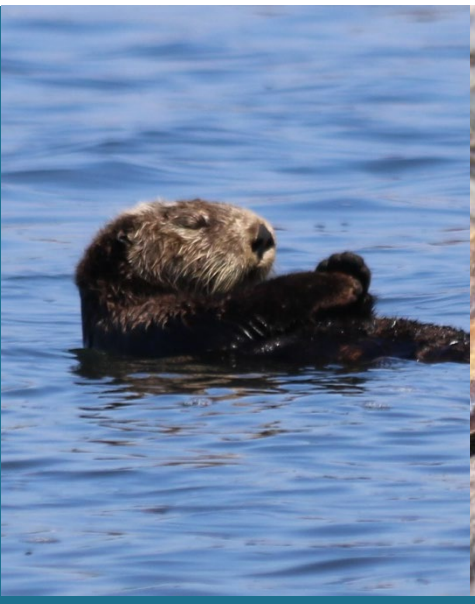
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

Report to the Legislature

Senate Bill 147 Fully Protected Species Report

July 2024



Cover Images

Top right: California Condor (*Gymnogyps californianus*), photo courtesy of Carie Battistone, California Department of Fish and Wildlife

Bottom left: Southern Sea Otter (*Enhydra lutris nereis*), photo courtesy of Michael Harris, California Department of Fish and Wildlife

Bottom center: Limestone Salamander (*Hydromantes brunus*), photo courtesy of California Department of Fish and Wildlife

Bottom right: Owens Pupfish (*Cyprinodon radiosus*), photo courtesy of Jeff Weaver, California Department of Fish and Wildlife

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EXECUTIVE SUMMARY

California's fully protected species statutes (Fish & G. Code, §§ 3511, 4700, 5050, and 5515) were enacted beginning in the 1930s, prior to the enactment of either the California Endangered Species Act or the federal Endangered Species Act. These statutes prohibited the take of 37 species of mammal, bird, reptile, amphibian, and fish that were historically considered vulnerable and in need of special protections.

In July 2023, the California Legislature passed Senate Bill 147 (SB 147) that modified the fully protected species statutes to remove three species and added a section to the California Endangered Species Act (Fish & G. Code, § 2081.15). This legislation provided a permitting mechanism for take of fully protected species until December 31, 2033 for a defined set of infrastructure projects if specified conditions are met. The legislation also required the Department to "develop a plan on or before July 1, 2024, to assess the population status of each fully protected species. The plan shall include recommendations to the Legislature for resources necessary to determine the scientific status of each fully protected species." This report presents the Department's initial review of the existing available information on the scientific status of each of the state's fully protected species, a plan for producing robust population status assessments for each species, and an estimate of the resources required to complete the assessments.

For each fully protected species, this report provides a species description, a description of available information based on current and past monitoring efforts, a process for assessing the species' scientific status, and a comprehensive plan to assess the species' population status. There are currently 34 species designated as fully protected, including nine mammals, eleven birds, two reptiles, three amphibians, and nine fish. Some of these species occur in only a handful of isolated locations, while others have ranges that span much of the state. Most are also listed as either threatened or endangered under the California Endangered Species Act and/or federal Endangered Species Act. Ongoing efforts to monitor these species vary considerably, with some species receiving comprehensive monitoring and others receiving almost none. Currently, the Department has sufficient information on the population status of only 25% (nine) of the species.

Senate Bill 854 (2018) directed the Department to conduct a Service Based Budgeting (SBB) review to identify strategic goals reflecting its core programs. The Department's SBB review studied, and is continuing to evaluate and report on, the service standards designed to meet its mission, cost estimates and staffing requirements to meet its mission, and a comparison of the mission level needs against existing staffing. SBB findings have identified that current staffing is sufficient to accomplish approximately 31% across mission level needs. Species and Habitat Conservation show the greatest need with a 69% gap in meeting the Department's mission level.

This report recognizes that additional resources are needed to assess the population status of each species and report on their scientific status. Assessments of population status of fully protected species generally require complex multi-year investigations, and such efforts have not been previously funded for most of the species. To assess the population status for 23 of the 34 fully protected species and conduct scientific status assessments for all 34 fully protected species, the Department would need additional permanent staff positions and funding to support temporary staff positions, contract services, equipment, and vehicles. The Department realizes securing

these resources is challenging, especially in the current budget environment. However, we continue to evaluate existing resources and efforts, and find efficiencies where possible, to provide support for this critical information.

INTRODUCTION

Senate Bill 147, which was passed by the California Legislature in July 2023, provided a permitting mechanism to take fully protected species for specific categories of infrastructure projects (Fish & G. Code, § 2081.15). The legislation also required the California Department of Fish and Wildlife (Department) to "develop a plan on or before July 1, 2024, to assess the population status of each fully protected species. The plan shall include recommendations to the Legislature for resources necessary to determine the scientific status of each fully protected species." For each fully protected species, this report provides a description of available information based on current and past monitoring efforts, a process for assessing the species' scientific status, and a comprehensive plan to assess the species' population status. This report also includes a summary of additional resources needed to assess the population status of each species and report on their scientific status.

What is a Fully Protected Species?

The classification of fully protected species was a precursor to the California Endangered Species Act (CESA) and federal Endangered Species Act (ESA), and California's initial effort beginning in the 1930s to identify and provide protection to 37 species of California native animals that the Legislature deemed to be rare or to face possible extinction. SB 147 removed three species from the lists of fully protected species (Thicktail Chub, American Peregrine Falcon, and Brown Pelican) that the Fish and Game Commission had previously determined were either recovered or extirpated, and there are now 34 species of mammals, birds, reptiles, amphibians, and fish designated as "fully protected" (Fish & G. Code, §§ 3511, 4700, 5050, and 5515) (Figure 1).

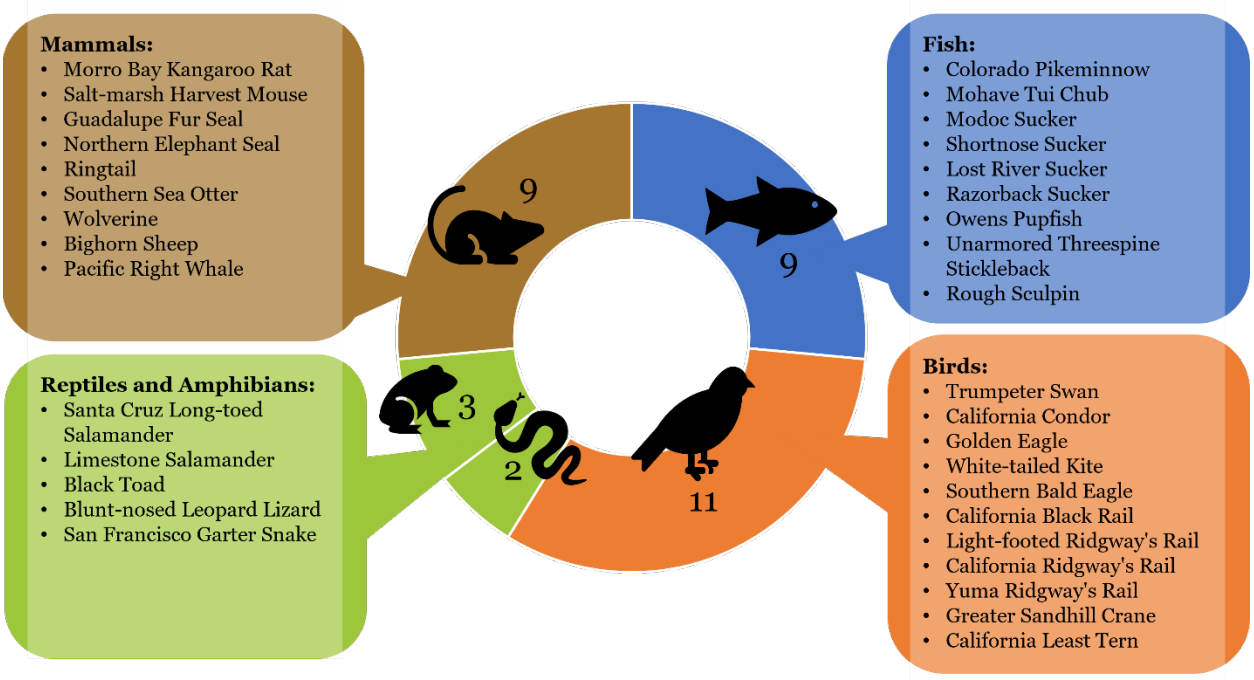


Figure 1. The 34 fully protected species by class.

These 34 species occupy a wide variety of habitats across California, from a handful of eastern California desert springs inhabited by Owens Pupfish to northern and central coast tidal marshes inhabited by California Ridgeway's Rail. Range sizes for the species vary from a few hundred acres to nearly the entire state. Most fully protected species have subsequently been listed under CESA, and presently 18 are listed as endangered and 8 are listed as threatened (Figure 2). One species, the Bighorn Sheep, has both threatened and endangered populations under CESA. Seven fully protected birds and mammals are not currently CESA-listed, including White-tailed Kite, Golden Eagle, Trumpeter Swan, Northern Elephant Seal, North Pacific Right Whale, Southern Sea Otter, and Ringtail.

