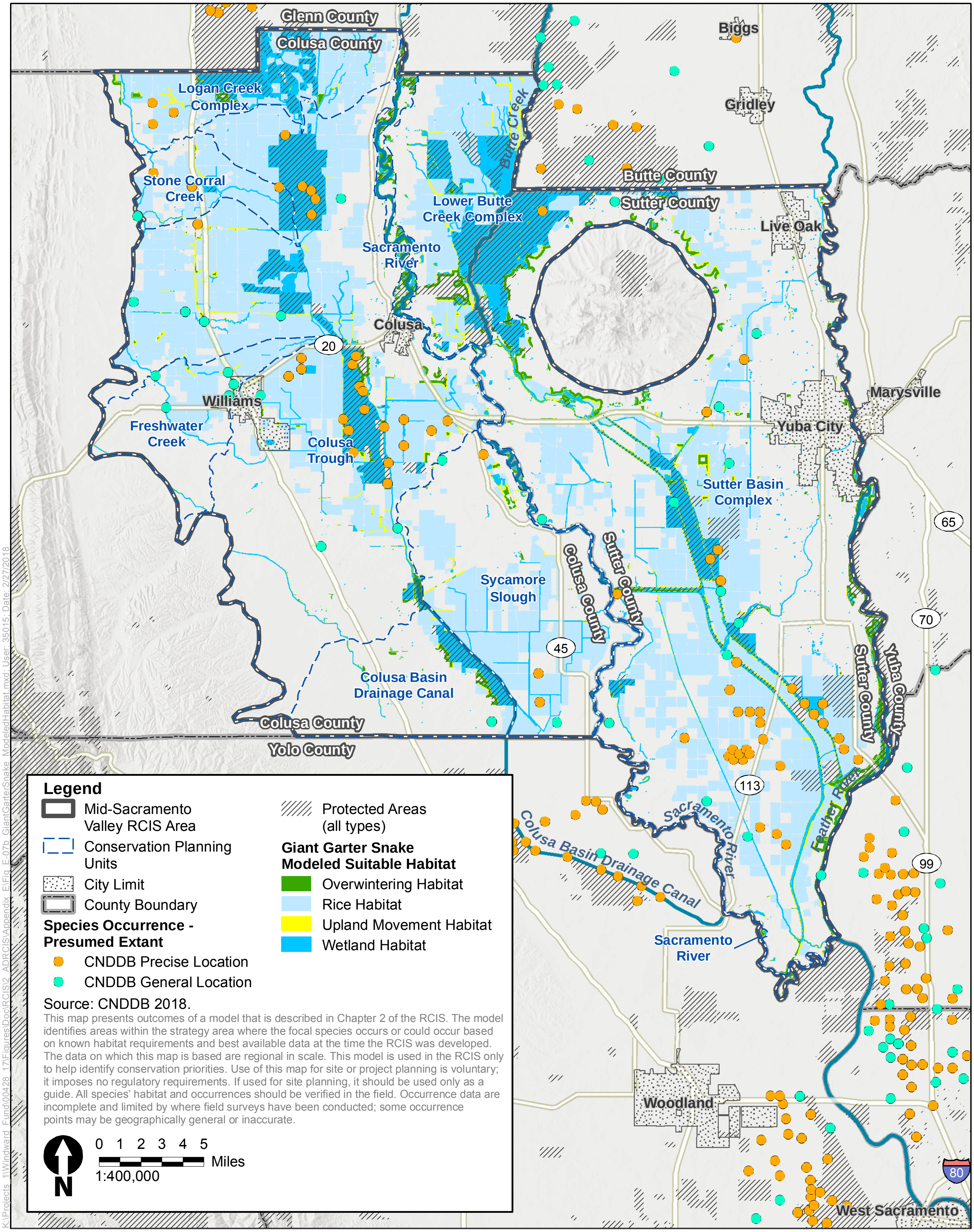

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Figure E-7
Giant Garter Snake Modeled Suitable Habitat

