1 Introduction and Vision

"One thing is clear—to be effective, SWAPs need to serve as a catalyst for conservation, a mechanism for aggregating data that can be presented in a geospatial context, and that provides easily accessible and usable products by any and all for the purpose of conservation."

SWAP Best Practices Report, AFWA 2012

California's State Wildlife Action Plan (SWAP) is a comprehensive, statewide plan for conserving the state's fish and wildlife and their vital natural habitats for future generations. It is part of a nationwide effort by all 50 states and 5 U.S. territories to develop conservation action plans and participate in the federally authorized State and Tribal Wildlife Grants (SWG) Program.

The purpose of the SWG Program is to support state actions that broadly benefit wildlife and habitats, but particularly "Species of Greatest Conservation Need (SGCN)" identified by the individual states. Each state has prepared a SWAP that assesses the health of the state's wildlife and habitats, identifies the problems they face, and outlines the actions needed to conserve them over the long term. SWAPs describe the steps that are needed to conserve wildlife and their habitats before species become too rare or habitats become too costly to restore. Taken as a whole, all the SWAPs together present a national action blueprint for conserving the country's wildlife heritage and preventing species from becoming threatened or endangered.

California developed its first SWAP in 2005 (called SWAP 2005 in this document). At that time, California Department of Fish and Game (CDFG) worked in collaboration with the University of California, Davis to prepare *California Wildlife: Conservation Challenges – California's Wildlife Action Plan* (CDFG 2005). To meet current requirements of the grant program, California Department of Fish and Wildlife (CDFW, formerly CDFG) has now prepared SWAP 2015, the first comprehensive update of SWAP 2005.

1.1 California's Challenge – Sustaining Biodiversity

California is a state with both tremendous biodiversity and a large and growing human population. The challenges of supporting sustainable socioeconomic activities while protecting natural heritage are, therefore, paramount. SWAP 2015 is a key component of the state's approach to meet these challenges.

California's landscapes support the greatest biodiversity of any state in the nation. With a Mediterranean climate and varied topography, geology, soils, and hydrology, the state's vegetation communities are recognized as one of the world's important biodiversity hotspots. The deserts, mountain ranges, vast valleys, wetlands, woodlands, rivers, estuaries, and marine environments of the state provide habitats for approximately 650 bird species, 220 mammals, 100 reptiles, 75 amphibians (CDFW 2014), approximately 70 freshwater fish (Moyle and Davis 2001), and approximately 6,500 taxa of native plants. California's lands span more than 158,000 square miles with over 4,900 lakes and reservoirs, 175 major rivers and streams, and 1,100 miles of marine coastline. An integrated ecosystem conservation approach is essential to maintaining healthy wildlife populations in such a diverse setting.

Debra Hamilton, CDFW

California is also the most populous state in the nation. As recognized in the Governor's latest *Environmental Goals and Policy Report* (EGPR), California's population is anticipated to grow from approximately 38 million in 2013 to 50 million by mid-century. This continued growth creates the challenge of how to support an increasing population in harmony with the state's environment and natural resources. Climate change and the state's efforts to confront it will touch nearly every aspect of land use planning, investments for the future, and decisions about natural resource conservation. Among its array of goals, the EGPR calls for the state to take steps to preserve natural systems, working landscapes, and natural resources, as well as striving to increase ecosystem services and biodiversity and ensure resilience of natural systems to recover from disruption (Governor's Office of Planning and Research [OPR] 2013).

1.2 CDFW Jurisdiction

CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, plants, and habitat necessary for biologically sustainable populations of those species. It includes the authority to manage threatened or endangered native animals and plants and to acquire and seek the designation of wildlife areas, ecological reserves, and other natural areas. SWAP 2015 helps CDFW fulfill these responsibilities.

As the state's trustee agency for fish and wildlife resources, CDFW is responsible for providing biological expertise to review and comment upon environmental documents and impacts arising from development, infrastructure, and other project activities as they are considered under the California Environmental Quality Act, or CEQA (Public Resources Code 21000 et seq.). (A "trustee agency" is a state agency having jurisdiction by law over natural resources that may be affected by a project and that are held in trust for the people of the state of California.)

Bob Sahara, CDFW

CDFW responsibilities also include, but are not limited to:

- conducting wildlife resource assessments, wildlife and habitat research and monitoring, conservation planning, and wildlife management;
- assisting with the development of, and issuing approvals for, Natural Community Conservation Plans;
- regulating alteration to the bed, bank, channel or flow of rivers, lakes, and streams;
- regulating the take of plant and animal species that have been designated as rare, threatened, or endangered by the California Fish and Game Commission;
- collecting scientific data, conducting analyses, evaluating resource status, and developing regulations to provide hunting and fishing opportunities to the public;
- activities that are required by statute, provide considerable public benefit, and contribute substantially to the state's economy;
- protecting, maintaining, enhancing, and restoring California's marine ecosystems for their ecological values and their use and enjoyment by the public through sound science and effective communication;
- serving as the principal state agency contact for wildlife issues in all counties and communities;
- educating the public about wildlife conservation and wildlife public safety issues;
- providing technical advisers for species and habitat conservation planning efforts and evaluating lands considered for acquisition for the benefit of wildlife resources;
- advising local governments, commissions, and working groups regarding biological, technical, and conservation issues;
- serving as the lead state agency charged with helping to resolve human-wildlife conflict, public safety, and depredation problems (an increasing challenge because of growth and development in rural communities and natural areas and expansion of agricultural activities); and
- participating in the development of strategies to monitor, assess, reduce, and manage wildlife disease, as well as responding to potential and actual outbreaks of disease.

1.3 Vision for State Wildlife

A vision for SWAP 2015 has guided its preparation and will facilitate its implementation. The intent of this vision is to provide the underlying foundation for defining conservation strategies in the plan and for addressing changing circumstances that may emerge during its implementation. The vision is presented below.

> Through SWAP 2015, CDFW seeks to conserve the wildlife resources of the nation's most biologically diverse state in harmony with the need to support a growing human population and in recognition of the challenges of a changing climate. SWAP 2015 is a flexible, but scientifically grounded plan. It uses an ecosystem approach to conserve and manage diverse habitats and species and create a blueprint for conservation actions to respond to the highest priorities of California's aquatic, marine, and terrestrial resources. Its implementation relies on making important and helpful conservation information more accessible to resource managers and the public and on developing lasting partnerships with a broad array of governments, agencies, organizations, businesses, and citizens. With guidance from SWAP 2015 and help from many partners, CDFW's vision for the state's wildlife is to sustain the floral and faunal biodiversity of California over the next decade through the strategies laid out in SWAP 2015 and establish the framework for ongoing conservation for future generations in the decades that follow.

1.3.1 Vision Components

In the following chapters, SWAP 2015 describes the key conservation factors crucial to the sustainability of California ecosystems, and for each geographic province, provides specific conservation strategies that will either reduce or ameliorate negative impacts to ecological systems or enhance the qualities vital to the natural landscapes of California. While the SWAP strategies are tailored to specific conservation targets and geographic provinces, several components of the strategies have broader benefits that clearly apply across the state and describe

Ascent Environmental

fundamental, desired outcomes for wildlife conservation in California. The vision for wildlife conservation developed through SWAP 2015 includes the following components:

- Maintain and enhance the integrity of ecosystems by conserving key natural processes and functions, habitat qualities, and sustainable native species population levels, so that California's ecosystems are resilient to shifting environmental conditions resulting from climate change.
- Promote partnerships with federal, state, and local agencies; tribal governments; and non-governmental organizations with aligned conservation goals to leverage efficient use of funding and other public resources.
- Inspire greater understanding and recognition of critical needs for wildlife and their habitats by lawmakers, land use planners, private landowners, and others who can influence conservation actions.
- Allocate sufficient water and manage water resources to maintain healthy ecosystems and fish and wildlife populations when considering state and regional water supply needs.
- Provide resources and coordinate efforts with partners to eradicate or control invasive species and to prevent new introductions.
- Sustain the quality of California's natural resources and biodiversity in harmony with predicted economic growth and human population increases.
- Continue to prioritize protection of key habitat linkages, sensitive habitats, and specialized habitats for SGCN.
- Integrate conservation with the productivity of working landscapes and environments, recognizing the values of agriculture, rangeland, forestry, and fisheries.
- Support conservation programs that benefit all species, habitats, and ecosystems through broad-based public funding from federal, state, special district, and local government sources.
- Educate the public about wildlife conservation issues and inspire a conservation ethic in present and future generations through public outreach.
- Enhance conservation capacity by clearly articulating conservation purposes, applying adaptive management techniques, and effectively using staff and financial resources.

1.3.2 Relationship to the CDFW Strategic Plan

The CDFW Strategic Plan was originally issued in May 1995 and was approved by the Governor's Office in October 1997. It was developed in collaboration with stakeholder organizations, employees, and other interested individuals. Updated in 2007, the Strategic Plan is a major tool for CDFW to effectively accomplish its mission and goals. It provides a guiding framework for 10 years or longer, attempts to anticipate the future of California's wildlife resources, and describes the actions to improve CDFW's organizational effectiveness.

SWAP 2015 and the CDFW Strategic Plan are well-aligned in their perspective and emphasis on collaboration and partnership for conservation success. To make progress in the contemporary arena of wildlife conservation, CDFW has acknowledged in the Strategic Plan that it must conserve wildlife in a manner that serves the residents of this state. The will of the public, as expressed by laws, regulations, and land use decisions, ultimately determines the quality and quantity of wildlife habitat to be preserved for the state's natural heritage and future generations. These realities suggest a model of action for conserving wildlife that inspires collaboration and cooperation among a wide range of interested parties by placing greater emphasis on educating, motivating, and rewarding the public, landowners, organizations, businesses, and other agencies (CDFG 2007).