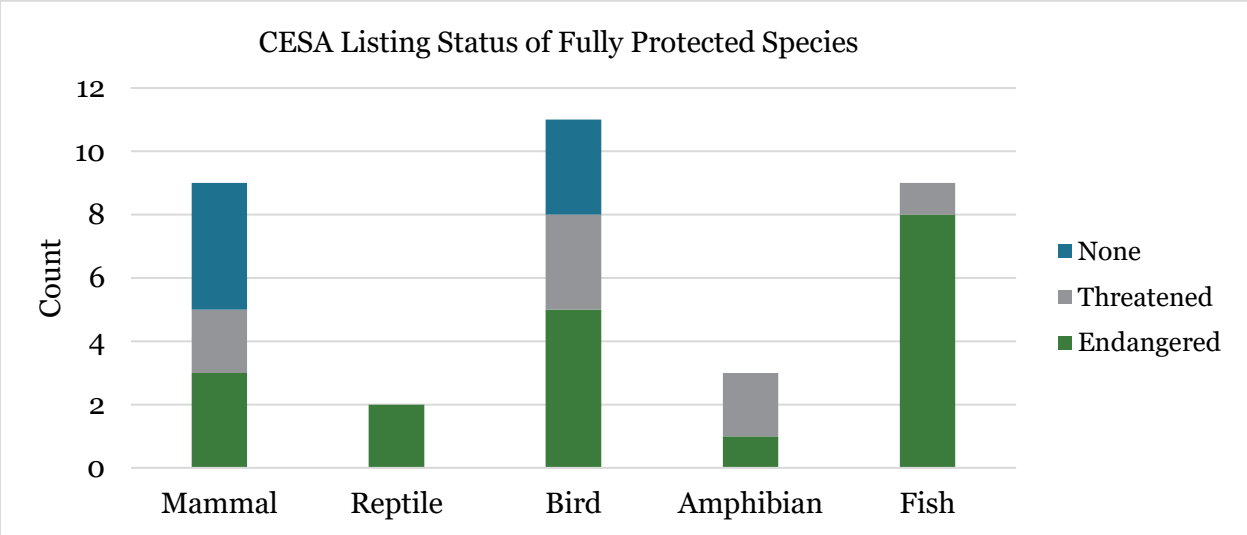


Figure 2: CESA listing status of all fully protected species. Bighorn Sheep are included in the "endangered" category, though only the Sierra Nevada subspecies is listed as endangered.

Fully protected species may not be taken or possessed at any time except under a narrow set of authorizations provided for in statute. "Take" means to "hunt, pursue, catch, capture, or kill", or to attempt to do any of these (Fish & G. Code, § 86). The Department may authorize the taking of a fully protected species for necessary scientific research, including efforts to recover fully protected, threatened, or endangered species. Take of fully protected species may also be authorized if the conservation and management of the species is approved in a Natural Community Conservation Plan (Fish & G. Code, § 2835) and the take will occur within the plan area. Fully protected birds may be captured and relocated, by permit, for the protection of livestock.

The fully protected classification has been considered a more restrictive protection standard than a listing of threatened or endangered under CESA due to the more limited circumstances under which take can be authorized. With SB 147, the Legislature created a new permitting mechanism for take of fully protected species for a set of five project categories that address water, transportation, and renewable energy (Fish & G. Code, § 2081.15). These permits must include components that are not required in CESA incidental take permits (e.g., a monitoring program and an adaptive management plan). Additionally, permitted take must be incidental to an otherwise lawful activity, the impacts of the take must be minimized and fully mitigated, and the project may not jeopardize the continued existence of the species.

Population Status and Scientific Status

For the purposes of this report, population status and scientific status are interpreted and defined as follows:

> *Population status***:** current population size and population trend. The population status assessment for each fully protected species contains an estimate of the resources required to estimate its current California population size, and the resources required for long-term monitoring of that population.
>
> *Scientific status:* current conservation status, which includes information on population size and trend, range size and trend, threats to the species, and other conservation and management considerations (e.g., does the species have a very small population size or limited range, have there been any long-term changes to its distribution or population, what are the key threats to the species, what are any current protection measures and regulatory mechanisms, what are recommended management or restoration actions?).

For species listed under CESA and as funding is available, the Department conducts five-year reviews to assess the scientific status and to determine if the conditions that led to the original listing are still present (Fish & G. Code, § 2077). Our evaluation of each fully protected species includes a brief review and summary of the information available on species' status (e.g., population size, range, distribution, trends, threats) and broadly identifies the data gaps and additional information needed. We also identify the resources required to conduct a detailed scientific status assessment (equivalent to a CESA five-year review) for each fully protected species.

INFORMATION AVAILABILITY

Ranking Population Status and Scientific Status Criteria

Department staff assessed the available information for each species' population size, population trend, range size, range trend, and threats, and ranked each of these status criteria according to level of information availability and its quality:

1. High: comprehensive information availability with a high degree of certainty.
2. Medium: some information available, but either more information is needed or there is uncertainty in the quality of the information.
3. Low: little to no recent information is available or large knowledge gaps exist.

Population Size and Population Trend

Population size is the number of individuals in a population, and population trend indicates whether the size of the population is increasing, declining, or stable. The combination of these two criteria informs the population status of each fully protected species. For a given species, a ranking of high for both population size and population trend indicates that the Department likely has sufficient monitoring information to comprehensively assess its population status. A ranking of medium in either category indicates that more resources are needed for monitoring to target data gaps or improve the quality of available data. A ranking of low in either category indicates large deficiencies in the available information and that resources are not sufficient and substantial additional monitoring is needed.

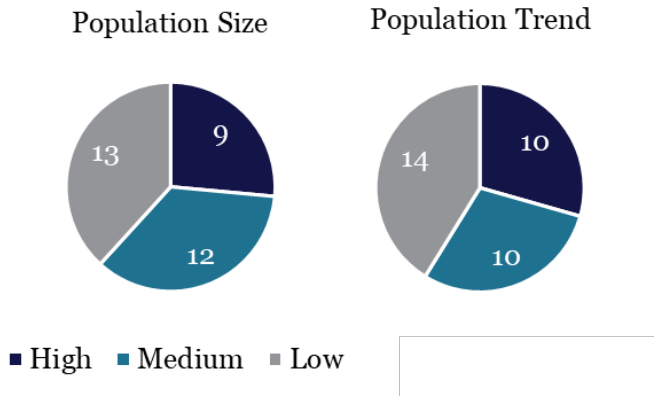


Figure 3. Level of information availability and certainty for population size and population trend for all fully protected species. The numbers in the pie chart represent the number of fully protected species in each of the High, Medium, and Low rankings.

The amount and quality of information on each of the status criteria is quite variable across the 34 fully protected species. Currently, the Department has sufficient information and resources to assess the population status of only 25% (nine) of the species. These species are sufficiently monitored and managed by the Department and/or other resource agencies (Northern Elephant Seal, Razorback Sucker, Lost River Sucker, Shortnose Sucker, California Condor, and Bighorn Sheep), or no longer occur substantially in California, negating the need for intensive monitoring (Wolverine, Trumpeter Swan, and Colorado Pikeminnow). Two additional species, Guadalupe

Fur Seal and North Pacific Right Whale, are primarily monitored and managed by the National Marine Fisheries Service. The Department believes that additional monitoring information is needed for 23 species to comprehensively assess their population status.

Range Size, Range Trend, and Threats

Range size is a measure of the geographic area in which a species may occur, and range trend indicates whether this area is getting bigger, smaller, or remaining stable. A score of high for range size and range trend indicates that the Department has a high level of confidence in sufficiency of information regarding the area occupied by the species in California, and whether that area has increased, decreased, or remained stable over time. Scores of medium and low represent relatively less knowledge of the area and locations where a species occurs (e.g., all occupied locations might not be known, boundaries of the species range are unclear). Threats are the activities or processes that impact a species' continued ability to survive or reproduce. A score of high for threats indicates that the Department is confident that the threats to the species are known, and that the relative importance of each threat is understood. Scores of medium or low for threats suggest low confidence that all threats to a species are known, or that the relative level of impact across known threats is unclear.