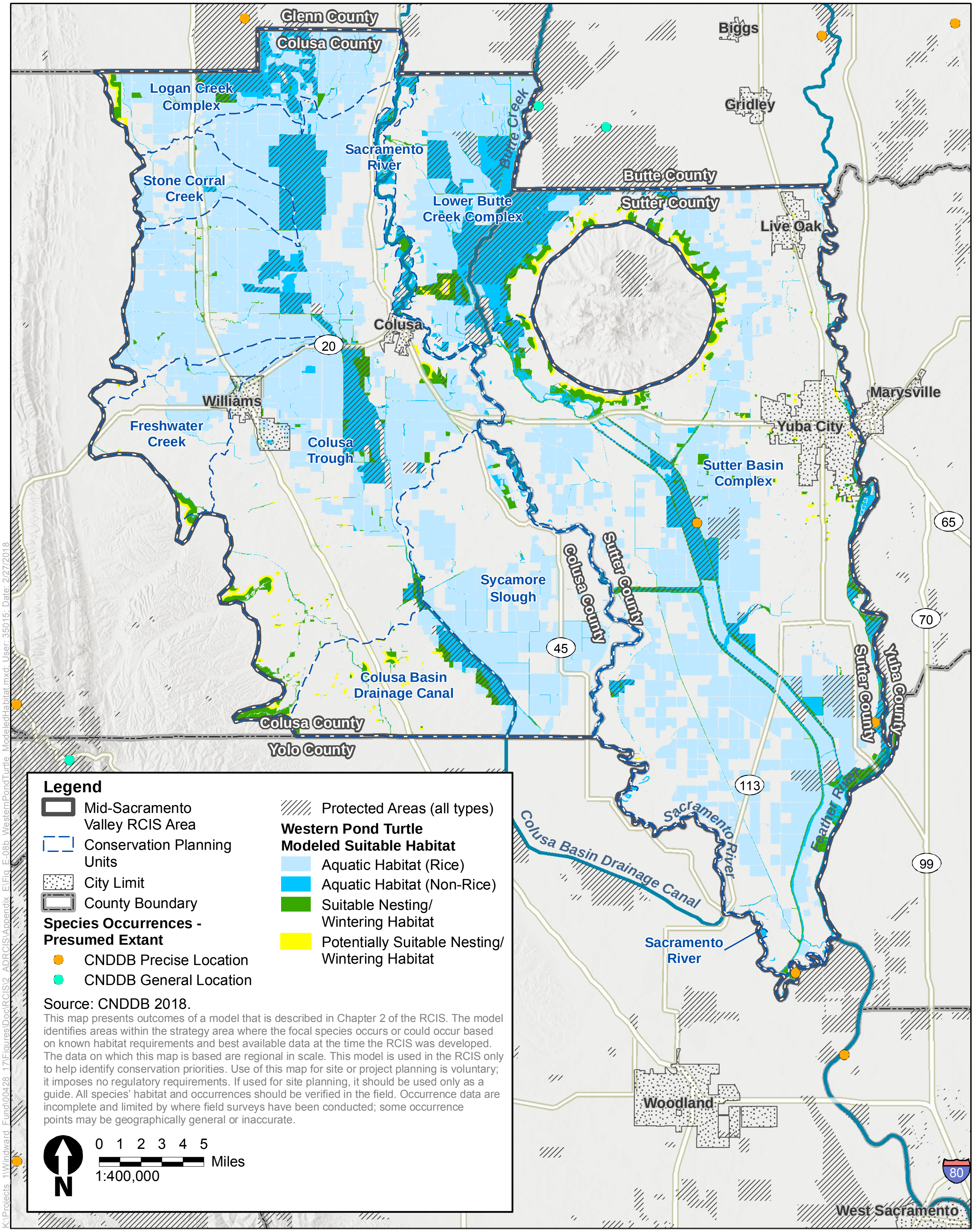

Figure E-8
Western Pond Turtle Modeled Suitable Habitat

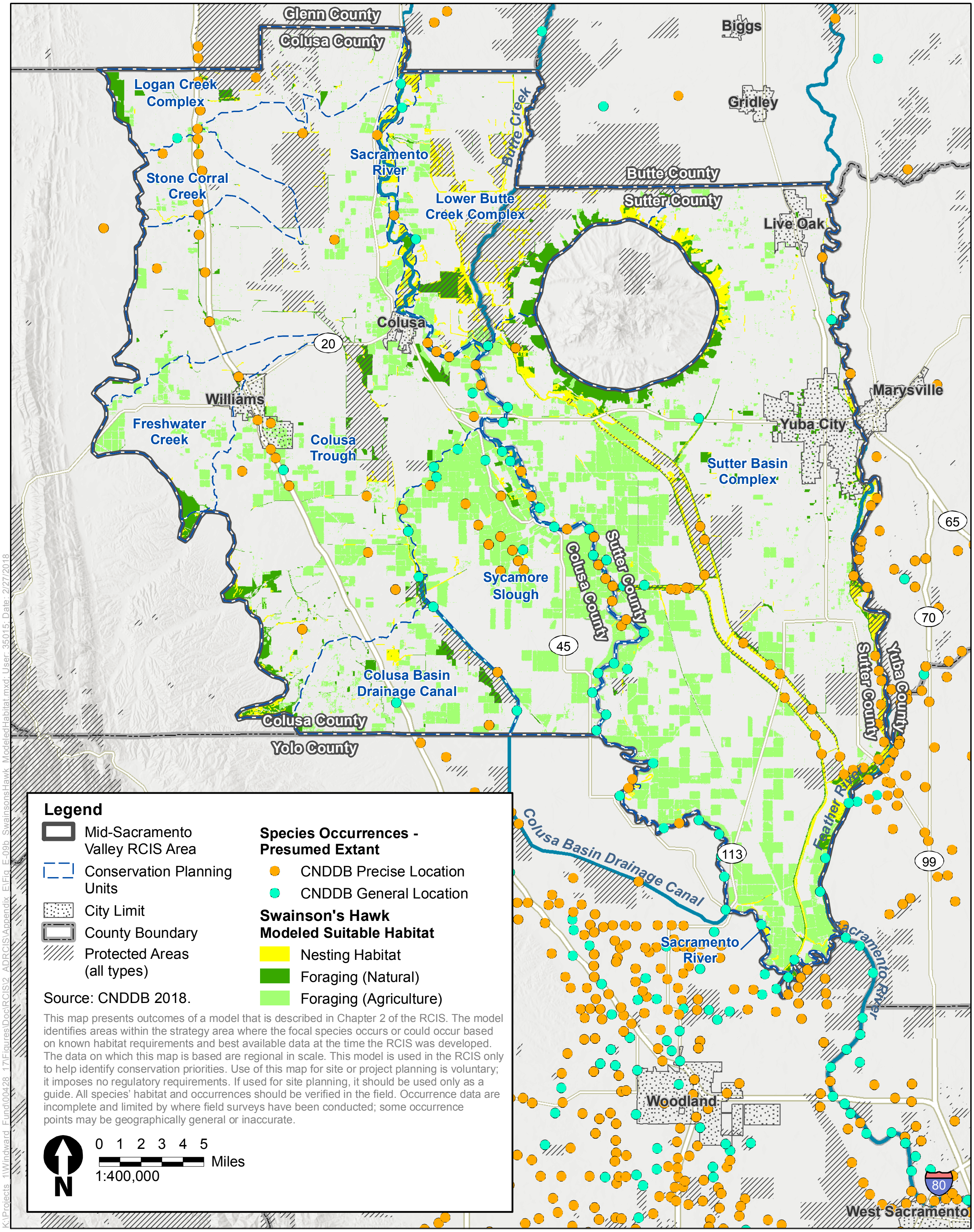

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Figure E-9
Swainson's Hawk Modeled Suitable Habitat