This collaborative approach maintains reliance upon the science-based method of making resource management decisions. Offering cooperative arrangements and incentives for conservation can result in a more enlightened and involved public. An informed public will demand that good science remain a vital part of the decision- making process. In keeping with these principles, four themes are reflected in the CDFW Strategic Plan that guide and are wholly consistent with the underpinnings of SWAP 2015:

1. Public service, outreach, and education;
2. Cooperative approaches to resource stewardship and use;
3. Managing wildlife from a broad habitat perspective; and
4. Organizational vitality.

1.4 State and Tribal Wildlife Grant Program

SWAPs prepared by each state represent a groundbreaking effort to bring together the best science available to conserve priority fish and wildlife and their habitats through innovative public-private partnerships. The SWG program is a primary funding source available for state fish and wildlife agencies and their conservation partners to restore and actively manage the nation's declining wildlife. With no dedicated funding stream, the program has been funded at relatively modest levels averaging just over $1 million in apportioned funding annually for each state and territory. Without the SWG program, funding for state fish and wildlife diversity programs to prevent endangered species listings would be greatly curtailed or eliminated.

Nationwide, SWAPs have identified 12,000 species that are at risk of becoming endangered and they offered a set of conservation actions to address key pressures, providing a voluntary and non-regulatory alternative to the federal listing process. The SWG program has had strong bi-partisan backing and is supported by over 6,300 organizations and businesses that make up the Teaming with Wildlife coalition (www.teaming.com). The coalition represents millions of bird watchers, hikers, hunters, anglers, and other nature enthusiasts and their businesses. The

coalition was founded in the mid-1990s to specifically advocate for the creation of the SWG program and remains strong and committed today to ensure this successful program continues.

1.4.1 Required SWAP Elements

Each SWAP must be approved by the U.S. Fish and Wildlife Service (USFWS) Director and must consider the broad range of fish and wildlife and associated habitats, with priority on those species with the greatest conservation need. The states must review and, if necessary, revise their SWAPs at least every 10 years. California's due date for updating SWAP 2005 is October 1, 2015. Revisions to each SWAP must follow the guidance issued in the July 12, 2007 letter from the USFWS Director and the President of the Association of Fish and Wildlife Agencies (AFWA). In satisfying this guidance, as with all state wildlife action plans, SWAP 2015 must address the following eight elements of a comprehensive wildlife conservation strategy required by Congress. These elements are incorporated into the plan and Appendix A identifies where the elements are addressed in SWAP 2015.

The required SWAP elements are:

Element 1: Species Distribution and Abundance. The distribution and abundance of species of wildlife, including low and declining populations, as each state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of wildlife of the state. (In subsequent discussions, these species are referred to as Species of Greatest Conservation Need or SGCN.)

Element 2: Key Habitats and Community Types. The location and relative condition of key habitats and community types essential to the conservation of each state's SGCN.

Element 3: Problems and Research/Survey Priorities. The problems which may adversely affect SGCN or their habitats, and priority research and surveys needed to identify factors which may assist in restoration and improved conservation of SGCN and their habitats.

Element 4: Conservation Actions and Priorities. The actions necessary to conserve SGCN and their habitats and establish priorities for implementing such conservation actions.

Element 5: Monitoring and Adaptive Management. The provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting conservation actions, as appropriate, to respond to new information or changing conditions.

Element 6: SWAP Review and Update Procedures. Each state's provisions to review its strategy at intervals not to exceed 10 years.

Element 7: Coordination with Conservation Partners. Each state's provisions for coordination during the development, implementation, review, and revision of its strategy with federal, state,

and local agencies and Indian Tribes that manage significant areas of land or water within the state, or administer programs that significantly affect the conservation of species or their habitats.

Element 8: Public Participation Strategies. Each state's provisions to provide the necessary public participation in the development, revision, and implementation of its strategy.

1.4.2 Summary of Key Changes from SWAP 2005

SWAP 2015 has been substantially updated and revised from SWAP 2005. The changes are based on (1) guidance from USFWS (2007) and AFWA (2011, 2012) about the revision process; (2) an independent evaluation of SWAP implementation from 2005-2014 (see Section 8.2); and (3) new data, directives, and initiatives from CDFW and others relevant to SWAP 2015 (see details below).

Since the approval of SWAP 2005, many new initiatives have been completed or are underway in California that affect or will affect strategies and priorities for managing the state's natural resources. These initiatives include, but are not limited to the following:

- California Natural Resources Agency's 2009 Climate Change Adaptation Strategy and 2014 update, Safeguarding California: Reducing Climate Risk (2009, 2014);
- National Fish, Wildlife and Plant Climate Adaptation Strategy (National Fish, Wildlife, and Plants Climate Adaptation Partnership 2012);
- California Essential Habitat Connectivity Project (Spencer et al. 2010), showing the habitat connectivity of the state;
- Phase II of the Areas of Conservation Emphasis Mapping Model (ACE II), showing biological richness and biodiversity;
- updates to the Species of Special Concern (SSC) documents for birds, mammals, reptiles, amphibians, and freshwater fish;
- implementation of a statewide network of Marine Protected Areas (MPAs), as required by the Marine Life Protection Act (MLPA);
- California Water Plan (California Department of Water Resources [DWR] 2013), and the Governor's Water Action Plan (2014) providing a collaborative framework for decisions about California's water resources;
- development of a large-scale conservation planning effort in the Sacramento-San Joaquin Delta called the Bay Delta Conservation Plan or BDCP (http://baydeltaconservationplan.com);
- development of a large-scale conservation planning effort in the southern California desert region, called the Desert Renewable Energy Conservation Plan or DRECP (CEC et al. 2014);
- Central Valley Flood System Conservation Strategy (DWR 2015);
- California Fish and Wildlife Strategic Vision Plan (CDFW and California Fish and Game Commission 2012);
- initiation of the Regional Advanced Mitigation Planning (RAMP) Program (described in more detail in Section 7.1.2);

- adoption of a resolution by the California Biodiversity Council (2013) to promote better alignment among California and federal resource agencies for natural resource conservation priorities;
- adoption of a resolution by the California Biodiversity Council and the Strategic Growth Council (2014) to collaboratively undertake "Integrated Regional Planning Initiatives";
- implementation of the Air Resources Board's Cap-and-Trade Program, which includes conservation actions related to carbon sequestration;
- California Department of Forestry and Fire Protection Fire and Resource Assessment Program's California Forest and Rangelands: 2010 Assessment (2010) and 2015 update in preparation;
- update of the OPR Environmental Goals and Policy Report, California @ 50 Million (2013);
- West Coast Governors' Agreement on Ocean Health Action Plan (2008);
- release of the Nursery Functions of U.S. West Coast Estuaries: The State of Knowledge for Juveniles of Focal Invertebrate and Fish Species (Hughes et al. 2014);
- implementation of the California Salmon Stronghold Initiative by CDFW, USFWS, National Marine Fisheries Service, Caltrout, TNC, Trout Unlimited, and the Wild Salmon Center (Wild Salmon Center 2012);
- release of the Congressional independent scientific report, California Hatchery Scientific Review Group's California Hatchery Review Report (2012), and implementation of interagency-tribal, strategic hatchery management;
- adoption of the CDFW's Policy for Quality in Science and Key Elements of Scientific Work (CDFG 2008a);
- Secretarial Order Number 3330 entitled "Improving Mitigation Policies and Practices of the Department of the Interior," issued by Secretary of the Interior Sally Jewell in October 2013, which calls for an ecosystem approach to conservation; and
- completion of the Wildlife Conservation Board Strategic Plan (2014).

The California Legislature has also provided broad guidance regarding CDFW's approach to resource management decisions since 2005. In 2012, Assembly Bill 2402 was enacted into law, adding provisions to the Fish and Game Code relevant to the ecosystem conservation, adaptive management, and stakeholder partnership approaches embodied in SWAP 2015. The bill also changed the name of the California Department of Fish and Game to the California Department of Fish and Wildlife, indicating CDFW's increasing role to safeguard the natural resources of the state. Among the revisions to the Fish and Game Code (FGC) were the following:

- FGC Section 703.3 was added to declare the state policy that CDFW and the Fish and Game Commission "use ecosystem-based management informed by credible science in all resource management decisions to the extent feasible," and "resource management decisions … should also incorporate adaptive management to the extent feasible."
- FGC Section 703.5 was added to establish that it is state policy to "seek to create, foster, and actively participate in effective partnerships and collaborations with other agencies and stakeholders to achieve shared goals and to better integrate fish and wildlife resource

conservation and management with the natural resource management responsibilities of other agencies."

The principles of ecosystem conservation, adaptive management, and use of effective partnerships to achieve the conservation goals for CDFW are central to the approach for preparing SWAP 2015.

Significant recent changes to California's environment have also been documented resulting from climate change, including sea level rise, natural community shifts, increased prevalence of invasive species, increased duration and intensity of wildfires, and prolonged drought (CNRA 2009, CNRA 2014). These climate-induced pressures on wildlife, in combination with other known pressures, have the potential to greatly affect wildlife species and habitats and must be considered when developing management strategies.