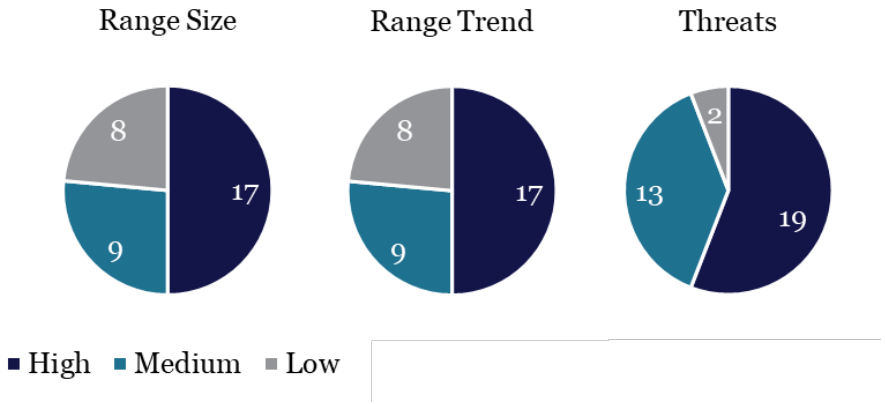


Figure 4. Level of information availability and certainty for range size, range trend, and threats for each fully protected species. The numbers in the pie chart represent the number of fully protected species in each of the High, Medium, and Low rankings.

Generally, the Department has a better understanding of fully protected species' range size, range trend, and threats than the population size and population trend information. Department staff indicated high information availability and certainty for range size, range trend, and threats for at minimum half of the fully protected species. Yet, the Department still has low certainty in the range size and range trend for eight species, all of which are difficult to sample and/or occur in remote locations that require considerable effort to access. Therefore, any increase in resources to inform population status for these species will likely inform range size and trend as well.

The five status criteria (population size, population trend, range size, range trend, and threats) will inform the Department's assessment of fully protected species' scientific status. High rankings within all five criteria indicate that the Department has sufficient information to comprehensively assess the scientific status of the species. Only five species have high rankings for all five criteria (Bighorn Sheep, Trumpeter Swan, California Condor, Razorback Sucker, and Colorado Pikeminnow). For the other fully protected species, the scientific status reports will reflect remaining gaps in species knowledge.

RESOURCE NEEDS

The Department's 2021 Service Based Budgeting Report highlights the eight key areas in which the Department provides services to stakeholders and California's natural resources: Public Use and Enjoyment; Species and Habitat Conservation; Permitting and Environmental Protection; Law Enforcement; Lands and Facilities; Education and Outreach; Operational Support; and Administrative Support (CDFW 2021). The service-based budgeting report identifies Species and Habitat Conservation as the most under-resourced service relative to the mission level need in percentage (only 26% of mission fulfilled by current level of resources). Further, within this service category, Species Monitoring and Evaluation has the largest deficit of gap hours by sub-program (more than 650,000 gap hours annually). This deficit is also reflected in this report.

Assessments of population status of fully protected species generally require complex multi-year investigations, and such efforts have not been previously funded for most of the species. To assess the population status for 23 of the 34 fully protected species and conduct scientific status assessments for all 34 fully protected species, the Department would need additional permanent staff positions and funding to support temporary staff positions, contract services, equipment, and vehicles. The Department realizes securing these resources is challenging, especially in the current budget environment. However, we continue to evaluate existing resources and efforts, and find efficiencies where possible, to provide support for this critical information. An analysis of resource needs can be found in each individual species account and a summary is provided in Appendix A.

Population Status Assessments

To evaluate the resources needed to assess the population status for each fully protected species, Department staff summarized information and data sources from current and past monitoring efforts and the degree to which these efforts inform population size and trend. For several species, adequate information and resources are available to develop population status assessments. For species with information needs, we describe the survey methods and level of effort required to comprehensively monitor the population. To accurately assess population trend information for many of these species, 5–10 years of monitoring will be necessary. Staffing needs include permanent and temporary Department scientific staff as well as one-time or annual contractor services. Additional resources include annual operating expenses for each permanent position for travel and ongoing equipment needs and one-time large equipment purchases, such as trucks or specialized survey equipment. Each species monitoring plan considers the unique distribution, behavior, and detection challenges of the individual species and uses accepted survey protocols where available. Contemporary techniques are proposed where traditional sampling or trapping will not be sufficiently informative (e.g., genetic sampling to estimate population size). Detailed information for each species is included in the species accounts at the end of this report.

Scientific Status Reports

To determine the scientific status of each fully protected species the Department will conduct a review for each of the 34 fully protected species (i.e., equivalent to a CESA five-year review). Using the best available scientific information, these reviews will describe species population trends, identify habitat essential for the continued existence of species, and develop recommended management actions for species recovery. The completion of these reviews cannot be achieved without knowledge of the population status and trends of California's wildlife and dedicated full-time staff to complete the reviews. When funding is available, these reviews are already tasked for species listed pursuant to CESA (27 of the 34 fully protected species). However, to date the Department has not had sufficient resources to complete these reviews for most of the 257 listed species (as described in Fish & G. Code, §§ 2072.3 and 2077(a) and California Code of Regulations, Title 14, § 670.1(d)). For many CESA-listed species, comprehensive five-year species reviews have not been conducted for more than two decades.

Since 2019, the Department has employed three permanent, full-time staff tasked with completing five-year species reviews. Staff tasked with completing five-year reviews are currently averaging approximately two five-year reviews per year.

SPECIES ACCOUNTS

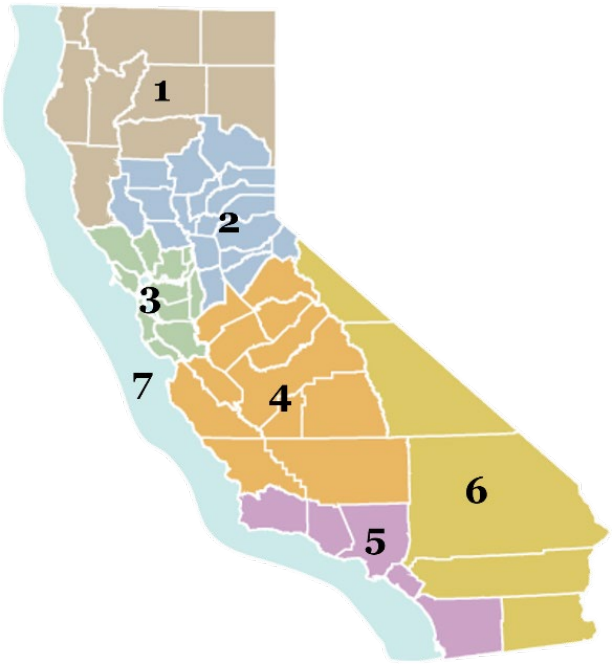
The fully protected species accounts are organized by species class (Table 1). Each account contains a description of the species, its listing status, an assessment of information available, current monitoring/management effort, and what is currently known about its population status. Further, each account includes a comprehensive monitoring plan and details the resources required to implement each plan.

Table 1. Fully protected species by taxonomic class and region of occurrence. Seven species have undergone name changes, and the names in brackets reflect those originally used in Fish & G. Code §§ 3511, 4700, and 5515.

Class	Common Name	CDFW Region	Page #
Fish	Colorado Pikeminnow [Colorado River Squawfish]	6	16
Fish	Mohave Tui Chub [Mohave Chub]	6	18
Fish	Modoc Sucker	1	20
Fish	Shortnose Sucker	1	22
Fish	Lost River Sucker	1	22
Fish	Razorback Sucker [Humpback Sucker]	6	25
Fish	Owens Pupfish	6	27
Fish	Unarmored Threespine Stickleback	5, 6	29
Fish	Rough Sculpin	1	32
Amphibian	Santa Cruz Long-toed Salamander	3, 4	34
Amphibian	Limestone Salamander	4	37
Amphibian	Black Toad	6	39
Reptile	Blunt-nosed Leopard Lizard	4	41
Reptile	San Francisco Garter Snake	3	44
Bird	Trumpeter Swan	1, 2, 3	46
Bird	California Condor	1, 4, 5	48
Bird	Golden Eagle	all	50
Bird	White-tailed Kite	all	52
Bird	Southern Bald Eagle	all	54
Bird	California Black Rail	2, 3, 4, 6	57
Bird	Light-footed Ridgway's [Clapper] Rail	5	59
Bird	California Ridgway's [Clapper] Rail	3	61
Bird	Yuma Ridgway's [Clapper] Rail	6	63
Bird	Greater Sandhill Crane	1, 2, 3, 4	65
Bird	California Least Tern	3, 4, 5	67
Mammal	Morro Bay Kangaroo Rat	4	70
Mammal	Salt-marsh Harvest Mouse	3	72
Mammal	Guadalupe Fur Seal	7	75
Mammal	Northern Elephant Seal	7	77
Mammal	Southern Sea Otter	7	79
Mammal	Ringtail [Ring-tailed Cat]	all	81
Mammal	Wolverine	1, 2, 4, 6	83
Mammal	Bighorn Sheep	5, 6	85
Mammal	North Pacific Right Whale [Pacific Right Whale]	7	87

The Department is represented by seven geographic regions and headquarters functions. Due to the broad distribution of several fully protected species, Department staff from multiple regions may be involved in the monitoring and management of the species (Table 1). The Department's regions are referenced in the species accounts to describe both current monitoring efforts and additional staffing and resource needs. Regional service areas include:

1. **Northern Region**: Del Norte, Humboldt, Lassen, Mendocino, Modoc, Shasta, Siskiyou, Tehama, and Trinity counties.
2. **North Central Region**: Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Lake, Nevada, Placer, Plumas, Sacramento*, San Joaquin*, Sierra, Sutter, Yolo*, and Yuba counties. *Note: These counties are split between regions.
3. **Bay Delta Region**: Alameda, Contra Costa, Marin, Napa, Sacramento*, San Mateo, Santa Clara, Santa Cruz, San Francisco, San Joaquin*, Solano, Sonoma, and Yolo* counties. *Note: These counties are split between regions.
4. **Central Region**: Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Luis Obispo, Stanislaus, Tulare, and Tuolumne counties
5. **South Coast Region**: Los Angeles, Orange, San Diego, Santa Barbara, and Ventura counties
6. **Inland Deserts Region**: Imperial, Inyo, Mono, Riverside, and San Bernardino counties
7. **Marine Region**: The entire California coastline from border to border.