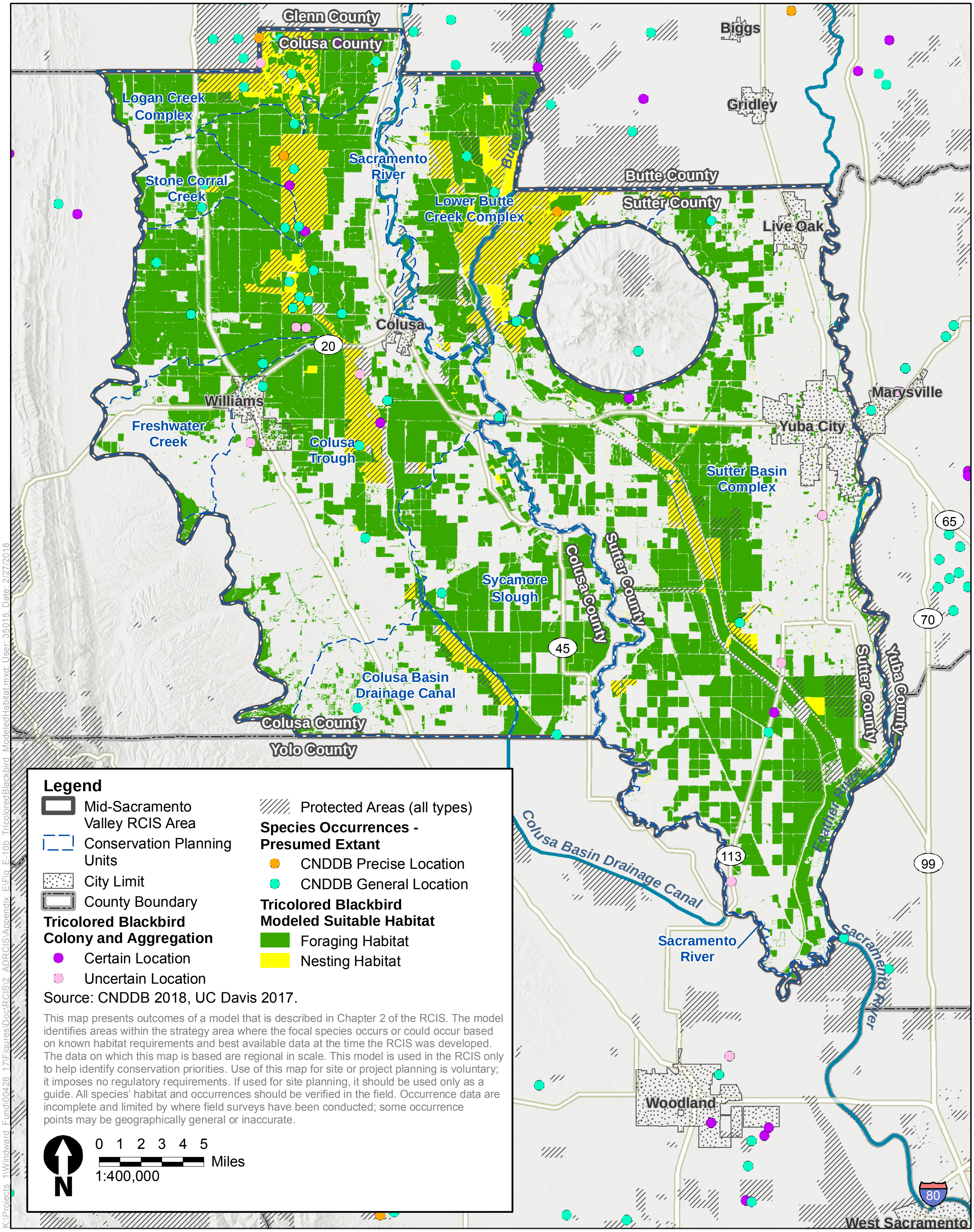

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Figure E-10
Tricolored Blackbird Modeled Suitable Habitat

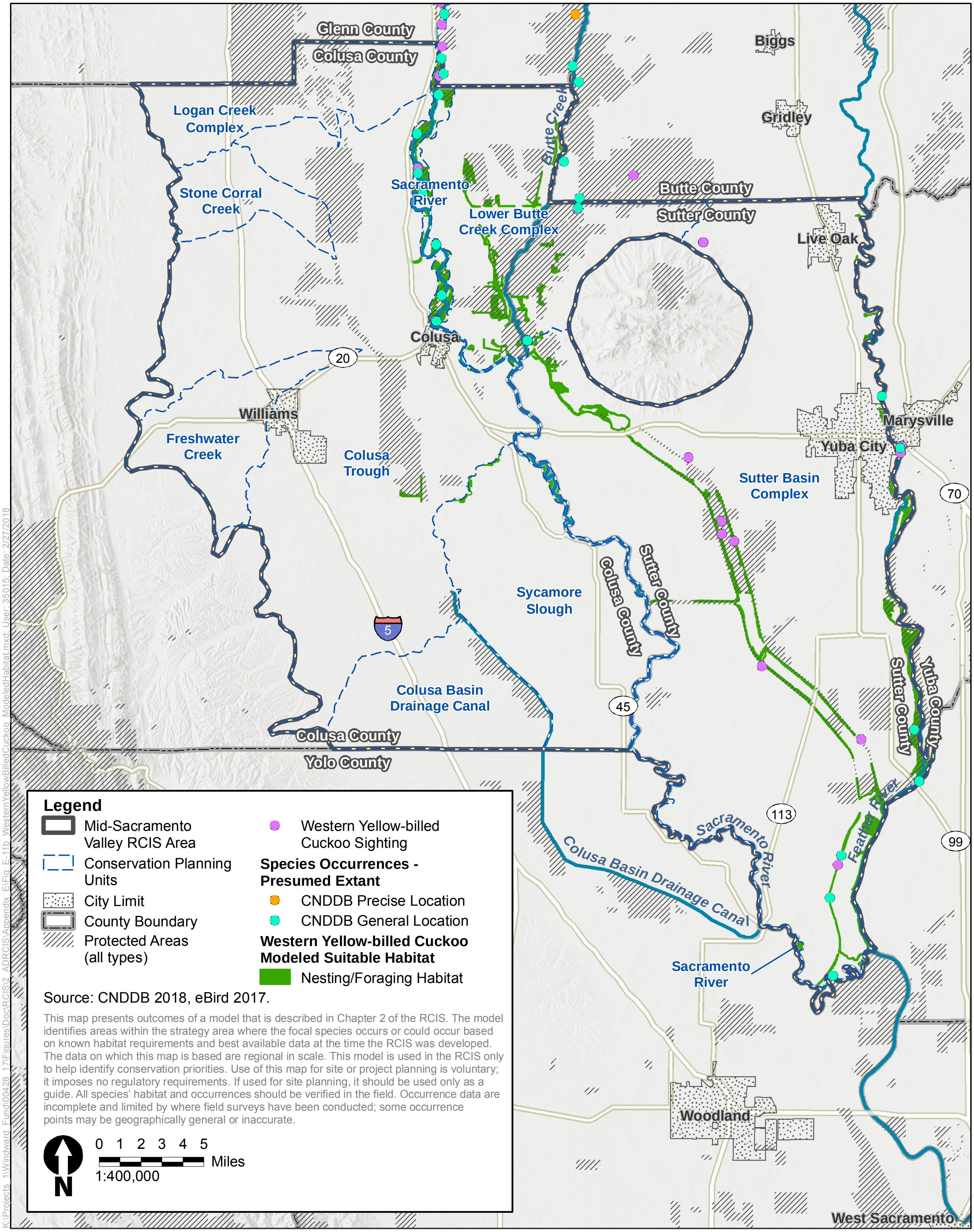
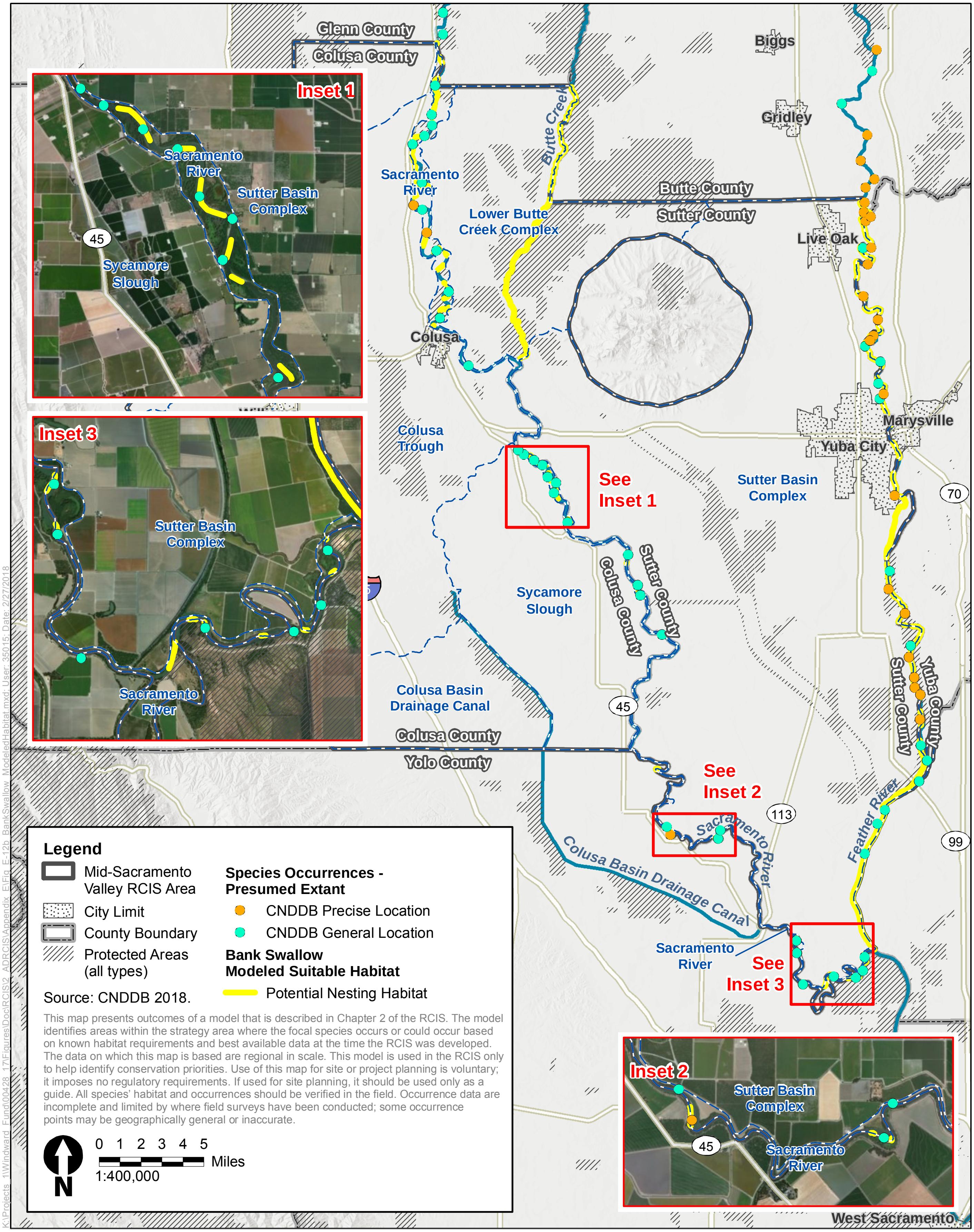