Climate change-related issues were considered during the development of SWAP 2015 by analyzing the impacts of climate change on ecosystems, using climate change vulnerability as a criterion for SGCN, and developing conservation strategies that address impacts of climate change. Specifically, SWAP 2015 considering climate change in the following ways:

- Under SWG, CDFW conducted climate change vulnerability analyses for species in four taxonomic groups (birds, mammals, amphibians/reptiles, and fish) as part of developing the revised SSC lists for California.
- Under SWG, CDFW is conducting statewide vegetation (macrogroup) climate change vulnerability analysis.
- Climate change vulnerability was considered as a criterion for the selection of SGCN. Within the four taxonomic groups, if the considered species were ranked "high" under the species vulnerability study described above, the species were identified as an SGCN.
- A climate forecast report was used to assess the conditions of selected targets, including the identification and evaluation of ecological conditions that are important to the targets and vulnerable to climate changes (PRBO 2011).
- For some conservation units during the situation analysis of targets, climate change experts have participated in the discussion and/or provided inputs regarding the ecological responses to climate change-related issues.
- Ecoregional conservation strategies developed to consider ways to address the impacts of climate change.
- Every strategy identified under a regional analysis in SWAP 2015 was coded and cross-referenced with the National Fish, Wildlife, and Plants Climate Adaptation Strategy (USFWS 2012) and California's Climate Adaptation Strategy (Natural Resource Agency 2014), and the thus achieving important climate adaptation co-benefits through SWAP implementation.
- Climate adaptations were considered in defining statewide goals and objectives.

- One of the key evaluation factors for the SWAP/SWG implementation evaluation report (see Section 8.2) was to determine if climate change issues were considered under individual SWG projects. The SWG grant projects that considered climate change were recognized and further investigated to determine which of the following 5 categories were addressed under the grant: (1) data analysis and modeling, (2) data collection, (3) adaptation strategy plan development, (4) adaptation strategy plan implementation, and/or (5) scenario development and analysis. The total grant amount addressing each of the categories was calculated.

The key changes in SWAP 2015, compared to the approach used in SWAP 2005, are described in detail in Appendix B. In summary, the key changes include:

- new multi-scaled, ecologically focused geographic boundaries;
- revisions to the list of SGCN;
- multi-species, ecosystem approach;
- inclusion of plants on the list of SGCN;
- inclusion of marine conservation targets;
- transparent and systematic planning framework for ongoing management of the SWAP program (i.e., *Open Standards for the Practice of Conservation*);
- standardization of lexicons for key terms including key ecological attribute (KEAs), stresses and pressures;
- systematic identification and ranking of pressures and stresses;
- integration of climate change related issues;
- emphasis on partnerships and collaboration;
- development of companion plans;
- development of effectiveness measures for conservation strategies and adaptive management; and
- a new format available as a dynamic, online resource.

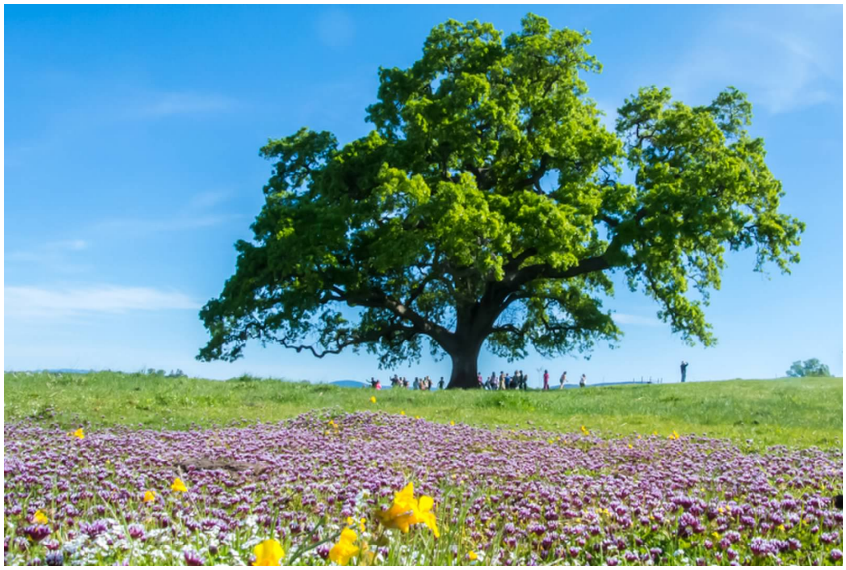
1.5 SWAP 2015 Approach

1.5.1 Ecosystem and Multi-species Approach to Conservation

SWAP 2015 adopted an ecosystem and multi-species approach to conservation. An ecosystem approach to conservation is the broad management of natural resources using ecosystems as a unit to ensure that native plants and animals bound to the system are maintained at viable levels. It involves maintaining and enhancing the ecological processes, structure, and conditions, recognizing that all components are interrelated in a dynamically changing system. Large-scale landscape approaches are generally the most reliable and preferred method to conserve ecological integrity, including biological diversity. The approach benefits both game and non-

game (or harvested and non-harvested) wildlife species, and creates many co-benefits related to both natural values (such as enhanced water quality, soil retention, or resilience to the effects of climate change) and societal values (such as open space, scenic quality, or outdoor recreation opportunities). Ecosystem-based management is defined and established as state policy in the California Fish and Game Code (FGC Sections 43 and 703.3, see Section 8.1 Adaptive Management for more discussion).

Directing conservation strategies for SGCN is one of the federal requirements for a SWAP. The SGCN list consists of species deemed to be most rare, imperiled, and/or in need of conservation identified by CDFW for California. The SWAP 2015 list of SGCN includes fish, wildlife, and flora to allow the SWAP to be comprehensive in its scope, although the federal SWG funding is limited to just non-game fish and wildlife species. There are however benefits for all species sharing a target habitat with an SGCN. While it is true that most, if not all, native biota have a conservation need, for the list to be useful as a prioritization tool, only those species that were considered to have the greatest conservation needs are included. In 2005 the original California SWAP used the existing CDFG Sensitive Animals List as the SGCN list. This was a comprehensive and convenient decision, but resulted in a list without a specific effort to prioritize species.



Bob Sahara, CDFW

For SWAP 2015, a new SGCN list has been developed by CDFW to facilitate prioritization of conservation strategies (Appendix C). The SGCN list includes species that are already state or federally listed as threatened, endangered, that are candidates for listing under the state and/or federal Endangered Species Acts, that are considered by CDFW to be SSC, and that are considered to be highly vulnerable to climate change by CDFW. Development of the new SGCN list followed a rigorous scientific process to determine the lower end of "need" by using the detailed technical reviews being conducted for CDFW SSC reports (www.dfg.ca.gov/wildlife/nongame/ssc/), which identify imperiled species that are not already listed as threatened or endangered by the state or federal government. For more details about the criteria used for SGCN, see Section 2.4.

To comprehensively address California ecosystems in a spatially explicit manner, habitat types have been used to represent terrestrial, freshwater aquatic, and marine ecosystems. Because SWAP 2015

has identified over 1,000 SGCN, developing the SWAP based on a comprehensive assessment of individual species was not feasible or desirable; however, it is recognized that dividing California into habitat categories may present limitations that must be balanced with conservation efforts that consider species-specific needs to be effective in improving the SGCN status.

1.5.2 Geographic Scales

To address conservation needs for the full SGCN list and to apply an ecosystem management approach, SWAP 2015 uses three geographic scales to differentiate and organize California's terrestrial, freshwater aquatic, and marine ecosystems. These geographic scales are used to analyze key conservation factors and their influences on SGCN and their habitats, as well as to identify conservation strategies. The geographic scales in the SWAP are: statewide, provinces, and regional conservation units.

An exception to developing conservation strategies within these geographic scales is the analysis for anadromous fish. Anadromous fish begin life in the fresh water of rivers and streams, migrate to the ocean to grow into adults, and then return to fresh water to spawn. Most anadromous fish spend the majority of their life in marine environments and travel great distances between their marine habitat and spawning rivers or streams. Because the geographic ranges of anadromous fishes span many of the provinces developed for SWAP 2015, the organization of conservation strategies by conservation unit or province does not adequately address their conservation needs. As such, conservation strategies for anadromous fishes have been developed separately to capture all the habitats within their ranges. See Chapter 6 for a full discussion of anadromous fishes in California.

California has been subdivided into seven provinces for analysis and conservation planning in SWAP 2015 (Figure 1.5-1). There are six terrestrial and freshwater aquatic landscape provinces based generally on the definition of provinces by Bailey (1976) from U.S. Forest Service (USFS) that use vegetation and other natural land cover types, which are influenced by geophysical features, to define boundaries. The province definition of SWAP 2015 deviates from Bailey's definition to a degree in an effort to better integrate the terrestrial and freshwater aquatic characteristics of California ecosystems. Geophysical features of the state (such as a mountain range or major valley), and subsequently Bailey's province boundaries, are oriented mostly north-south. Many aquatic features (such as rivers and numerous watersheds) flowing into those features have an east-west orientation. The SWAP terrestrial landscape/freshwater aquatic system provinces seek to take both into account. A seventh province--the Marine Province--consisting of state-controlled, intertidal and subtidal land between the coast and a three-mile limit, has been added to SWAP 2015 to increase consistency and effectiveness in protecting the state's marine life, marine ecosystems, and the natural heritage.