COLORADO PIKEMINNOW
Ptychocheilus lucius

Species Description and Listing Status

The Colorado Pikeminnow is a large sized minnow. They historically occupied the lower Colorado River drainage; however, now only occur in small numbers in the upper mainstem Colorado River and its tributaries. The species is currently listed as endangered under CESA and ESA. Threats to Colorado Pikeminnow include dams, stream dewatering, altered stream flow patterns, water quality degradation, and the introduction of non-native species.

Colorado Pikeminnow. There are no extant populations of Colorado Pikeminnow in California. Photo Credit: Joseph Tomerelli.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	High

Current and Past Monitoring

Extensive fisheries surveys have occurred annually in the lower Colorado River basin since the 1960s. Currently, multiple entities that participate in the Lower Colorado River Multi-Species Conservation Program implement recovery goals for native fish, excluding the Colorado Pikeminnow. The program's focus is on developing native fish population estimates, while the Department, Arizona Game and Fish Department, and Nevada Department of Wildlife monitor and collect data for all fish species. Fisheries surveys have not observed Colorado Pikeminnow since the 1960s in the lower basin. Fisheries data produced by this program are readily available to the Department.

Comprehensive Monitoring Plan

No additional monitoring is proposed as the current monitoring conducted by the Lower Colorado River Multi-Species Conservation Program is sufficient.

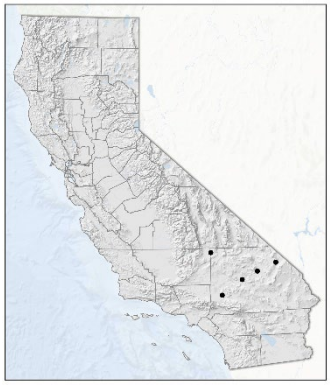
Resources Needed to Implement Comprehensive Monitoring

Existing monitoring conducted by the Lower Colorado River Multi-Species Conservation Program is sufficient to detect any remaining Colorado Pikeminnow that may occur in the lower basin surveys. As noted, the species has not been detected in the lower basin since the 1960s. Currently, the program is funded for 50 years with an operating budget of $626 million.

MOHAVE TUI CHUB
Siphateles bicolor mohavensis

Species Description and Listing Status

The Mohave Tui Chub is a moderate- to large- sized minnow that is recognized as the only fish native to the Mohave River basin in San Bernardino County. Their preferred habitat includes deep pools and slough-like areas. The Mohave Tui Chub is listed as an endangered species under both CESA and ESA. Known threats to Mohave Tui Chub include hybridization with the closely-related Arroyo Chub, drought, habitat encroachment from cattails, competition, and predation.



Mohave Tui Chub and its range map. The current California populations are represented by black points on the map. Photo Credit: Joe Ferreira, California Department of Fish and Wildlife.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	Medium

Mohave Tui Chub occur in five isolated populations, located at Lark Seep (Naval Air Weapons Station China Lake), Camp Cady Wildlife Area, Morningstar Pond (Mohave National Preserve), Zzyzx/Soda Springs, and Deppe Pond (privately owned). The newest of these population was established at Morningstar Pond in 2011, and most of these populations have not been surveyed within the last five years. Most recently, West Pond at Zzyzx/Soda Springs was surveyed in 2023, Morningstar Pond was surveyed in 2013, and Lark Seep was surveyed in 2007. Mohave Tui Chub have hybridized with introduced Arroyo Chub in their historical native habitat of the Mojave River. All other non-hybridized populations occur in ponds located within the Mojave River watershed but are not connected to the river.

Current and Past Monitoring

Infrequent monitoring occurs for the species and the Department has no dedicated staff for survey and management of this species. The Mohave Tui Chub working group is comprised of volunteers, the National Park Service, the U.S. Navy, the Department, and the U.S. Fish and Wildlife Service.

The Mohave Tui Chub survey protocol was established in 2020 with the intent to survey all populations yearly as recommended in the Mohave Tui Chub Recovery Plan. To date, the Department is only aware of one survey of one population that has occurred since its establishment. Data generated in 2023 includes population estimates for the Morningstar Pond population and presence-absence data for the Deppe Pond and Camp Cady populations.

Comprehensive Monitoring Plan

The Mohave Tui Chub Recovery Plan states that populations should be surveyed annually, and that habitat quality should be monitored and maintained. Multiple mark-recapture surveys over several days would be required to obtain a statistically-valid population estimate. The optimal window for surveys is a 2-week window in late fall, and thus this effort would require at least two survey years to develop an estimate for all existing populations. Annual monitoring would need to be conducted to establish a population trend and monitor habitat quality. Cattail removal and other habitat maintenance require several full days of labor. A minimum of one month annually per population is needed for survey, monitoring, data collection, data analysis, and habitat maintenance.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (to implement the monitoring plan each year), travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

MODOC SUCKER
Catostomus microps

Species Description and Listing Status

The Modoc Sucker is a small species of sucker that inhabits the cool pools of headwater springs in the Pit River drainage in Modoc and Lassen Counties, California. The Modoc Sucker is a threatened species under CESA. The species was delisted due to recovery from the ESA in 2016. Known threats to the species include drought, climate change, livestock grazing, invasive species, and water management.

Modoc Sucker and its range map. The current California range is indicated in black areas on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo Credit: Peter Rissler, U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	Medium
Range Trend	Medium
Threats	Medium

Population estimates have not been developed for the species; however, surveys conducted in 2012 by the U.S. Fish and Wildlife Service detected the presence of Modoc Sucker in streams where the species was known to historically occur. Population size has likely decreased in the past decade due to the recent severe drought, but rangewide, sucker populations are likely stable due to high resiliency. The range size of Modoc Suckers has increased from the original range that was known at the time of ESA listing in 1985. Surveys in 2008 observed suckers in additional streams in both California and Oregon. Surveys in 2012 confirmed that the sucker distribution had not changed from the 2008 surveys.

Current and Past Monitoring

The Department (2002), Reid (2008), and USFWS (2012) conducted monitoring surveys of Modoc Suckers in 2002, 2008, and 2012, respectively. These surveys generated data on the distribution, occupancy, abundance, genetics, and habitat characteristics of Modoc Sucker across its range (with few exceptions due to landowner access); however, no population size or density estimates resulted from the surveys, and there is currently no funding or staffing available to conduct future surveys. There is little information available about the rangewide population size of Modoc Suckers and the impacts of drought and non-native species on population demographics.

Comprehensive Monitoring Plan

Monitoring requirements of Modoc Sucker have recently been described in a post-delisting monitoring plan developed by the U.S. Fish and Wildlife Service (2015) in cooperation with the Department, Oregon Department of Fish and Wildlife, and the United States Forest Service.

Repeated night-time bank observation surveys to track occupancy and abundance trends are needed to monitor population status. This survey effort would require annual field surveys that span at least six work weeks. Surveys conducted over a ten-year period would better account for inter-annual variation in habitat availability due to differences in water year type (i.e., dry vs. wet).

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

LOST RIVER SUCKER and SHORTNOSE SUCKER

Deltistes luxatus and *Chasmistes brevirostris*

Species Description and Listing Status

The Lost River and Shortnose suckers are large, long-lived fish native to the Upper Klamath basin in Oregon and the Lost River basin in California. Individuals of both species have been aged over 30 years, and the largest Lost River Sucker can reach 800 mm fork length. Both species inhabit large shallow lakes with abundant aquatic vegetation and cool, well-oxygenated water. The species are listed as endangered under both CESA and ESA. Known threats include habitat alteration and degradation, nonnative species, poor water quality, drought, climate change, and water management. Introgressive hybridization with other non-listed sucker species is also considered a significant threat to Shortnose Suckers.

Lost River Sucker and its California range represented in gray on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo Credit: U.S. Fish and Wildlife Service.