Figure E-11
Western Yellow-billed Cuckoo Modeled Suitable Habitat



ICF

Figure E-12
Bank Swallow Modeled Suitable Habitat

Appendix F
Regulatory Processes

This Mid-Sacramento Valley Conservation Investment Strategy (RCIS) is designed to inform implementation of conservation actions and habitat enhancement actions, including those conducted to provide compensatory mitigation. When undertaking any type of ground-disturbing or vegetation-manipulating activities, it is important to consider that the action taken may affect resources regulated by one or more agency and may require one or more regulatory permit.

When developing permit applications to these agencies, a key consideration is whether the proposed project falls under an existing permitting program or regional program for compensatory mitigation. In addition, it is important to consider how this RCIS and other existing permitting programs are applicable to the different regulatory agencies that may have purview over the project. This appendix provides a brief overview of the permitting agencies and key regulations that may require mitigation that can be informed by this RCIS. This appendix is also designed to provide guidance related to established programs and guidance on how the information in this Mid-Sacramento Valley RCIS can be used to support mitigation requirements of different regulatory agencies.

Regulatory Overview

The following sections provide a high-level overview of the regulatory agencies typically involved in project permitting where the proposed activity may disturb aquatic resources and species addressed by the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). This overview is not comprehensive, and other permits from other agencies or local jurisdictions may be required. The purpose of this overview is to provide basic guidance on regulations that may relate to proposed projects.

U.S. Army Corps of Engineers

Under Section 404 of the federal Clean Water Act (CWA), a permit is required from the U.S. Army Corps of Engineers (Corps) for the placement of dredged or fill material into waters of the United States, including wetlands. Projects may be authorized under existing general permits (nationwide permits or regional general permits), or may require an individual permit. A nationwide permit is a more streamlined permit process than an individual permit, although supporting compliance efforts, such as for the ESA and National Historic Preservation Act, are similar regardless of permit type. Project activities that could trigger CWA Section 404 permitting (individual or general) include temporarily or permanently filling any portion of a water of the United States.

U.S. Fish and Wildlife Service and National Marine Fisheries Service

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) administer the federal ESA. The ESA requires these agencies to maintain lists of threatened and endangered species and affords substantial protection to listed species. NMFS's jurisdiction under ESA is limited to the protection of marine mammals, marine fishes, and anadromous fishes;[1] all other species are subject to USFWS jurisdiction. The ESA includes mechanisms that provide exceptions to take prohibitions identified in Section 9 of ESA. These are addressed in ESA Section 7 for federal actions and ESA Section 10 for nonfederal actions.

Endangered Species Act Section 7

Section 7 of the ESA requires all federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat critical to such species' survival. To ensure that its actions do not result in jeopardy to listed species or in the adverse modification of critical habitat,[2] each federal agency must consult with USFWS and/or NMFS regarding federal agency actions that may affect listed species regulated by the respective agencies. Consultation begins when the federal agency (often the Corps) submits a written request for initiation to USFWS or NMFS, along with the agency's biological assessment of its proposed action, and when USFWS or NMFS accepts that biological assessment as complete. If USFWS or NMFS concludes that the action is not likely to adversely affect a listed species, the action may be conducted without further review under the ESA. Otherwise, USFWS or NMFS must prepare a written biological opinion describing how the agency's action will affect the listed species and its critical habitat.

If the biological opinion concludes that the proposed action would jeopardize the continued existence of a listed species or adversely modify its critical habitat, the opinion will suggest "reasonable and prudent alternatives" that would avoid that result. If the biological opinion concludes that the proposed action would take a listed species but would not jeopardize its continued existence, the biological opinion will include an incidental take statement. *Incidental take* is take that is "incidental to, and not intended as part of, an otherwise lawful activity."[3] The incidental take statement specifies an amount of take that is allowed as a result of the action and whether reasonable and prudent measures may be required to minimize the impact of the take.