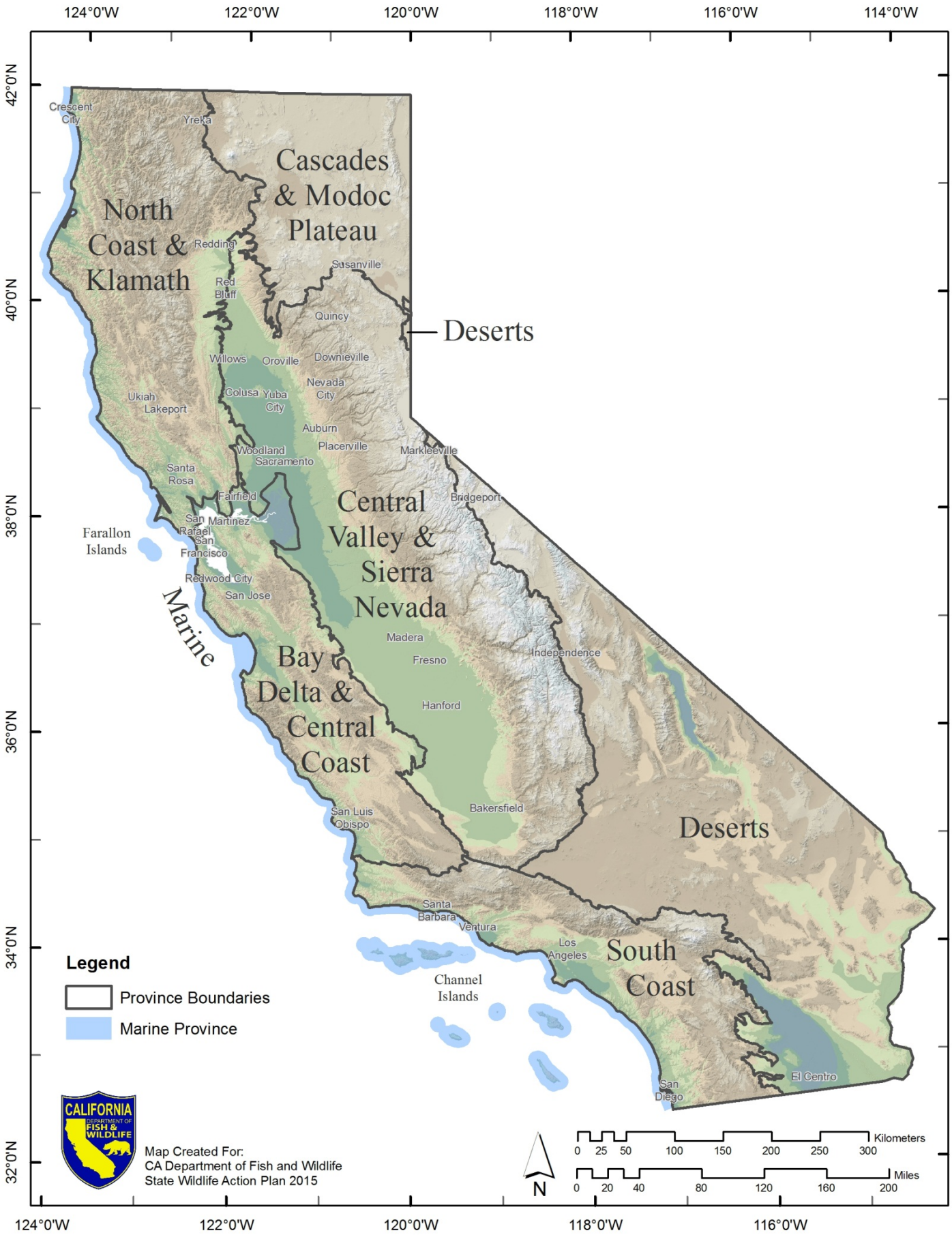


Figure 1.5-1 SWAP 2015 Provinces

The smallest geographic area defined for analysis in SWAP 2015 is the "conservation unit," which consists of "ecoregions," "hydrologic units," and "marine conservation units." Ecoregions, defined as "sections" in the Bailey (1976) nomenclature, are subdivisions of provinces based on major terrain features, such as a desert, plateau, valley, mountain range, or a combination thereof. SWAP 2015 uses 19 sections described in Bailey (1976) as the ecoregions for SWAP 2015 (Figure 1.5-2).

Dave Feliz, CDFW

The ecoregions by definition focus on terrestrial ecosystems, and are not well-suited for aquatic biodiversity planning, especially for fish as rivers cross multiple ecoregions. CDFW used the Watershed Boundary Dataset classification and mapping system of U.S. Geologic Survey (USGS), which divides and sub-divides the United States into successively smaller watersheds, to define "hydrologic units" for the SWAP 2015 analysis of aquatic ecosystems. The USGS hydrologic classification system includes areas of different sizes that are nested within each other, from the largest geographic area (i.e., regions) to the smallest geographic area (i.e., cataloging units). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits (in California) based on the levels within the USGS hydrologic classification system. The "subregion" level in the USGS classification system (i.e., HUC 4) is the most analogous in size and geographic configuration to the terrestrial ecoregions, therefore, the subregions under the USGS classification were used as the hydrologic units for SWAP 2015.

Adoption of the USFS Bailey's terrestrial classification and USGS hydrologic classification system provides an organizational approach that is both nationally recognizable to resource managers and is sufficiently flexible to customize for meeting the particular needs of conserving California ecosystems (Figure 1.5-3).

The marine conservation units have the same boundaries as the study areas identified within the 2008 MLPA Master Plan (CDFG 2008b), except for a small deviation between the North and North-Central areas.

During the SWAP 2015 update process, a boundary was defined for the San Francisco Bay-Delta (Figure 1.5-4) that consists of the entire San Francisco Bay and portions of the San Francisco Bay HUC (HUC 1805), Sacramento River (HUC 1802) and San Joaquin River (HUC 1804). The boundary includes areas of tidal influence, areas of salt marsh vegetation, and lowland elevations behind dikes/levees. In addition, the area was increased to roughly incorporate a1-meter sea-level rise to take climate change into account. This area does not correspond to the legal definition of the Delta or any CDFW organizational Region; it is a unique area designed for SWAP 2015 and is called the Bay Delta conservation unit.