Shortnose Sucker and its California range represented in gray on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo Credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	Medium

For both species, the only known spawning populations exist in Clear Lake Reservoir (Clear Lake National Wildlife Refuge), California. The U.S. Fish and Wildlife Service, U.S. Geological Survey, and U.S. Bureau of Reclamation have been consistently monitoring the Lost River and Shortnose suckers since fall of 2004 and have produced multiple studies and status reviews. No accurate population estimates are derived from these monitoring efforts; however, the data collected includes spawner recruitment, adult demographics, spawn run timing, adult movements, and other metrics informative to population status. The current population trend for both species is contracting due to the lack of recruitment of juvenile suckers to the adult spawning population. In addition to the Clear Lake Reservoir population, the U.S. Fish and Wildlife Service released juvenile suckers into Sheepy Lake on the Lower Klamath National Wildlife Refuge in early 2023 as part of the Sucker Assisted Rearing Program. The intent is for these fish to grow out in Sheepy Lake and be used to supplement the Upper Klamath Lake population when they reach a certain size class.

The range of Lost River and Shortnose suckers is well documented in historical and current literature. There has been a recent contraction in the range of the two species due to the ongoing removal of four lower Klamath River dams to restore access to more than 400 miles of habitat for anadromous fish. Furthermore, a small population of both sucker species historically occurred in Tule Lake but have recently been extirpated due to severe drought and water management practices.

Current and Past Monitoring

Currently, U.S. Geological Survey, U.S. Fish and Wildlife Service, and U.S. Bureau of Reclamation conduct annual monitoring of both species in Clear Lake Reservoir. Numerous datasets have been generated for the Clear Lake Reservoir populations, including spawner recruitment, adult demographics, spawn run timing, adult movements, relationships between reservoir surface water elevations, inflows, spawning, and other associated metrics. The surveys are conducted under annual Memorandums of Understanding with the Department, and data is supplied to the Department.

Even with intensive sampling efforts, collecting information on these species is difficult, and the most recent status review does not provide population size or density (USFWS 2019). Instead, low population size is inferred based on the low numbers of captures and recaptures during annual monitoring efforts compared to similar monitoring efforts on Upper Klamath Lake.

Very little is known about the juvenile life stages of these sucker species and the recruitment process to the spawner population in Clear Lake Reservoir. Juveniles are not identifiable by species based on morphological characteristics, and the factors contributing to the lack of recruitment to the spawner population are not well understood and are a considerable threat to

both species. Though most monitoring is focused on Clear Lake Reservoir, other studies are done at Tule Lake, the Lost River, and Lower Klamath Lake, including Sheepy Lake, Copco Reservoir, and Iron Gate Reservoir.

Comprehensive Monitoring Plan

With the existing level of monitoring being conducted by the federal agencies, further monitoring by the Department is not currently necessary. The most appropriate way to sample a statistically valid population estimate would be to use existing federal agency data to develop an estimate.

Resources Needed to Implement Comprehensive Monitoring

No additional resources were identified as there is already sustained federal funding to annually monitor and manage the species.

RAZORBACK SUCKER
Xyrauchen texanus

Species Description and Listing Status

The Razorback Sucker is a large, long-lived, warm-water fish endemic to the Colorado River basin. Their preferred habitat includes large, slow-moving sections of river within the Colorado River watershed. Typically, Razorback Suckers are found in deep pools, oxbow lakes, and backwaters, where they feed on a variety of prey, including aquatic insects, detritus, and zooplankton. The species is listed as endangered under both CESA and ESA. In California, the remaining populations are primarily sustained by a fish augmentation program.

Razorback Sucker and its potential California range represented in gray on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	High

Multiple state and federal agencies, as well as non-governmental organizations, have been conducting annual fisheries surveys for many years prior to the creation of the Lower Colorado River Multi-Species Conservation Program in 2005. The program's native fish augmentation program (660,00 adults) is in year 18 and is 36% complete. A population estimate of 5,037 individuals was produced for the Colorado River reach from Davis Dam in Mohave County, Arizona, to Parker Dam in San Bernadino County, California (reach 3; Bullard et al. 2022). A population estimate of 1,162 individuals was produced for the lower Colorado River reach from Parker Dam, San Bernadino County, CA, to Imperial Dam, Imperial County, CA (reach 4 and reach 5; Heishman et al. 2023). The population estimates of Razorback Sucker have reached their highest point since the 1990s due to a large effort to stock the species and improved detection

rates brought about by the installation of submerged antenna that detect the passive integrated transponder tags.

The Lower Colorado River Multi-Species Conservation Program produces annual reports and presents their findings annually at the Colorado River Aquatic Biologists meeting. The population of Razorback Suckers in California is semi-stable due to the extensive stocking of 4,000 adult fish (>305mm) annually in both reaches 3 and reaches 4 and 5. In 2018, the Department participated in the development of the U.S. Fish and Wildlife Services' Special Status Assessment (USFWS 2018). At the time, the population was too small to obtain an estimate; however, currently, the population estimate is 1,162, and a new spawning group has been discovered.

Current and Past Monitoring

The Lower Colorado River Multi-Species Conservation Program fisheries surveys cover the entire range of the lower Colorado River basin, which includes the states of California, Arizona, and Nevada, from the international border with Mexico to the confluence of the mainstem at Lake Mead. The goal of the surveys is to monitor the status of the lower Colorado River native fish species as well as the success of the program's fish augmentation plan to stock up to 660,000 adult Razorback Suckers greater than 300 mm in length. The U.S. Bureau of Reclamation is the lead agency for implementing the recovery goals of the Lower Colorado River Multi-Species Conservation Program. Participants of the program include, but are not limited to, the Department, the Arizona Game and Fish Department, the Nevada Department of Wildlife, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the National Park Service, Marsh and Associates, and the Arizona State University. The data from the various fisheries surveys includes population estimates, genetic diversity metrics, post-stocking survival rate, predator avoidance training, pond and raceway hatchery rearing, passive integrated transponder tag retention, and spawning and larval collection data. The Department, as a participant in the Lower Colorado River Multi-Species Conservation Program, has reliable access to the data. The program is well-funded, with up to $626 million allocated for a 50-year operating budget, and continually looks to identify, minimize, and address data gaps.

Comprehensive Monitoring Plan

No additional monitoring is identified as the current monitoring conducted by the Lower Colorado River Multi-Species Conservation Program is sufficient.

Resources Needed to Implement Comprehensive Monitoring

No additional resources were identified as the current monitoring conducted by the Lower Colorado River Multi-Species Conservation Program is well-funded with up $626 million allocated over a 50-year operating budget.

OWENS PUPFISH
Cyprinodon radiosus

Species Description and Listing Status

Owens Pupfish is a small freshwater fish that is endemic to the Owens Basin in eastern California, near the communities of Bishop, Big Pine, and Lone Pine. Owens Pupfish occupy spring pools, sloughs, and other slow flowing waters. The Owens Pupfish is listed as an endangered species under both CESA and ESA. Threats to Owens Pupfish include non-native fish species, encroachment from emergent vegetation, and groundwater extraction.

Owens Pupfish and its California range represented in black on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo Credit: Jeff Weaver, California Department of Fish and Wildlife.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	High
Range Trend	High
Threats	High

Owens Pupfish only occur in locations where non-native fish have been removed; therefore, their range size is fairly well-known. Currently, there are five existing populations in the native range: three in Fish Slough, one at Mule Spring (Big Pine) and one at Well 368 (Independence). These five populations occupy less than 0.25 acres of habitat. The recent introduction of Owens Pupfish after the completion of the River Spring Lakes Restoration Project outside of their native range has resulted in an increase in their habitat and population size; however, they still only occur at six locations. Owens Pupfish populations tend to fluctuate by an order of magnitude over the growing season. Without constant human intervention, the median time to population extirpation is 8 years. The loss of spring flows resulted in the loss of significant portions of Owens Pupfish habitat in the last five years.

Current and Past Monitoring

Historical management of Owens Pupfish has included numerous habitat creation or restoration projects and resulted in 88 translocations since the species was rediscovered in 1964; however, over 90% of these translocations have failed. Currently, the Department conducts surveys of Owens Pupfish populations across their range on a >1-year frequency. Single mark-recapture estimates of the Owens Pupfish population in Mule Spring, Well 368, BLM Ponds, and Marvin's Marsh were completed in 2019. The Bishop Paiute Tribe, in coordination with Bureau of Land Management (BLM) and the Department, conduct weekly monitoring of BLM Spring population to ensure no non-native predators are introduced into the habitat. The Department conducts quarterly surveys of the remaining Owens Pupfish populations; however, the funding source is short-term, provided by a State Wildlife Grant.

Comprehensive Monitoring Plan

Ongoing population monitoring is a key management element in evaluating Owens Pupfish status and trends. Multiple mark-recapture surveys would be required to sample for a statistically valid population estimate. Two surveys of at minimum five sampling efforts each would be required (i.e., fall and spring) on a continual, annual basis to evaluate both overwintering survival and abundance. Further, regular population and habitat surveys are required to prevent individual population extirpation.