Endangered Species Act Section 10

In cases where federal land, funding, or authorization is not required for an action by a nonfederal entity, the take of listed fish and wildlife species can be permitted by USFWS and/or NMFS through the Section 10 process. Private landowners, corporations, state agencies, local agencies, and other nonfederal entities must obtain a Section 10(a)(1)(B) *incidental take permit* for take of federally listed fish and wildlife species "that is incidental to, but not the purpose of, otherwise lawful activities." An HCP must accompany an application for an incidental take permit. The purpose of the HCP, and the HCP's planning process, is to ensure that the effects of the authorized incidental take is adequately minimized and mitigated (U.S. Fish and Wildlife Service 2005).

The take prohibition for listed plants is more limited than for listed fish and wildlife. Under Section 9(a)(2)(B) of the ESA, endangered plants are protected from "removal, reduction to possession, and malicious damage or destruction" in areas that are under federal jurisdiction. Section 9(a)(2)(B) of the ESA also provides protection to plants from removal, cutting, digging up, damage, or destruction where the action takes place in violation of any state law or regulation or in violation of a state criminal trespass law. Thus, the ESA does not prohibit the incidental take of federally listed plants

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[1] *Anadromous fishes* are fish that spend part of their life cycle in the ocean and part in fresh water. NMFS has jurisdiction over anadromous fish that spend the majority of their life cycle in the ocean.

[2] *Critical habitat* is defined as specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described in the *Federal Register*.

[3] 64 CFR 60728

on private or other nonfederal lands unless the action requires federal authorization or is in violation of state law. Although Section 10 incidental take permits are only required for wildlife and fish species, the Section 7(a)(2) prohibition against jeopardy applies to plants, and issuance of a Section 10(a)(1)(B) incidental take permit cannot result in jeopardy to a listed plant species.

California Department of Fish and Wildlife

California Endangered Species Act

The CESA prohibits take of wildlife and plants listed as threatened or endangered by the California Fish and Game Commission. *Take* is defined under the California Fish and Game Code (FGC) (more narrowly than under the ESA) as any action or attempt to "hunt, pursue, catch, capture, or kill." Therefore, take under the CESA does not include "the taking of habitat alone or the impacts of the taking."[4] Rather, the courts have affirmed that under the CESA, "taking involves mortality."

Like the ESA, the CESA allows exceptions to the prohibition for take that occurs during otherwise lawful activities. The requirements of an application for incidental take under CESA are described in FGC 2081. Incidental take of state-listed species may be authorized if an applicant submits an approved plan that minimizes and "fully mitigates" the impacts of this take.

Natural Community Conservation Planning Act

In 1991, California's Natural Community Conservation Planning Act (NCCP Act)[5] was enacted to implement broad-based planning that balances appropriate development and growth with conservation of wildlife and habitat. Pursuant to the NCCP Act, local, state, and federal agencies are encouraged to prepare NCCPs to provide comprehensive management and conservation of multiple species and their habitats under a single plan, rather than through preparation of numerous individual plans on a project-by-project basis. The NCCP Act is broader in its orientation and objectives than are the ESA and the CESA. Preparation of an NCCP is voluntary. The primary objective of the NCCP Act is to conserve natural communities at the ecosystem scale while accommodating compatible land use. To be approved by the California Department of Fish and Wildlife (CDFW), an NCCP must provide for the conservation of species and protection and management of natural communities in perpetuity within the area covered by permits. *Conservation* is defined, in summary, by the NCCP Act and the FGC as actions that result in the delisting of state-listed species. Thus, NCCPs must contribute to the recovery of listed species or prevent the listing of nonlisted species, rather than just mitigate the effects of covered activities. This recovery standard is one of the major differences between an NCCP and an HCP prepared to satisfy ESA or CESA.

The 1991 NCCP Act was replaced with a substantially revised and expanded NCCP Act in 2002. The revised NCCP Act established new standards and guidance on many facets of the program, including scientific information, public participation, biological goals, interim project review, and approval criteria. The new NCCP Act took effect on January 1, 2003.

Lake and Streambed Alteration Agreement

A project proponent is required to enter into a lake and streambed alteration agreement with CDFW when a proposed project would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use

[4] *Environmental Council of Sacramento v. City of Sacramento*, 142 Cal. App. 4th 1018 (2006).

[5] FGC 2800 *et seq.*

material from a streambed.[6] Through this process, CDFW can impose conditions on a project to ensure that no net loss of wetland values or acreage will be incurred. Strictly speaking, the agreement is not a permit but, rather, a mutual agreement between CDFW and the applicant; however, it serves a similar regulatory and protective function. CDFW cannot provide a streambed alteration agreement until after the California Environmental Quality Act (CEQA) review is complete.

Regional Water Quality Control Board

Clean Water Act Section 401 Water Quality Certification

CWA Section 401 requires that applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain water quality certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401. The Regional Water Quality Control Board (RWQCB) cannot provide Section 401 certification until after CEQA review is complete. The Corps will require compliance with Section 401 as a prerequisite to authorization of the project under Section 404.

Although the RWQCB has its own application forms, in practice, the application for Section 401 certification and for issuance or waiver of waste discharge requirements (WDRs) (see below) are combined, and can use much of the same information as the CWA Section 404 permit application. For projects occurring within multiple state and federal agency jurisdictions, the Joint Aquatic Resources Permit Application may also be used.

Waste Discharge Requirements

The RWQCBs designate beneficial uses and establish water quality objectives for the state's waters through development of basin plans under the Porter-Cologne Water Quality Control Act (Porter-Cologne Act), federal CWA, and general provisions of California Water Code Section 13000 (California State Water Resources Control Board 2017). The water quality objectives include both quantitative and narrative targets that may differ depending on the specific beneficial uses being protected. Narrative objectives are established for parameters such as color, suspended and settleable material, oil and grease, biostimulatory substances, and toxicity. Numeric objectives can include such parameters as dissolved oxygen levels, temperature, turbidity, pH, and concentrations of specific chemical constituents such as trace metals and synthetic organic compounds.

Under the Porter-Cologne Act, the RWQCB regulates the discharge of waste to waters of the state. All parties proposing to discharge waste that could affect waters of the state must file a report of waste discharge with the local RWQCB, which will then respond by issuing WDRs in a public hearing or by waiving them (with or without conditions).

The terms *discharge of waste* and *waters of the state* are broadly defined in the Porter-Cologne Act such that discharges of waste include fill, any material resulting from human activity, or any other discharge that may directly or indirectly affect waters of the state. While all waters of the United States that are within the borders of California are also waters of the state, the converse is not true—waters of the United States are more specifically defined, with the result that they are a subset of waters of the state in practice.