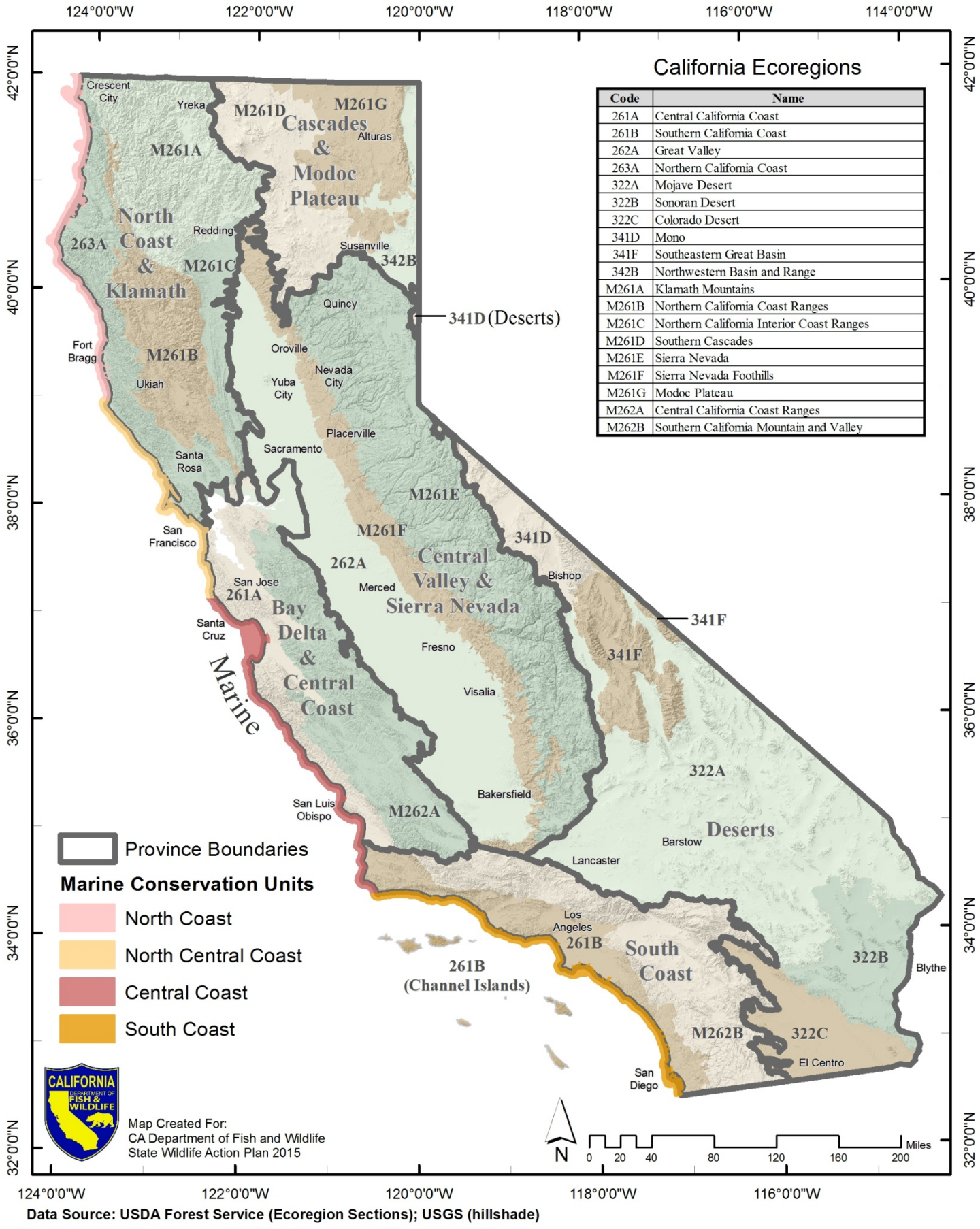


Figure 1.5-2 Relationship of Ecoregions to SWAP 2015 Provinces

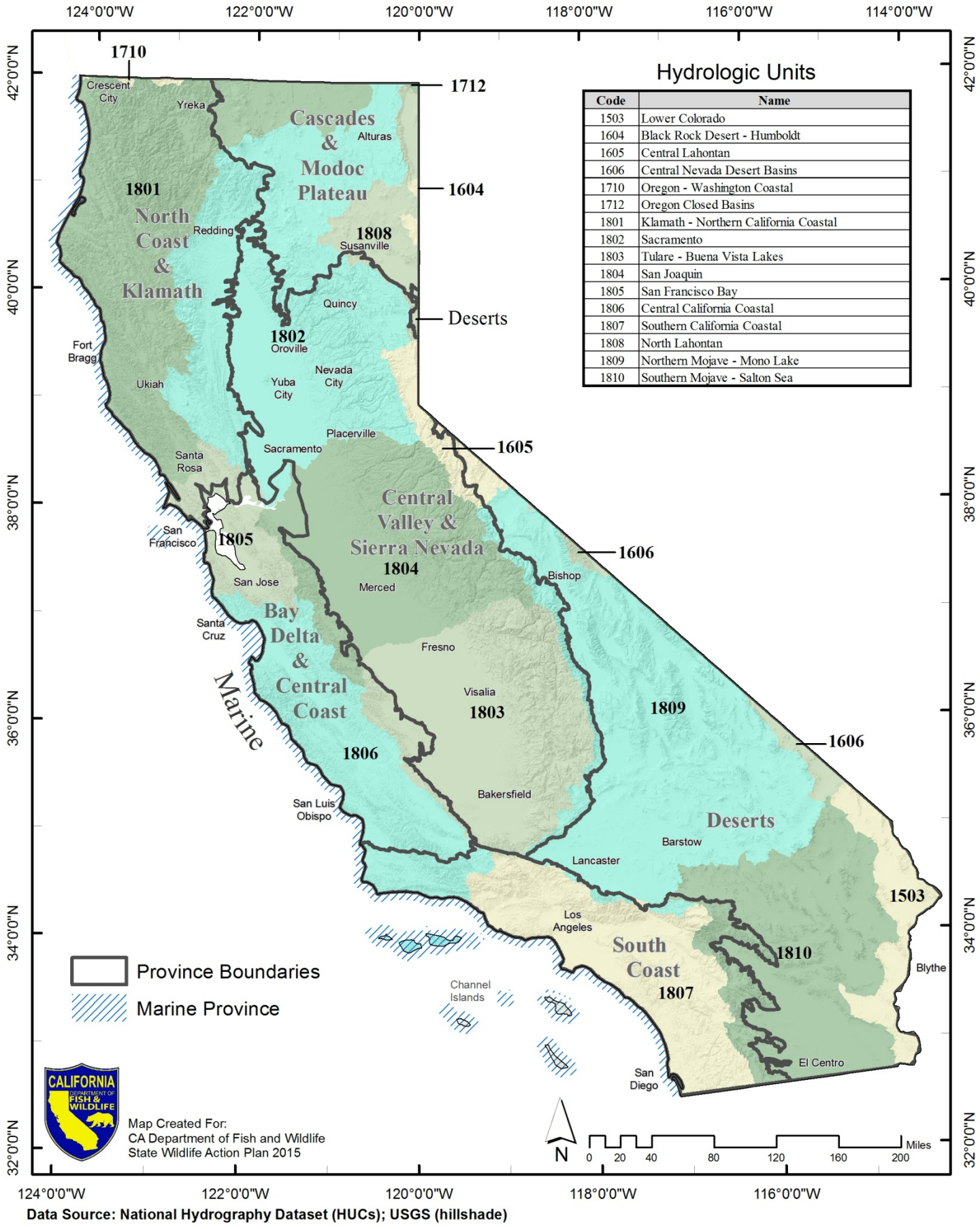
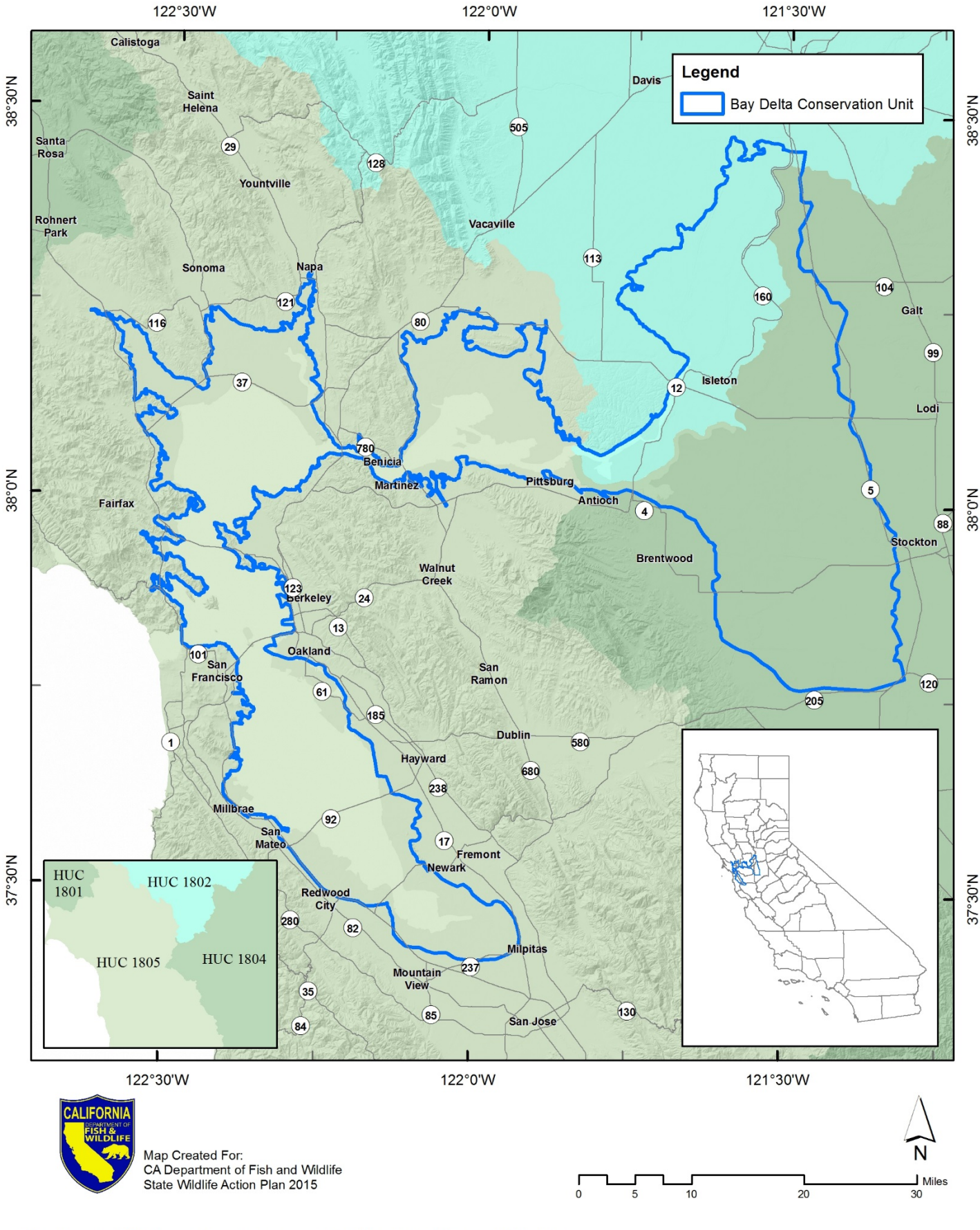


Figure 1.5-3 Relationship of Hydrologic Units to SWAP 2015 Provinces



Data Source: USDA Forest Service (ecoregions); US Geological Survey (hillshade), NHD (hydrologic units)

Figure 1.5-4 Bay Delta Conservation Unit Defined for SWAP 2015

1.5.3 Selection of Priority Conservation Targets

The process to provide the SWAP elements required by USFWS and develop multi-species conservation strategies began by broadly categorizing natural resources in California. These categories considered under SWAP 2015 are the following; terrestrial, freshwater aquatic, and marine habitats. Within each of these resource categories there would be strategies applicable to specific geographic regions, and others that would be applied more broadly across many regions or possibly statewide. To assess conservation needs at a manageable scale, the state was subdivided for each resource category using established and accepted units for analysis, as described above, i.e., ecoregions, hydrologic units, and marine conservation units, collectively referred to as conservation units. The conservation units were grouped into provinces.

SWAP 2015 aspired to develop at least one conservation project, consisting of a set of conservation strategies, for each conservation unit in California. The process to identify targets for individual conservation units varied according to its type. For terrestrial strategies, the decision to focus on ecosystems rather than individual species was influenced by direction given by the USFWS, as well as recently enacted legislation in California (AB 2402, 2012). AB 2402, or the "Huffman Bill," established the policy within state government to use ecosystem-based management, defined as "an environmental management approach relying on credible science that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation."

A conservation target is an ecological entity chosen to be the focus of conservation actions. While in concept a target can be a species, a habitat, or an ecological system, for SWAP 2015 the conservation targets are defined in terms of some natural community such as vegetation, habitat type, or species assemblage. To better understand the relative location, extent, and distribution of ecosystems in California, a habitat type was chosen as a surrogate to represent the interactions between the biotic and abiotic characteristics of the system, and associated species. There are more ecological elements that were not chosen as a conservation target for 2015 SWAP, but those elements will continue to be analyzed over time. Specifically, the conservation targets in SWAP 2015 consist of:

- *macrogroups*, which are terrestrial plant communities within ecoregions that support wildlife, and are defined by California's Vegetation Classification and Mapping Program, based on the National Vegetation Classification System (http://www.dfg.ca.gov/biogeodata/vegcamp/);
- *native fish and freshwater aquatic species assemblages* occupying the freshwater aquatic habitats within the hydrologic units; and
- *marine ecosystems*, which are seven marine habitats in the Marine Province representing (a) embayments, estuaries, and lagoons; (b) intertidal zone; (c) nearshore subtidal zone (0-30 m depth); (d) mid-depth zone (30-100 m depth); (e) deep zone (>100 m depth); (f) offshore rocks that support marine life; and (7) islands.