Resources needed to Implement Comprehensive Monitoring

While there has been continuous Department effort towards Owens Pupfish management since the 1960s, there is currently no permanent staff dedicated to the monitoring of this species. Required resources would include those needed for staff (to complete all mark recapture surveys and regular population and habitat surveys), travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

UNARMORED THREESPINE STICKLEBACK
Gasterosteus aculeatus williamsoni

Species Description and Listing Status

The Unarmored Threespine Stickleback is a scaleless, freshwater fish that grows up to two inches long. Their preferred habitats are cool, shallow, slow-moving waters in streams with adequate cover in the form of aquatic plants or overhanging brush. This stickleback is listed as endangered under both CESA and ESA. Known threats to the stickleback include extreme drought, urban development, water pollution from mining and extraction runoff, wildfires, hybridization, and the introduction of non-native species.

Unarmored Threespine Stickleback and its California range represented in gray on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo Credit: Jennifer Pareti, California Department of Fish and Wildlife.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	High
Range Trend	High
Threats	High

Unarmored Threespine Stickleback have a very limited distribution, with the southern California populations represented in the Upper Santa Clara River, Bouquet Creek, Soledad Canyon Creek, San Francisquito Canyon Creek, Fish Canyon Creek, and Lower Castaic Creek in Los Angeles County, San Felipe Creek in San Diego County, and Sugarloaf Pond and Bluff Lake in San Bernardino County. They are also reported from San Antonio Creek drainage in Santa Barbara County.

Monitoring and surveys cover the majority of the range of Unarmored Threespine Stickleback in California. The main survey sites occur in streams within the Santa Clara watershed. One out-of-basin Unarmored Threespine Stickleback population is also monitored at San Felipe Creek.

Current and Past Monitoring

The Department's South Coast Region staff monitors and manages Unarmored Threespine Stickleback of the Santa Clara River watershed populations and San Felipe Creek. Five Unarmored Threespine Stickleback-occupied streams in the Santa Clara River watershed are monitored on a weekly to monthly basis by Department staff to document their presence, water quality, stream discharge, and potential for fish strandings. Staff collect data on stickleback presence, relative abundance and distribution, water quality, stream discharge, stream habitat, size class, and the presence and relative abundance of other native and non-native aquatic species. Multiple fish rescues and translocations have occurred since 2014 as recovery actions in response to drought and wildfire impacts. A trapping study was conducted by the Department, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey in Soledad Canyon Creek from 2021-2023 (2-3 surveys per year) to determine the relative abundance and distribution of the Unarmored Threespine Stickleback population. The Fish Canyon Creek population may be locally extirpated. Current staff includes one Senior Environmental Scientist (Specialist) and one Scientific Aid, both funded from a non-permanent State Wildlife Grant. Additionally, one Scientific Aid is funded through June 30, 2024.

Drought and wildfire impacts have resulted in several rescues and translocations. These include:

- 338 fish rescued from the Santa Clara River and released into San Francisquito Canyon Creek in 2014,
- 171 fish rescued from Soledad Canyon Creek and translocated into Fish Canyon Creek in 2016,
- 80 fish rescued from San Felipe Creek and relocated further upstream in 2018,
- 308 fish translocated from Fish Canyon Creek to Soledad Canyon Creek in 2020,
- 65 fish rescued from San Francisquito Canyon Creek and relocated upstream in 2022;
- 195 fish translocated from San Felipe Creek to Soledad Canyon Creek in 2022, and
- 73 fish rescued from San Francisquito Canyon Creek and relocated upstream in 2023.

The Department's Inland Deserts Region generates data on the presence and relative abundance of the San Bernardino County Unarmored Threespine Stickleback populations. Staff includes one temporary Environmental Scientist whose funding expires June 30, 2024. Department staff have surveyed all known San Bernardino County population sites in 2023. The results of these surveys indicate that the population in Shay Pond is extirpated, and the population at Juniper Springs is likely extirpated as well, although confirmation is required. Unarmored Threespine Stickleback are present in high numbers in Sugarloaf Pond, and in 2023 a total of 222 individuals were translocated to establish a new population in Bluff Lake.

Comprehensive Monitoring Plan

Comprehensive monitoring would entail at minimum annual surveys of each population. If a population estimate is required, multiple mark-recapture surveys would be necessary. Each survey would require deployment of baited minnow traps in the early morning. The traps would soak for 90-minutes before checking each trap for fish. Fish above a predetermined size would be marked and released (first survey). Subsequent surveys would be the same except all captured fish would be checked for marks and all unmarked fish would be marked. Three to four of these surveys are recommended.

Similarly, additional surveys to determine relative abundance would require deployment of baited minnow traps in the early morning. The traps would soak for 90-minutes before checking each trap for fish. All captured fish would be counted and released. A minimum of two surveys at each location is recommended to generate a population trend over the course of a single year.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (Region 5 and Region 6), travel-related expenses, vehicles, and monitoring equipment. See Appendix A for a summary of resource needs.

ROUGH SCULPIN
Cottus asperrimus

Species Description and Listing Status

The Rough Sculpin is a small species of sculpin that is primarily found in the clear, cool, and fast-moving rivers and streams of the lower Pit River watershed. Within this range, the species occupies areas with aquatic vegetation and a sand or gravel substrate. The Rough Sculpin is listed as threatened under CESA. Known threats are consistent with those for other native fish species residing in the Pit River watershed, especially the Fall River. Threats for Rough Sculpin in California include livestock grazing, invasive species, water management, drought, and climate change. Additional threats may be identified if a future study occurs.

Rough Sculpin and its California range represented in black on the map. The area is represented at hydrologic unit scale and may be larger than the true range. Photo credit: Spring Rivers Ecological Sciences LLC.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	Medium

Very little information is known of either the current population status or trend of Rough Sculpin because monitoring surveys have not been conducted since the 1970s.

Current and Past Monitoring

The Department and partners undertook efforts in 1973, 1974 and 1978 to understand the biology, distribution, and range of the species. These surveys appear to have established an accurate range for the species; however, it does not appear that these efforts have been repeated. Several large data gaps exist related to the current range, distribution, population size, threats, and trends of the species.

Limited annual incidental observations of the species may occur during Shasta crayfish recovery monitoring. The data, which is collected from Spring Rivers Ecological Sciences LLC and Pacific Gas and Electric might be attainable because Memorandums of Understanding and Scientific Collecting Permits are generally issued for the type of survey work conducted by these entities.

Comprehensive Monitoring Plan

Recommendations within the *Status and Proposed Management of the Rough Sculpin, Cottus asperrimus, in California* are still valid (Daniels and Courtois 1982). An effort to ascertain current range size should be undertaken over a period of 2-3 years using backpack electroshocking, hand seines and direct observation (e.g., snorkel surveys). Appropriate transects would then be established within the current range and direct observation would occur over a period of two years to establish baseline population estimates. Follow-up surveys would then occur every five years to assess population trends. Efforts would be complicated within some parts of the species' range due to overlap with state and federally listed populations of Shasta Crayfish, limiting the ability of staff to use backpack electroshocking in areas occupied by the crayfish. Furthermore, an additional complicating factor with Rough Sculpin is that neither the Department nor any other agency has done any work on the species in decades and no institutional knowledge exists to guide new monitoring efforts.

Resources Needed to Implement Comprehensive Monitoring

The comprehensive monitoring plan outlined above would require staff resources (to maintain a five-month long field season and up to 20 survey trips per year), which could vary significantly across the species' range—direct observation efforts require a larger number of people to provide accurate coverage in larger waterbodies (e.g., the Fall River, lower Hat Creek, Horr Pond). Additional resources would be needed for travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

SANTA CRUZ LONG-TOED SALAMANDER
Ambystoma macrodactylum croceum

Species Description and Listing Status

The Santa Cruz Long-toed Salamander is an amphibian found near ponds or slow-moving streams in Santa Cruz and Monterey counties. The species is endemic to southern Santa Cruz and northern Monterey counties in an area approximately 16 miles long and 5 miles wide. The northern extent of the range occurs around Aptos in Santa Cruz County, and the southernmost extent occurs south of Highway 156 near Castroville. Santa Cruz Long-toed Salamander is listed as endangered under both CESA and the ESA. Threats to the species include habitat loss from urban and commercial development, habitat degradation and fragmentation, expansion of highways that restrict movement between upland and breeding habitat and increase road mortalities, disease, climate change, pesticide use, invasive species, salinization, and competition.

Santa Cruz Long-toed Salamander and its California range represented in gray on the map. Photo Credit: Mark Allaback, Biosearch Environmental Consulting.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Medium
Range Size	Medium
Range Trend	High
Threats	High

Since 1954, 32 Santa Cruz Long-toed Salamander breeding sites have been identified (USFWS 2019). The 2019 U.S. Fish and Wildlife Service five-year review notes that only 23 sites are known to have successful breeding, with 18 of those sites in Santa Cruz County and five in Monterey County. Population estimates are largely unavailable at most of the remaining known breeding sites and many of the mark-recapture studies that provided population estimates are now outdated. Conducting mark-recapture studies for this species is labor intensive, expensive, and has been done sporadically on conserved properties. These studies can vary widely from year to year at the same pond because not every individual attempts to breed every year, and the number

of individuals attempting to breed can vary greatly due to rainfall totals and timing throughout the season.