[6] FGC 1602

Any activity that results or may result in a discharge that directly or indirectly affects waters of the state or the beneficial uses of those waters are subject to WDRs, even if they are not also waters of the United States. Thus, the WDRs are more broadly applicable. The Central Valley Regional Water Quality Control Board has produced a combined application forms for Section 401 certification and waiver of WDRs to ensure that applicants do not need to file both a report of waste discharge and an application for Section 401 certification.

Water Quality Objectives for Use in Designing and Implementing Projects with Impacts on Creeks or Wetlands

The Central Valley Regional Water Quality Control Board (Central Valley Water Board) is the RWQCB with jurisdiction within the Mid-Sacramento Valley RCIS area. The Central Valley Water Board is charged with maintaining the beneficial uses of waters of the United States in the Central Valley Region, as presented in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Central Valley Regional Water Quality Control Board 2016). If a project will affect waters of the state (as defined by the California State Water Resources Control Board), project proponents are required to apply to the geographically appropriate RWQCB for waste discharge requirements (waters of the State of California) or for CWA Section 401 certification (waters of the United States). The RWQCB reviews applications for waste discharge requirements and certifications to ensure that potential impacts on waters of the United States and state have been avoided and minimized to the maximum extent practicable.

To assist project proponents in designing projects to avoid and/or minimize impacts on waters of the state, the San Francisco Bay Regional Water Quality Control Board developed a technical reference circular titled "*A Primer on Stream and River Protection for the Regulator and Program Manager*," that provides guidance for applicants on how to design projects that protect and restore stream and wetland system functions. Project proponents are encouraged to consult this circular when developing projects with potential impacts on creeks or wetlands throughout California (San Francisco Bay Regional Water Quality Control Board 2003).

Projects that affect creeks or wetlands should strive to achieve three water quality objectives—watershed hydrology, stream dynamic equilibrium, and stream and wetland system habitat integrity. The following is a summary of the technical reference circular. This guidance applies broadly to all RWQCBs.

- **Watershed hydrology.** The hydrologic connectivity between headwaters and estuary, surface water and groundwater, and landscape, floodplain, and stream channel should be protected to produce the pattern and range of flows necessary to support beneficial uses identified in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins and a functional ecosystem.
- **Stream dynamic equilibrium.** Stream attributes, including hydrologic and sediment regimes, vegetation communities, channel forms, slopes, and floodplain areas, should be protected in a manner so as not to arrest natural hydrogeomorphic processes nor accelerate an imbalance resulting in excessive erosion or deposition of sediment, cause nuisance, or otherwise adversely affect beneficial uses. Over time, watershed processes contribute to a dynamic balance between sediment loads and surface water flows, which produce complex, fluctuating, and resilient systems.

- **Stream and wetland system habitat integrity.** Stream and wetland system habitats should be maintained by protecting the type, amount, and complexity of wetland and riparian vegetation, the extent of riparian areas, and the substrate characteristics necessary to support aquatic life.

Achievement of these water quality objectives protects and restores the physical integrity and associated functionality of stream and wetland systems, which include perennial, intermittent, and ephemeral streams and wetlands and their associated riparian areas. The following four principles should be used in developing projects to achieve the water quality objectives.

- **Water quality functions and land use.** Functioning stream and wetland systems provide a wide range of water quality benefits that support the beneficial uses identified in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. Many land use activities have the potential to substantially degrade water quality functions of stream and wetland systems. Therefore, project proponents should recognize the intrinsic connections between land use activities and the structures, processes, and functions of stream and wetland systems.
- **No net loss.** Stream and wetland system areas, functions, and beneficial uses in the region have been substantially degraded from historical levels because of human activities. Therefore, the remaining resources are especially valuable. Projects and associated mitigation measures should be consistent with the California Wetlands Conservation Policy (No Net Loss Policy, Executive Order W-59-93) to ensure no net loss and to achieve a long-term net gain in the quantity, quality, and permanence of stream and wetland system areas, functions, and beneficial uses.
- **Climate change adaptation.** Stream and wetland system protection and restoration are a critical element of a strategy for reducing adverse impacts of greenhouse gas emissions and adapting the region's water resource management to account for the adverse impacts of climate change and sea level rise. Protecting and restoring stream and wetland system functions, including floodwater storage, groundwater recharge, carbon sequestration (e.g., in riparian vegetation and wetland soils that are rich in organic matter), and maintaining aquatic life and wildlife habitat connectivity are important to mitigate for the adverse impacts of climate change.
- **Watershed approach.** Many water quality and ecosystem problems are best identified, prioritized, addressed, and solved using a watershed approach. A watershed approach helps to address cumulative impacts on water quality, and encourages the development of watershed plans and partnerships that coordinate the planning, use, and protection of stream and wetland system resources. Project proponents should consider their project's impacts when multiple individual impacts add to, or interact with, other impacts in a watershed, resulting in cumulative adverse impacts on water quality. Project proponents should include all appropriate and practicable measures to avoid and minimize potential direct, secondary, and cumulative temporary and permanent impacts on water quality and beneficial uses.

Tables F-1 through F-3 summarize goals for achieving the water quality objectives.

Table F-1. Watershed Hydrology Goals for Stream and Wetland System Functions

Runoff flow and volume

Maintain site runoff and transport characteristics (i.e., timing, magnitude, duration, time of concentration, and discharge pathways of runoff flow) such that post-project flow rates and durations mimic preproject levels. Where practicable, incorporate measures to restore natural runoff patterns (e.g., enhance soil infiltration capacity and increase the storage of runoff) in watersheds that have been substantially altered from their predevelopment conditions.

Hydrologic connectivity

Maintain lateral, vertical, and longitudinal flow pathways, including connectivity between stream channels, riparian areas, floodplains, and wetlands; surface water and groundwater; and ocean or estuary-to-headwaters at adequate levels to protect stream and wetland system functions and beneficial uses, including the maintenance of, and access to, a diverse range of habitats for aquatic life and wildlife.

Natural flow regime

Maintain the natural variation of flows and hydrograph characteristics (i.e., timing, magnitude, duration, and time of concentration) such that the range of flows including low, channel forming, and flood flows are of a magnitude and duration to achieve the following goals.

- Sustain channel morphology and balance sediment transport.
- Support riparian vegetation community maintenance.
- Provide adequate flows and velocities during low-flow months to satisfy aquatic life and wildlife habitat requirements.
- Maintain seasonal flows that permit the migration or free movement of migratory fish and access to floodplain and off-channel habitat (e.g., sloughs and permanently or seasonally flooded wetlands) for aquatic life.