Macrogroups are mid-level plant communities in the hierarchical classification based upon the Manual of California Vegetation classification system adopted by California, consistent with the National Vegetation Classification standard. These plant communities can be considered as habitats, where a given plant or animal species is dependent on the plant community for food, cover, or reproduction at some stage or all of its life cycle. Additional consideration of habitat elements, such as snags and logs, together with vegetation dominance or unique characteristics to which wildlife are thought to respond allows for predictions of use based on species associations (CDFG 1988).

The focus of SWAP 2015 is on species deemed to be most rare, imperiled, and in need of conservation. Habitat types with high levels of species richness, high counts of rare and endemic species, and high counts of vulnerable species (including declining and at-risk species and SGCN) were prioritized for terrestrial conservation targets. CDFW used information on species geographic distributions, together with species habitat relationship ratings from the California Wildlife Habitat Relationships (Laudenslayer and Mayer 1988) program, to determine which terrestrial vertebrate species rely on the habitats present within each conservation unit for feeding, cover, or reproduction. Measures of biodiversity (the number of native species), rarity (the number of SGCN), and endemism (the sum of endemism scores from the SSC documents for mammals, birds, reptiles, and amphibians), along with local expert knowledge, were used to prioritize the selection of a target for the individual conservation unit. The selection was finalized by considering the conservation status of the candidate habitat types in the area. Terrestrial targets, therefore, could be viewed as biologically rich areas with a higher risk of losing native species. Focusing conservation strategies on such targets will have direct benefits to SGCN and other species that occur or otherwise depend on the habitat.

Freshwater aquatic targets were selected based on evaluation of native fish and aquatic species assemblages within each hydrologic unit. Native fish and freshwater aquatic species assemblages are a group of species, often morphologically similar within groups, which segregate on the basis of habitat, sub-habitat, or diet; exhibit persistence in composition through many generations; and have high resiliency (Grossman et al. 1982). In relatively undisturbed streams, species assemblages may consist of co-evolved species, which are usually tied to factors such as elevation, gradient, channel size, and shape (Moyle et al. 2003). Often imperiled because of anthropogenic habitat degradation, native species assemblages selected as targets are frequently confined to or occur totally within a single sub-hydrologic unit, such as a lake or stream. Expert opinion and knowledge were employed to identify the highest priority freshwater aquatic targets for each hydrologic unit.

Marine ecosystem targets were based on priorities identified through work recently completed as part of the Marine Life Protection Act (MLPA). The MLPA Initiative was a public-private partnership established to help California implement the MLPA. This was accomplished by using the best readily available science and the advice and assistance of scientists, resource managers, experts, stakeholders and members of the public. The goals of the MLPA go beyond the scope

of traditional management of activities affecting living marine resources, which has focused upon maximizing yield from individual species or groups of species. For example, the first goal of MPLA emphasizes biological diversity and the health of marine ecosystems, rather than the abundance of individual species. The second goal recognizes a role of Marine Protected Area (MPA) system as a tool in fisheries management. The third goal recognizes the importance of recreation and education in MPAs, and balances these with the protection of biodiversity. The fourth goal recognizes the value of protecting representative and unique marine habitats for their own value. The fifth and sixth goals address the deficiencies in California's existing MPAs that the MLPA identifies in the law (MLPA 2008).

MPA networks include key marine habitats, each of these habitats being represented in multiple MPAs across biogeographic regions, upwelling cells, and environmental and geographic gradients. The strong association of most demersal marine species (i.e., living on or near the ocean bottom) with particular habitat types (e.g., sea grass beds, submarine canyons, shallow and deep rock reefs), and variation in species composition across latitudinal, depth clines, and biogeographic regions, implies that habitat types must be represented across each of these larger environmental gradients to capture the breadth of biodiversity in California's waters. Different species use marine habitats in different ways. As a result, protection of all the key habitats along the California coast is a critical component of MPA network design. Key habitat types provide particular benefits by harboring a different set of species or life stages, having special physical characteristics, or being used in ways that differ from the use of other habitats.

For each broad natural resource category, the goal of the SWAP 2015 was to develop at least one conservation project, or set of strategies, directed at a high priority conservation target, and that would have broad benefits to multiple species and SGCNs. Some regional teams exceeded this goal, by developing multiple conservation projects for multiple targets. Despite this, the number of conservation targets that deserve some conservation strategies outweighed the capacity of CDFW. While SWAP 2015 succeeds in developing over 60 conservation projects and over 250 regional conservation strategies, an ever growing need for additional conservation planning remains, as more and more stresses are experienced by the California ecosystems. The targets that were chosen and are presented in SWAP 2015 represent an initial foundation upon which the future conservation needs and priorities of California's natural resources can be built.

The question will undoubtedly arise in many minds why one target was selected over another or why an important target was not chosen. Given the limitations of time and staffing, firm priorities were set based on target selection criteria. Implementation of SWAP 2015 will result in measurable progress in meeting the conservation needs of the selected targets and individual SGCNs. As progress is made, CDFW and its partners can begin the identification of other high priority targets and define conservation strategies. Similar to the targets developed herein, they will include clear goals and objectives with strategies that are measurable, attainable, relevant, and time bound. Strategies developed subsequent to the publication of SWAP 2015 will be adopted through the revision process described in Chapter 7. Appendix D lists the conservation

strategies for all macrogroups in California, freshwater aquatic species assemblages, marine ecosystems, and anadromous fish.

Table 1.5-1 provides a summary of conservation targets selected for conservation units organized by province.

Table 1.5-1 California SWAP 2015 Provinces, Conservation Units, and Conservation Targets

Province	Conservation unit	Conservation target	
North Coast and Klamath	Northern California Coast Ecoregion	American Southwest Riparian Forest and Woodland Freshwater Marsh	North Coastal and Montane Riparian Forest and Woodland Pacific Northwest Conifer Forests
	Northern California Coast Ranges Ecoregion	American Southwest Riparian Forest and Woodland North Coastal and Montane Riparian Forest and Woodland	Pacific Northwest Subalpine Forest
	Northern California Interior Coast Ranges Ecoregion	California Foothill and Valley Forests and Woodland	
	Klamath Ecoregion	Alpine Vegetation Fen (Peatlands) Montane Upland Deciduous Scrub North Coastal and Montane Riparian Forest and Woodland	Subalpine Aspen Forests and Pine Woodlands Western Upland Grasslands Wet Mountain Meadow
	Klamath-Northern California Coastal HUC 1801	Native Aquatic Species Assemblages/Communities	
Cascades and Modoc Plateau	Southern Cascades Ecoregion	North Coastal Mixed Evergreen and Montane Conifer Forests	Western Upland Grasslands
	Modoc Plateau Ecoregion	Big Sagebrush Scrub Great Basin Dwarf Sagebrush Scrub	Great Basin Upland Scrub
	Northwest Basin and Range Ecoregion	Great Basin Pinyon-Juniper Woodland	
	North Lahontan HUC 1808	Eagle Lake Native Fish Assemblage	
	Sacramento HUC 1802	Goose Lake Native Fish Assemblage	
Bay Delta and Central Coast	Central California Coast Ecoregion	California Grassland, Vernal Pools, and Flowerfields Coastal Sage Scrub American Southwest Riparian Forest and Woodland	Northwest Coast Cliff and Outcrop Coastal Dune and Bluff Scrub North Coast Deciduous Scrub and Terrace Prairie
	Central California Coast Ranges Ecoregion	California Grassland, Vernal Pools, and Flowerfields	American Southwest Riparian Forest and Woodland
	San Francisco Bay Conservation Unit	Salt Marsh	
	Central California Coast HUC 1806	Coastal Lagoons	
Central Valley and Sierra Nevada	Great Valley Ecoregion	American Southwest Riparian Forest and Woodland	
	Sierra Nevada Foothills Ecoregion	Chaparral California Foothill and Coastal Rock Outcrop Vegetation California Foothill and Valley Forests and Woodlands	Desert Transition Chaparral Montane Chaparral

Table 1.5-1 California SWAP 2015 Provinces, Conservation Units, and Conservation Targets			
Province	**Conservation unit**	**Conservation target**	
Central Valley and Sierra Nevada (continued)	Sierra Nevada Ecoregion	North Coastal Mixed Evergreen and Montane Conifer Forests Alpine Vegetation	Pacific Northwest Supalpine Forest Fen (Peatlands)
	Sacramento HUC 1802	Clear Lake Native Fish Assemblage	Goose Lake Native Fish Assemblage
	Central Lahonton HUC 1605	Carson River Native Fish Assemblage	Walker River Native Fish Assemblage
	San Joaquin HUC 1804	San Joaquin Native Fish Assemblage	
	Tulare-Buena Vista Lakes HUC 1803	Upper Kern River Native Fish Assemblage	
South Coast	Southern California Coast Ecoregion	California Grasslands and Flowerfields	
	South Coast Mountain and Valleys Ecoregion	American Southwest Riparian Forest and Woodland	
	Southern California Coastal HUC 1807	Native Fish Assemblage	South Coast Native Aquatic Herp Assemblage
Deserts	Mono Ecoregion	Great Basin Pinyon-Juniper Woodland	Big Sagebrush Scrub
	Mojave Desert Ecoregion	Shadscale-Saltbush Scrub	
	Sonoran Desert Ecoregion	Mojave and Sonoran Desert Scrub	
	Colorado Desert Ecoregion	Desert Wash Woodland and Scrub	Sparsely Vegetated Desert Dune
	Southeastern Great Basin Ecoregion	American Southwest Riparian Forest and Woodland Great Basin Upland Scrub High Desert Wash and "Rangeland" Scrub	
	Central Lahonton HUC 1605	Walker River Native Fish Assemblage	
	Northern Mojave-Mono Lakes HUC 1809	Anthropogenically Created Aquatic Features Cienegas	Springs and Spring Brooks
	Southern Mojave-Salton Sea HUC 1810	Anthropogenically Created Aquatic Features	Cienegas
Marine	North Coast	Embayments, Estuaries, and Lagoons Intertidal Zone Nearshore Subtidal Zone (0-30m) Mid-Depth Zone (30-100m) Deep Zone (>100m)	Offshore Rocks Islands
	North Central Coast		
	Central Coast		
	South Coast		

[1] See Chapter 6 for description of aquatic ecoregions applied to anadromous fish.
HUC – Hydrologic Unit Code

1.5.4 Open Standards for the Practice of Conservation – Planning Framework

The *Open Standards for the Practice of Conservation* developed by the Conservation Measure Partnership (www.conservationmeasures.org) was used as the framework for updating SWAP 2015. The *Open Standards* process was employed for analysis of macrogroups (terrestrial plant communities), freshwater aquatic species assemblages, and marine ecosystems, but not for anadromous fish (Chapter 6). The use of a standardized process allowed for analysis across conservation units to summarize information at a province or statewide level.