For many years, Department staff have conducted annual surveys of Santa Cruz Long-toed Salamander larvae at most of the conserved breeding ponds; however, follow-up information regarding breeding success (e.g., metamorphs leaving the ponds) is not consistently collected. Where mark-recapture studies have been repeated, estimated population trends have been either inconclusive or have indicated stable or declining populations. For instance, the Valencia Lagoon population declined between 1978 (estimate of 2,583) and 2008 (estimate of 734) (Reed 1979, Biosearch 2008). Ellicott Pond appears to have remained stable between 1972 (estimate of 10,080) and 2015 (estimate of 9,913) (Biosearch 2015). Four previously unknown breeding ponds have been discovered over the last 10 years. However, at least three known breeding ponds have been functionally lost in that time due to salinity intrusion. Other known breeding ponds have been impacted by vegetation clearing, construction of migration barriers, roadkill, and recent drought conditions.

Current and Past Monitoring

Mark-recapture studies are ongoing and sporadic based on availability of funding. These studies are typically contracted to local biological consultants. Dipnet surveys to detect larvae and breeding occur annually by U.S. Fish and Wildlife Service and Department staff but do not provide information on population size or trends. Currently, a metamorph study is being conducted at the University of Miami. The Elkhorn Slough National Estuarine Research Reserve and Elkhorn Slough Foundation have recently completed an environmental DNA study that will likely be incorporated into future monitoring efforts (Goldberg et al. 2023). These survey efforts provide data on presence of larvae, local population estimates, upland observations, and environmental DNA detections; however, none of the survey efforts cover the entire range of the species or sample the sites annually. Additionally, since Santa Cruz Long-toed Salamander adults may not breed every year, survey results can vary dramatically.

Comprehensive Monitoring Plan

The Department is currently collaborating with the University of California, Los Angeles on a Section 6 grant to estimate the effective population size of ponds using genetic methods. Because of the intensive effort required to conduct mark-recapture surveys, this may be a more cost-effective approach that can be applied at all or most ponds. Initially, effective population size estimates from the genetic samples will be correlated with population estimates from mark-recapture studies to compare results of the two methods. The initial set of tissue samples for genetic analysis would be gathered in one year; however, the study and estimates would be repeated regularly to track changes over time. Land managers would track short-term population changes through ongoing dipnet surveys, monitor the presence of other species such as newts, and monitor hydroperiods. Dip-netting for larvae should continue annually. Follow-up surveys to determine successful transformation should be conducted using coverboards or other detection methods. Pond management includes survey work, grant/contract management, coordinating staff, and participating in technical advisory committee meetings to work with partner and other land managers with breeding ponds. Larval surveys take place in spring for varied durations depending on rainfall, and earlier winter surveys would be conducted during migration of adults to ponds. Additional time would be spent on analyzing data and planning the following year's surveys.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff to coordinate with other agencies, plan and implement surveys (including surveying as many of the ponds as possible before seasonal drying occurs), and conduct analyses. Additional resource needs would include travel-related expenses, vehicles, training, monitoring equipment, and contractor services. See Appendix A for a summary of resource needs.

LIMESTONE SALAMANDER
Hydromantes brunus

Species Description and Listing Status

The Limestone Salamander is a small amphibian in the lungless salamander family. It can be found in steep canyon slopes on moss-covered ledges, chaparral, or under rocks and logs in moist areas. The species has a very small range and is restricted to the Sierra Nevada foothills in Mariposa County. It is listed as threatened under CESA and is currently under review for listing under the ESA. Threats to the Limestone Salamander include habitat loss and fragmentation due to reservoir inundation, mining, and roads, and a general lack of information (life history, population data, connectivity) which challenges effective conservation actions.

Limestone Salamander and its California range represented in black on the map. Photo Credit: California Department of Fish and Wildlife.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	Low

The Limestone Salamander is difficult to detect and count because it occurs primarily underground on talus slopes that are difficult to survey. As a result, no estimate of population size or trend has been conducted or is presently available. Its range has been impacted by habitat loss and fragmentation from major highways and the creation of reservoirs and is likely stable to contracting.

Current and Past Monitoring

There have been no population surveys completed for Limestone Salamanders since the species range was originally surveyed in the early 1980s. Fragmented survey efforts have been completed for project specific work and additional occupied sites have been detected. Monitoring associated with Federal Energy Regulatory Commission projects and site-specific presence/absence surveys

are likely the only current data available (e.g., Merced ID 2011). Recently, the U.S. Fish and Wildlife Service funded the U.S. Geological Survey to conduct surveys to support its Species Status Assessment. Genetic samples collected during the surveys may be sufficient to permit inferences about effective population size and connectivity across the species' known range. None of the past surveys have covered the entire range, and very little is known about population size, trends, and density of the species. No Department funding is available for monitoring of this species.

Comprehensive Monitoring Plan

Given its reclusive nature and preferred habitat, regular monitoring is logistically difficult and time intensive. A combination of field survey and genetic sampling will be required to determine an accurate population status of the species. Surveys for Limestone Salamanders will need to be conducted along approximately 140 miles of drainages in the Merced River Canyon. Included in the surveys should be 63 locations from the 1980 survey, all known populations of Limestone Salamander reported in the California Natural Diversity Database, and additional areas identified by species experts through the use of topographical maps and other data, totaling approximately 235 survey locations. The full extent of the Limestone Salamander range will be established by surveying suitable habitat following the protocol delineated by Tordoff (1980).

In addition to surveys conducted using the Tordoff protocol, crews will place tiles in known occupied areas to attract and capture salamanders for genetic samples. Survey crews will place 200 tiles (50 tiles at each location) in three known Limestone Salamander occurrence sites (Hell Hollow, Briceburg, and the North Fork of the Merced), and in the Department's Limestone Salamander Ecological Reserve. All tile sites will be checked every other week from November to April. Individual Limestone Salamanders will be tagged along the ventral surface of the tail with a small chip (microtransponder chip) for tracking. Genetic samples will be collected and analyzed to determine effective population size. During the same period, other locations identified as potential Limestone Salamander habitat will be surveyed following Tordoff's (1980) protocol. Over the following year, slate tiles will be placed at the rest of the known Limestone Salamander sites and the likely occupied sites that were identified through topographical maps and exploratory surveys. When appropriate weather conditions exist during November to April, sites will be repeatedly surveyed. Initial survey effort to determine population status is anticipated to take five years. Continued annual field and genetic monitoring is required to determine population and range trends.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

BLACK TOAD
Anaxyrus exsul

Species Description and Listing Status

The Black Toad is a small amphibian that inhabits small wetlands in the high desert basin of Deep Springs Valley in Inyo County. It is currently listed as threatened under CESA and is not listed under the ESA. Threats to Black Toads include water diversions, increased livestock grazing, chytrid fungus, and climate change.

Black Toad and its California range represented in black on the map. Photo Credit: Wikipedia.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	Medium

There is no rangewide population estimate for Black Toad. The species is known to inhabit four springs in the Deep Springs Valley (Wang 2009). The Department performed a survey at a single occupied location in 1999 and estimated the population to be 8,419 toads. Due to a loss in breeding habitat, it is estimated that the population trend of Black Toads is likely declining. The current range trend of the species is unknown, with only two of the known occupied sites being surveyed in the last 15 years.

Current and Past Monitoring

There is at least one survey for Black Toads conducted by the Department and/or volunteer personnel each year. The purpose of these surveys is primarily to check habitat conditions and document the presence of Black Toads. The surveys focus on larvae and egg masses; adults are recorded if they are encountered. These surveys do not result in a population size or density estimate, are conducted opportunistically, and are conducted at only two sites in the Black Toad range. Data gaps include status of Chytrid fungus at occupied locations, occupancy of remote

satellite locations, distance that toads range from wetlands, impacts of climate change on hydrology, information on water diversions from spring habitat, and data on spring geochemistry.

Comprehensive Monitoring Plan

An accurate statewide population estimate for Black Toads would include mark-recapture surveys of adults during the breeding season (spring) and visual encounter surveys of egg masses. A minimum of 2–3 years would be required, but 10 or more years would be necessary to establish an accurate population trend, especially given interannual variation in precipitation that can significantly impact toad populations. To monitor the health of the population, swabbing for Chytrid fungal disease should be conducted in each population on an annual basis.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

BLUNT-NOSED LEOPARD LIZARD
Gambelia sila

Species Description and Listing Status

The Blunt-nosed Leopard Lizard is a large lizard in the iguana family that inhabits arid regions through much of the southern part of the San Joaquin Valley. It is listed as endangered under both CESA and the ESA. Threats to the Blunt-nosed Leopard Lizard include habitat loss, habitat degradation, habitat encroachment by dense non-native plants, precipitation cycle changes (causing longer or more extreme wet and dry cycles), prey base dynamics, and effects of agricultural pest management.