Table F-2. Stream Dynamic Equilibrium Goals for Stream and Wetland System Functions

Channel form and processes

Where channels are modified, design projects with proper channel form (e.g., channel shape, width/depth ratio), sinuosity, slope, and floodplain areas such that the balance between sediment loads and surface flows is attained for a range of low to high discharges. This goal promotes natural bank erosion as a desirable attribute of stream and wetland systems while requiring that projects avoid causing excessive erosion or deposition of sediment in and around the project area, creating hydraulic constrictions (e.g., undersized culverts), or requiring ongoing channel maintenance (e.g., dredging to maintain channel capacity, ongoing bed and bank repair). Where practicable, restore channel dimensions and slopes, riparian vegetation communities, floodplain, meander belt, and geomorphic adjustment zone widths, and adequate side slopes from the top of the banks to the top of the floodplain terraces in areas where geomorphic dynamic equilibrium has been affected.

Drainage network

Maintain the naturally occurring pattern and density of perennial, intermittent, and ephemeral streams, as well as associated aquatic habitats (e.g., wetlands) that transport water, materials, energy, and organisms through the watershed (i.e., the drainage network). Avoid changing the natural runoff pathways by filling, piping, ditching, or culverting.

Gullies and headcuts

Avoid formation or expansion of headcuts and gullies. Design projects with proper channel slope and avoid reducing the landscape infiltration capacity and increasing runoff, which may lead to soil erosion and gully formation or expansion.

Table F-3. Stream and Wetland System Habitat Integrity Goals for Stream and Wetland System Functions

Floodplain and riparian areas Maintain floodplains and/or riparian areas of adequate width to provide water quality functions such as floodwater and sediment storage, water quality enhancement, and maintenance of aquatic life and wildlife habitat. Establishment and protection of functioning riparian areas is one of the most straightforward and effective strategies to protect water quality; this strategy is a critical element in adapting to the impacts of climate change including changes in rainfall and runoff patterns.
Wetland hydrology Maintain the natural hydrologic regimes of wetlands, including their hydroperiods and levels of hydrologic connectivity to other aquatic habitats, at levels sufficient to support hydrophytic vegetation (where naturally present), aquatic life and wildlife habitat, and other associated beneficial uses.
Wetland and riparian vegetation Maintain wetland and riparian vegetation (both woody and herbaceous) such that the type, amount, and complexity are adequate to maintain water temperatures appropriate to the needs of aquatic life, withstand site-specific erosive forces, and supply large woody debris of sufficient quantities to maintain aquatic habitat.
Habitat connectivity Avoid creating unnatural barriers between or within stream/wetland systems and upland habitats (e.g., in-stream structures that restrict fish migration or encroachments on floodplains that restrict wildlife movement along a riparian corridor). These barriers affect migration corridors and dispersal systems connecting aquatic life and wildlife with resources and refuges. Protecting stream and wetland system corridors can increase the resiliency of biodiversity by providing migration corridors as aquatic life and wildlife adapt to the impacts of climate change on habitat conditions and distribution.

Compensatory Mitigation Approach

This Mid-Sacramento Valley RCIS was designed with the intent that it not only meets compensatory mitigation requirements of CDFW under the CESA, but that it also supports compliance with state and federal water-related regulations and the ESA. Guidance on how this Mid-Sacramento Valley RCIS can support implementation of compensatory mitigation for separate, but related, regulations is provided below.

Compliance with the Clean Water Act and the Porter-Cologne Water Quality Control Act

An RCIS can provide information and analysis useful for identifying conservation actions and habitat enhancement actions to fulfill compensatory mitigation requirements under federal and state water quality protection laws. For example, both federal and state guidance for compensatory mitigation for impacts on aquatic resources stress the need for a *watershed approach* to compensatory mitigation. This approach considers the importance of landscape position and resource type of compensatory mitigation projects for the sustainability of aquatic resource functions within the watershed.

Compensation Mitigation Rule

In 2008, the Corps and U.S. Environmental Protection Agency (USEPA) adopted regulations governing compensatory mitigation for impacts on waters of the United States authorized in permits issued pursuant to CWA Section 404 (the Compensatory Mitigation Rule).[7] The Compensatory Mitigation Rule requires the Corps to ". . . use a watershed approach to establish compensatory mitigation requirements in [Corps] permits to the extent appropriate and practicable."[8] The Rule defines a watershed approach as:

> . . . an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and locations of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource functions and services caused by activities authorized by [Corps] permits. The watershed approach may involve consideration of landscape scale, historic and potential aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resources when determining compensatory mitigation requirements for [Corps] permits.[9]

The ultimate goal of a watershed approach is to ". . . maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation sites."[10] Similarly, the State Water Resources Control Board proposes to require an almost identical watershed approach to compensatory mitigation as identified in its *Draft Procedures for Discharges of Dredged or Fill Materials to Waters of the State* (Draft Procedures) (California State Water Resources Control Board 2016a:28, 2016b).

The information needs identified for a watershed approach under the Compensatory Mitigation Rule and State Water Resources Control Board's Draft Procedures are almost identical. Where a watershed plan is available, it can be the basis of the watershed approach. A *watershed plan* is defined as follows.

> . . . a plan developed by federal, tribal, state, and/or local government agencies or appropriate non-governmental organizations, in consultation with relevant stakeholders, for the specific goal of aquatic resource restoration, establishment, enhancement, and preservation. A watershed plan addresses aquatic resource conditions in the watershed, multiple stakeholder interests, and land uses. Watershed plans may also identify priority sites for aquatic resource restoration and protection. Examples of watershed plans include special area management plans, advance identification programs, and wetland management plans.[11]

Where a watershed plan is not available, a watershed approach to compensatory mitigation may be based on the following elements.

> . . . analysis of information regarding watershed conditions and needs, including potential sites for aquatic resource restoration activities and priorities for aquatic resource restoration and preservation. Such information includes: current trends in habitat loss or conversion; cumulative impacts of past development activities, current development trends, the presence and needs of sensitive species; site conditions that favor or hinder the success of compensatory mitigation projects; and chronic environmental problems such as flooding or poor water quality.[12]

This RCIS is intended to provide information, analysis, and a process that supports a watershed approach to compensatory mitigation.

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[7] 33 CFR Part 332

[8] 33 CFR 332.3(c)(1)

[9] 33 CFR 332.2

[10] 33 CFR 332.3(c)(1)

[11] 33 CFR 332.2:25, lines 872–878.

[12] 33 CFR 332.3(c)(3):29, lines 1030–1948.

Mitigation Banking

This Mid-Sacramento Valley RCIS includes information and analysis regarding aquatic resources that can be used for compensatory mitigation under the federal CWA and the Porter-Cologne Act in several ways. Project proponents can use the information in this RCIS (e.g., conservation actions and priorities) to develop and site compensatory mitigation actions in connection with a specific permit or project. Mitigation bankers can use the information to develop and site mitigation banks that generate mitigation credits. Public agencies can use the information to develop and establish in-lieu fee programs that generate mitigation credits. In each of these cases, the approval of the Corps and/or the applicable RWQCB would be required. However, this RCIS could be useful in developing mitigation proposals for their approval.