The *Open Standards* is an internationally accepted conservation planning framework that brings together common concepts, approaches, and terminology in conservation project design, management, and monitoring to help practitioners improve the practice of conservation. The *Open Standards* offers an adaptive management approach that helps conservation practitioners systematically design their conservation strategies, and determine if their strategies are on track, why they are on track or not, and what adjustments they need to make. The five steps composing the adaptive project management cycle supported by *Open Standards* are: (1) conceptualizing the project vision and context; (2) planning actions and monitoring; (3) implementing actions and monitoring; (4) analyzing data, using the results, and adapting the project; and (5) capturing and sharing what has been learned (Figure 1.5-5).

Figure 1.5-5 Adaptive Project Management Cycle

The steps of the *Open Standards* process are consistent with those needed to fulfill the eight elements required by the USFWS for SWAPs described in Section 1.4.1, and the framework proposed by the AFWA Teaming with Wildlife Committee for measuring the effectiveness of State Wildlife Grants (AFWA 2011).

Definitions Important to Conservation Planning

Conservation Target: **An element of biodiversity at a project site, which can be a species, habitat/ecological system, or ecological process on which a project has chosen to focus.**

Goal: **A formal statement detailing a desired outcome of a conservation project, such as a desired future status of a target. The scope of a goal is to improve or maintain *key ecological attributes* (defined below).**

Key Ecological Attribute (KEA): **Aspects of a target's biology or ecology that, if present, define a healthy target and, if missing or altered, would lead to the outright loss or extreme degradation of the target over time.**

Objective: **A formal statement detailing a desired outcome of a conservation project, such as reducing a critical *pressure* (defined below). The scope of an objective is broader than that of a goal because it may address positive impacts not related to ecological entities (such as getting better ecological data or developing conservation plans) that would be important for the project. The set of objectives developed for a conservation project are intended, as a whole, to lead to the achievement of a goal or goals, that is, improvements of key ecological attributes.**

Pressure: **An anthropogenic (human-induced) or natural driver that could result in impacts to the target by changing the ecological conditions. Pressures can be positive or negative depending on intensity, timing, and duration.**

Species of Greatest Conservation Need (SGCN): **All state and federally listed and candidate species, species for which there is a conservation concern, or species identified as being vulnerable to climate change.**

Strategy: **A group of actions with a common focus that work together to reduce pressures, capitalize on opportunities, or restore natural systems. A set of strategies identified under a project is intended, as a whole, to achieve goals, objectives, and other key results addressed under the project.**

Stress: **A degraded ecological condition of a target that resulted directly or indirectly from pressures (e.g., habitat fragmentation).**

Standardized Approach Used by CDFW

By definition, KEAs are attributes for which the future viability of the conservation target most depends. If the KEAs are degraded, then the target is experiencing some type of stress, such as habitat fragmentation, changes in community structure, or changes in fire regime. A stress is caused by a pressure or multiple pressures, anthropogenic (human-induced) or natural drivers that result in negative impacts to the target by degrading the ecological conditions. Examples of pressures include housing and urban development, invasive plants and animals, excessively frequent or intense fire, and suppression of natural fire frequency.

The high level conceptual model for the *Open Standards* process (Figure 1.5-6) shows how conservation strategies work together to improve target conditions. For example, if the pressures are reduced, then stresses on the KEAs will be reduced, which would help maintain or improve the viability of the conservation target. Conservation strategies can also work directly on the conservation target to enhance the target's ecological conditions.

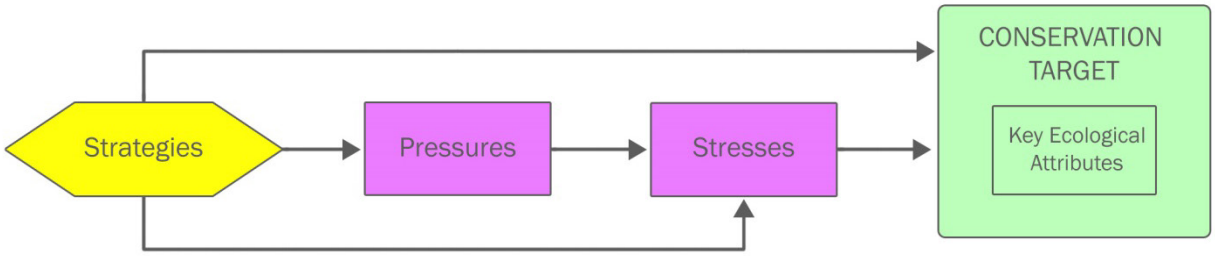


Figure 1.5-6 Conceptual Model for How Conservation Strategies Improved Conditions for Conservation Targets

CDFW provided *Open Standards* training to its regional teams to develop strategies for SWAP 2015 via three-day workshops and web conferences. Then the CDFW regional teams were asked to complete a seven-step workbook for each target. These steps included:

1. The geographic conservation unit (e.g., ecoregion, hydrologic unit, or marine conservation unit) and the target (e.g., macrogroup, native fish/freshwater aquatic species assemblages, or marine ecosystem) were identified. If the target was a macrogroup, the most appropriate California Wildlife Habitat Relationships habitat type(s) was identified and cross-referenced.

2. SGCN or other focal species that use the conservation target as habitat were identified.

3. The most important KEAs for each conservation target were selected from a standardized list (Table 1.5-2). The viability of each KEA was classified, based on the current condition and the desired future condition.

4. For each KEA, the resulting stresses, including those related to climate change, were identified using a standardized list (Table 1.5-3) and ranked by scope and severity. Scope is the proportion of the distribution of the target that can reasonably be expected to be affected by the stress within 50 years given the continuation of current circumstances and trends. Severity is the level of damage to the target, where it occurs, from the stress that can reasonably be expected within the next 50 years given the continuation of current circumstances and trends.

5. The pressures that cause the stresses were identified (Table 1.5-4) and rated according to their level of contribution and irreversibility. Other socio-economic factors that contribute to create those pressures (e.g., increase interests in rural lifestyle related to the housing development in natural areas) were also identified.

6. Strategies were developed to reduce the high rated pressures and were then ranked based on their potential positive impact (the degree to which the strategy would lead to desired changes) and feasibility (the degree to which the strategy could be implemented given time, financial, staffing, legal, or other constraints).

7. The highest ranking strategies and objectives (the desired outcomes) were identified. These strategies were then compiled into a database for analysis in SWAP 2015 (see below).

Miradi Database

CDFW needed to have a robust database that allows complex ecological data to be stored, managed and analyzed during the development of regional conservation projects, and for this purpose, the Miradi Adaptive Management Software Program (www.miradi.org) was used to guide CDFW regional teams going through the steps above. These Miradi database files were then uploaded into a cloud-based software system, called Miradi Share (www.miradishare.org), that enabled CDFW to aggregate and analyze the gleaned information across the provinces and the state for reporting in SWAP 2015. The *Open Standards* framework, Miradi software, and Miradi Share internet system will be used as ongoing management tools for tracking implementation and updating conservation data; conducting monitoring, evaluation, and adaptive strategy formulation; and preparing performance reporting towards goals and objectives for each conservation unit to document and share learning.

Table 1.5-2 Standardized Key Ecological Attributes and Indicators Used to Measure Change in Condition

Key Ecological Attributes	Status Indicator	
Area and extent of community	Amphibian distribution Area of habitat	Fish distribution Reptile distribution
Community structure and composition	Age class heterogeneity	Endemic diversity
Community structure and composition	Key species population level Native versus non-native species diversity	Structural diversity
Connectivity among communities and ecosystems	Level of connectivity	Level of genetic connectivity
Fire regime	Fire frequency, extent, and intensity	
Hydrological regime	Channel pattern Depth of groundwater	Water yield/capacity Level of natural hydrologic regime Snowpack
Nutrient concentrations and dynamics	Nutrient load	
Pollutant concentrations and dynamics	Concentration of pollutants	
Soil and sediment deposition regime	Stable bank Suitable soil characteristics	Total dissolved solids (parts per million)
Successional dynamics	Stage of succession	
Surface water flow regime	Water volume	
Water level fluctuations	Hydroperiod	Water level
Water quality	Level of water quality	Level of water yield
Water temperature and chemistry	Alkalinity	Water temperature
Weather regime	Rainfall	

Table 1.5-3 Standardized List of Stresses Used in SWAP 2015	
Carbon Dioxide (Climate Factor)	**Changes in Hydrology and Water Characteristics**
Change in carbon dioxide levels	Change in runoff and river flow
Temperature Changes (Climate Factor)	Change in water temperature
Change in annual average temperatures	Change in water chemistry
Change in temperature extremes	Change in water levels and hydroperiod
Precipitation Changes (Climate Factor)	Change in flood occurrence, frequency, intensity, and area flooded
Change in annual average precipitation	(including hydroperiod)
Change in spring average precipitation	Change in groundwater tables
Change in summer average precipitation	Changes in nutrients
Change in fall average precipitation	Change in pollutants
Change in average winter precipitation	Change in freshwater input*
Changes in Snow or Ice Regimes (Climate Factor)	Decrease in quantity of water*
Change in snow pack	**Changes in Ocean or Estuarine Hydrology and Water**
Change in snow cover period	**Characteristics**
Change in Sea Level (Climate Factor)	Altered ocean input
Sea level rise and ocean acidification	Change in pH and aragonite saturation
Changes in Coastal and Ocean Dynamics (Climate Factor)	Decrease in dissolved oxygen
Altered residence time*	Decrease in quality of water
Change in circulation pattern*	**Ecosystem Changes**
Altered tidal mixing*	Change in spatial distribution of habitat types
Change or loss in connectivity*	Change in community structure or composition
Change in currents, upwellings, and wave and spray patterns*	Change in biotic interactions (altered community dynamics)
Changes in Geophysical and Disturbance Regime	Change in functional processes of ecosystem
Change in sediment erosion-deposition regime	Changes succession processes and ecosystem development
Change in natural fire regime	Habitat fragmentation
Change in extreme events	Reduction in area in which to expand*
Altered sediment delivery*	Change in surface area*
Changes in Soil Characteristics	Decrease in native bivalve indicator species populations*
Change in nutrients	Decrease in native shorebird indicator species populations*
Change in pollutants	Decrease in proportion of native species*
Change in soil chemistry	Decrease in seagrass beds*
Change in soil moisture	Change in floating vegetation*
Change in soil temperature	**Geological Events: Catastrophic Geological Events**
	Volcanoes
	Earthquakes/tsunamis
	Avalanches/landslides
	Subsidence

* Stresses unique to the Marine Province

Table 1.5-4 Standardized List of Pressures Used in SWAP 2015	
Agricultural and forestry effluents	Livestock, farming, and ranching
Air-borne pollutants	Logging and wood harvesting
Annual and perennial non-timber crops	Marine and freshwater aquaculture
Climate change	Military activities
Commercial and industrial areas[1]	Mining and quarrying
Dams and water management/use	Other ecosystem modifications[5]
Fire and fire suppression	Parasites/pathogens/diseases
Fishing and harvesting aquatic resources	Recreational activities
Garbage and solid waste	Renewable energy
Household sewage and urban waste water[2, 3]	Roads and railroads
Housing and urban areas[1]	Shipping lanes[6]
Hunting and collecting terrestrial animals	Tourism and recreation areas
Industrial and military effluents[3, 4]	Utility and service lines
Introduced genetic material	Wood and pulp plantations
Invasive plants/animals	

Pressures include the following, which are emphasized under Marine Province:

1 Shoreline development

2 Urban runoff (e.g., landscape watering)

3 Point discharges

4 Hazardous spills

5 Modification of mouth/channels; ocean/estuary water diversion/control; and artificial structures

6 Ballast water

1.6 Companion Plans

Because of California's tremendous biodiversity and the broad spectrum of actions needed to implement conservation strategies across a full array of resources, land uses (including public access), government activities, and resource-consumptive industries, CDFW determined that a coordination framework for SWAP 2015 implementation is needed beyond the presentation in SWAP 2015. Called "companion plans," these sector-specific action plans will be instrumental in the implementation of SWAP 2015. CDFW, in partnership with other state and federal agencies and organizations involved in use, management, and/or conservation of California's natural resources and cultural heritage, will create the following nine sector-specific plans.

Nine Sector-Specific Companion Plans:

- **Agriculture**
- **Consumptive and Recreational Uses**
- **Energy Development**
- **Forests and Rangelands**
- **Land Use Planning**
- **Transportation Planning**
- **Tribal Lands**
- **Water Management**
- **Marine Resources**

Companion plans support development of well-coordinated, collaborative, multi-stakeholder efforts that leverage human and financial resources, as well as increase efficiencies for implementation of strategies, to achieve goals and objectives described in SWAP 2015. These plans will identify shared priorities of SWAP 2015 and CDFW partners and mutually strengthen the conservation capabilities of CDFW and participating organizations involved in the use, management, and/or conservation of natural and cultural heritages, as illustrated in Figure 1.6-1.

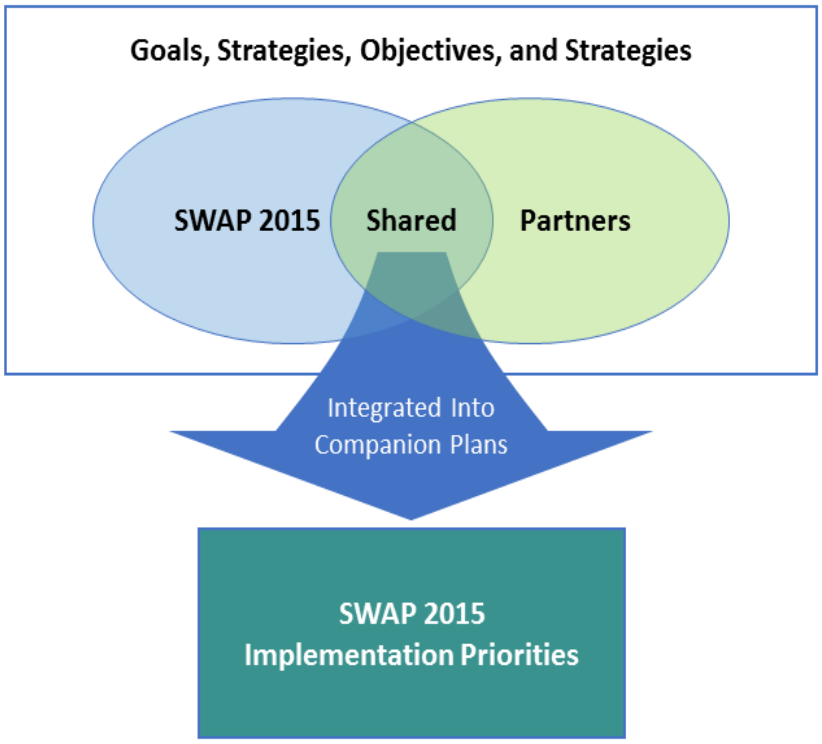


Figure 1.6-1 Identifying and Aligning SWAP 2015 and Partners' Priorities to Create Companion Plans

The companion plans explore solutions to the complexities of collaborative conservation actions to implement SWAP 2015. These plans go beyond the basic requirements of SWAPs and strengthen implementation of SWAP 2015 by engaging partners through identification of shared conservation goals, objectives, and strategies to be highlighted as the plan's highest implementation priorities. The companion plans also fulfill the strong suggestion of AFWA to incorporate more partner engagement as a best practice in wildlife conservation planning. The companion plan concept stems from growing interests and needs for inter-agency and partner coordination and collaboration in the state, as indicated in the adoption of a 2013 resolution by the California Biodiversity Council (2013) to promote better alignment among California and federal resource agencies for natural resource conservation priorities. The companion plan process brought agencies and partners (such as other state agencies, local and regional agencies, California tribes and tribal governments, nongovernmental organizations, academic institutions, and industry associations) together to identify aligned priorities, leverage human

and financial resources, and ultimately implement conservation actions effectively. Each companion plan supplements SWAP 2015 by:

- elaborating on how SWAP 2015 conservation strategies could be implemented collaboratively;
- identifying sector-specific shared conservation goals, objectives, and strategies for mutual supports;
- outlining linkages within and among sector plans;
- sharing opportunities to leverage financial or other resources for conservation actions among sectors;
- identifying actions that sector partners are already taking or could take to support overall implementation of SWAP 2015; and
- serving as a way to engage and encourage collaboration among agencies and partners.

To develop the nine sector-specific companion plans, CDFW created a development team for each sector composed of key agencies, government representatives, and partners. Facilitated meetings were conducted to gather information from experts within the nine development teams regarding how to mutually support implementation of SWAP 2015 and partners' efforts, including partnership opportunities, areas of alignment between partners, and opportunities to leverage existing efforts to achieve the goals of SWAP 2015 and of partners' efforts. Draft companion plans will be available for public review. Each companion plan:

- describes the scope of the sector;
- describes goals in common with SWAP 2015 and partners' efforts;
- highlights SWAP 2015 goals, objectives, and strategies that are aligned with sector priorities;
- outlines the alignment of goals, objectives, and strategies with other existing plans and strategies;
- describes leverage points and opportunities for implementing SWAP 2015 (e.g., key partners and potential sources of funding); and
- explains a timeline and measures of success for implementing joint actions.

Through cooperation and teamwork during the development, companion plans are fostering greater engagement with partners from key sectors in SWAP 2015 implementation. The companion plans are critical for determining feasible conservation actions addressed in SWAP 2015 and help allocate human and financial resources to support implementing those actions. Together, SWAP 2015 and associated companion plans set the context and strategic direction for integrated planning and management more broadly, and help effective use of funding to support these efforts for the state and its partners.

When completed, the companion plans will be posted on the CDFW website at http://www.dfg.ca.gov/SWAP/.