In-Lieu Fee Programs

In-lieu fee programs are identified by 33 Code of Federal Regulations (CFR) 332, *Compensatory Mitigation for Losses of Aquatic Resources* (also known as the Mitigation Rule), as a preferred approach to meeting compensatory mitigation needs for adverse effects on waters of the United States, second to mitigation banks. As defined in 33 CFR 332.2, an in-lieu fee program involves the following.

> "…the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for DA [Department of the Army] permits. Similar to a mitigation bank, an in-lieu fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor. However, the rules governing the operation and use of in-lieu fee programs are somewhat different from the rules governing operation and use of mitigation banks. The operation and use of an in-lieu fee program are governed by an in-lieu fee program instrument."

The National Fish and Wildlife Foundation's Sacramento District operates an in-lieu fee program that provides mitigation credits for impacts on aquatic species and habitats covered under the CWA, Rivers and Harbor Act, Porter-Cologne Water Quality Control Act, and ESA. The operational area for the in-lieu fee program mirrors the U.S. Army Corps of Engineers Sacramento District's jurisdictional boundary in California, covering the Central Valley, the Sierra Nevada Mountains, and the northeastern corner of the state. This in-lieu fee program area overlaps the entire RCIS area. The National Fish and Wildlife Foundation offers two categories of mitigation credits: vernal pool credits for impacts on vernal pool wetlands in 12 vernal pool service areas, and aquatic resource credits for impacts on wetlands, other waters of the U.S., waters of the state, and aquatic species. Watershed boundaries divide the aquatic resource areas to capture the headwaters and floodplains associated with the major river systems in the Central Valley. Vernal pool service areas and aquatic resource service areas overlap the entirety of the RCIS area. The National Fish and Wildlife Foundation in-lieu fee program is approved for use by the regulatory agencies that govern the environmental acts described above (National Fish and Wildlife Foundation 2018). This RCIS can inform the siting, design, and management of wetland mitigation projects under this and any other in-lieu fee program.

Mitigation Credit Agreements

Mitigation credit agreements that meet the requirements of relevant Corps, USEPA, and RWQCB mitigation regulations and policies could also be used to generate mitigation credits for compensatory mitigation under the CWA and Porter-Cologne Act. MCAs can create mitigation credits that can be used to fulfill "compensatory mitigation requirements established under any state or federal environmental law, as determined by the applicable local state, or federal regulatory agency . . ."[13] California CDFW approval of an MCA does not authorize the creation of mitigation credits under the CWA or Porter-Cologne Act. However, if the Corps or RWQCB determines that an MCA meets relevant federal requirements under the CWA and Porter-Cologne Act, they could allow the MCA to create mitigation credits that can be used under those acts. For example, the Corps and USEPA could determine that the MCA meets the Compensatory Mitigation Rule regulations and policies for in-lieu fee programs and could approve the MCA as an in-lieu fee program-enabling instrument. By fulfilling relevant Corps and USEPA requirements and obtaining their approval, the MCA could then be used to create mitigation credits that could be used to comply with the CWA. Similarly, the RWQCB could determine that such mitigation credits are consistent with Porter-Cologne Act requirements for purposes of a CWA Section 401 certification.

Compliance with the Federal Endangered Species Act

An RCIS can provide information and analysis for identifying conservation actions and habitat enhancements actions to fulfill compensatory mitigation requirements under federal wildlife protection laws. For example, in December 2016, the USFWS published their final compensatory mitigation policy under the ESA.[14] For compensatory mitigation under the federal ESA, USFWS prefers the following mitigation conditions.

- Compensatory mitigation projects sited within priority conservation areas identified in landscape-scale conservation plans.
- Compensatory mitigation projects implemented in advance of impacts.
- Mitigation mechanisms that consolidate compensatory mitigation on the landscape.

USFWS has also described the following standards for compensatory mitigation.

- Siting compensatory mitigation in locations identified in landscape-scale conservation plans or mitigation strategies in areas that will meet conservation objectives and provide the greatest long-term benefit to the species.
- Providing compensatory in-kind mitigation for the species affected by the proposed action.
- Providing metrics to measure the ecological functions at compensatory mitigation sites that are science-based, quantifiable, consistent, repeatable, and related to the conservation goals for the species.
- Providing benefits beyond those that would have otherwise occurred through routine or required practices or actions.
- Achieving conservation objectives within a reasonable timeframe or for at least the duration of the impacts.
- Securing the compensatory mitigation by durable means, including adequate legal, real estate, and financial protections that ensure its success.
- Providing accountability in case compensatory mitigation fails to meet its conservation objectives.
- Providing for appropriate and effective engagement of local communities and stakeholders.

This Mid-Sacramento Valley RCIS is intended specifically to provide information, analysis, and a process that supports compensatory mitigation that meets all of these criteria. For example, this RCIS can be used by project proponents to develop and site mitigation actions in connection with a

[13] FGC 1856(c)

[14] 81 FR 95316–95349.

specific permit or project. It can be used by mitigation bankers to develop and site conservation banks that generate mitigation credits, and they can be used by public agencies to develop and establish in-lieu fee programs that generate mitigation credits. In each of these cases, the approval of USFWS or NMFS would be required. However, this Mid-Sacramento Valley County RCIS could be useful in developing mitigation proposals for their approval.

USFWS or NMFS could also incorporate or refer to an RCIS in regulatory designations and analyses, such as recovery plans, critical habitat designations, habitat conservation plans, and biological opinions. For example, USFWS could determine that the mitigation strategies or actions of an RCIS meet the requirements of Section 7 of the federal ESA and include them in a biological opinion.

MCAs that meet the requirements of relevant USFWS or NMFS mitigation regulations and policies could also be used to generate mitigation credits for compensatory mitigation under the federal ESA.[15] For example, USFWS could determine that the MCA meets regulations and policies for conservation banks and could approve the MCA as a programmatic (umbrella) conservation bank-enabling instrument. Or USFWS or NMFS could determine that the MCA meets its policies for in-lieu fee programs and could approve the MCA as an in-lieu fee program-enabling instrument.

Compliance with Section 1600 of the California Department of Fish and Game Code (LSAA)

An RCIS can provide information and analysis for identifying in-stream and riparian habitat conservation actions and habitat enhancements actions to fulfill mitigation requirements under Section 1600 of the California Department of Fish and Game Code (CDFG). CDFW typically requires mitigation measures as part of the LSAA process which relate to state special-status species habitat requirements and watershed components and often coincide with the same measures required as part of a project's FESA and/or CESA compliance. MCAs, including the Sacramento District's In-Lieu Fee Program, that meet the requirements of relevant CDFW mitigation regulations and policies could also be used to generate mitigation credits for compensatory mitigation under the Section 1600 of the CDFG.

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