Blunt-nosed Leopard Lizard and its California range represented in gray on the map. Photo credit: Kai Medak.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Low
Range Size	Medium
Range Trend	Medium
Threats	Medium

Although there is no population size estimate available, the Department estimates there are 14 extant populations. A recent genetic study included samples from 17 pure Blunt-nosed Leopard Lizard populations and 6 sites in a zone where Blunt-nosed Leopard Lizard is potentially hybridized with Long-nosed Leopard Lizards (Richmond et al. 2017). Known populations include Little Panoche Valley, Panoche Plateau, Silver Creek Ranch, Kettleman Hills, Pixley National Wildlife Refuge, Allensworth Ecological Reserve, Semitropic Ecological Reserve, Antelope Plain, Buttonwillow Ecological Reserve, Lokern, Buena Vista, Elkhorn Plain, Carrizo Plain, Bakersfield, Comanche Point, and Wheeler Ridge, plus the hybrid zone in the Cuyama watershed (Richmond et al. 2017). There are two other occurrences of uncertain status. Blunt-nosed leopard lizards were documented in the 1980s on private property in Madera Valley (Williams 1990), and at least one individual was documented there in 2012. The lizard was also documented in 2006 in the Firebaugh Essential Habitat Area in Madera County (CNDDB 2019).

Current and Past Monitoring

Previous monitoring and reporting efforts for this species have resulted in estimates of population sizes and density, demographics, survivorship, and reproduction. The U.S. Fish and Wildlife Service completed a five-year review in 2010–2011 and a Species Status Assessment in 2020. The Department currently monitors the Lokern and Semitropic ecological reserves with a long-term monitoring grid methodology and driving surveys in additional areas. The Department also conducts incidental monitoring at Buttonwillow and Allensworth ecological reserves. The U.S. Fish and Wildlife Service monitors Pixley National Wildlife Reserve biannually. There is currently an intensive monitoring and reintroduction effort in the Panoche Valley, and the Center for Natural Lands Management conducts driving surveys on their Panoche Reserve. Other surveys and monitoring for the species are sporadic and/or project specific. Within the Carrizo Plains National Monument (including the Elkhorn Unit and Panorama Unit of the Carrizo Plains Ecological Reserve), selected sections were surveyed in 2023 by the Department and the Bureau of Land Management. These surveys are intended to be completed annually to inform grazing decision criteria at Carrizo Plains National Monument per the Bureau's Resource Management Plan.

It is important to note that San Joaquin Desert wildlife populations are known to fluctuate widely with precipitation cycles, so long-term efforts are needed for accurate estimates and trends. Additionally, none of the above surveys cover the entire range of the species. Current long-term monitoring of the Department's ecological reserves in the Central Valley is funded by associated mitigation allocations. Other ecological reserves and protected areas do not receive the same level of monitoring due to limits in staff time and funding. The U.S. Fish and Wildlife Service often does not have the staffing to complete a more comprehensive long-term monitoring project at Pixley National Wildlife Reserve. Geographic data gaps are extensive on the west side of the San Joaquin Valley outside of conserved lands, and within the largest conserved core area (the Carrizo Plains National Monument) most of the potential habitat is not regularly surveyed.

Comprehensive Monitoring Plan

To obtain a statistically valid population estimate for the species, 5–10 long-term monitoring grids located throughout the range are needed. Sighting these grids would require time-intensive reconnaissance assessments on many properties where the current status of Blunt-nosed Leopard Lizards is unknown. Once long-term monitoring grids are established, estimates based on walking transects could be complemented by also genetically determining the effective population size, if enough lizards could be captured in these areas. Scat detection dogs would aid substantially in detecting the individuals in long-term monitoring transects or plots. Long-distance transects using scat dogs through the Carrizo Plains National Monument, with associated genotyping of scat, would provide more reliable estimates of the number of individuals. To establish trends, these surveys should be repeated annually for 10–20 years. Lack of habitat management of dense non-native ground cover during wet years is likely detrimental to population trends in most areas, so monitoring different habitat management regimes would also improve our knowledge of trends.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (to support initial reconnaissance and range-wide assessment), travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

SAN FRANCISCO GARTER SNAKE
Thamnophis sirtalis tetrataenia

Species Description and Listing Status

The San Francisco Garter Snake requires both aquatic habitat near ponds, creeks, marshes, or canals for foraging and basking, and upland grassy habitat for cover, mating, and hibernation. The subspecies has a very small range and is only found on the San Francisco Peninsula from San Mateo County to northwestern Santa Cruz County along the base of the Santa Cruz Mountains. It is listed as endangered under both CESA and the ESA. Threats to the San Francisco Garter Snake include genetic isolation of northern and southern populations due to lack of connected habitats, habitat loss and fragmentation due to urbanization, sea level rise and saltwater intrusion into wetlands, and loss of freshwater wetlands. Historically, illegal collection was a problem and may still be to some extent. In some areas, non-native predators may be a problem (e.g., the West-of-Bayshore property owned by the City of San Francisco, and which supports the snake, has feral cats and invasive bullfrogs). The fungus responsible for Snake Fungal Disease (*Ophidiomyces ophiidicola*; ophidiomycosis,) was detected on San Francisco Garter Snakes at the West-of-Bayshore property in April 2022; however, the impacts of this disease on the species are uncertain.

San Francisco Garter Snake and its California range represented in black/gray on the map. Photo Credit: Mark Allaback, Biosearch Environmental Consulting.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Low
Range Size	High
Range Trend	Low
Threats	High

Overall, populations of the species are small and isolated. Wood et al. (2020) estimated that effective population size and adult abundance were small (< 100) at most sites. The U.S. Fish and Wildlife Service recovery plan for the species includes a goal of at least 10 populations with a minimum of 200 adults each (USFWS 1985). There are currently 13 known population complexes

(USFWS 2020). Wood et al. (2020) reported that small population sizes and reduced connectivity among populations may have increased differentiation (particularly at the most geographically isolated populations) and decreased genetic diversity in at least one remaining population. Longer-term repeat studies would be required to obtain information on contemporary population trends.

Based on records from the California Natural Diversity Database and a lack of recent observations, the Department estimates the range to be shrinking. The Species Status Assessment conducted by the U.S. Fish and Wildlife Service (USFWS 2020) states that while the overall range has not changed much over time, distribution within the range has decreased in areas where habitat was lost.

Current and Past Monitoring

From 2016 to 2018, Wood et al. (2020) performed demographic surveys at seven sites in San Mateo County. Otherwise, monitoring has occurred sporadically throughout the range, and very few populations are surveyed routinely. Demographic surveys are conducted at the West-of-Bayshore property every five years as part of the San Francisco International Airport Recovery Action Plan for the species (most recently in 2022). Surveys occurred on a Midpeninsula Regional Open Space District ownership as part of a graduate project (Kim et al. 2018), and open space district biologists may be conducting ongoing monitoring. California State Parks is interested in commencing surveys on its properties, but to date, none have occurred.

Data generated from the studies summarized above include general observations from visual encounters, genomic assessments of diversity and population structure, and mark-recapture analyses resulting in population size estimates. None of the survey efforts have reliable funding or staff, and the surveys only cover a portion of the species range. Important data gaps include population trends, surveys for presence/absence outside of known breeding areas (particularly on private lands), use of upland habitats, and dispersal distances.

Comprehensive Monitoring Plan

Future rangewide monitoring efforts should be modeled after Wood et al. (2020). This involves the use of multiple traplines—drift fence arrays with funnel traps—at each site from April through June. Surveys should continue at known populations and be expanded to other known and potential new locations. Each population complex (13 total known) could likely be surveyed in 6–8 weeks. Monitoring can be conducted annually with rotation between a subset of sites each year. Tissue collection and genomic analysis should continue to track genetic diversity over time and to evaluate diversity, population structure, and rates of inbreeding at additional sites.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (to survey known locations, evaluate potential for occupancy at new sites, and survey locations to identify new populations), travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

TRUMPETER SWAN
Cygnus buccinator

Species Description and Listing Status

The Trumpeter Swan is the largest waterfowl species in North America and inhabits freshwater lakes, ponds, marshes, and slow river stretches with abundant aquatic vegetation. Trumpeter swans do not breed in California, but the state is at the southern-most edge of the wintering range, and Trumpeter Swans are uncommon in the Sacramento Valley and northeastern California during the winter. The species is not listed under CESA or the ESA. Threats to the species include powerlines and lead poisoning.

Trumpeter Swans. This species does not currently have a known consistent range in California, as Trumpeter Swans occur only in small numbers seasonally. Photo Credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	High

The North American Trumpeter Swan Survey was conducted at 5-year intervals from 1968–2015. Trumpeter Swans in North America are divided into three populations: Pacific Coast, Rocky Mountain, and Interior populations; California is on the edge of the wintering range for both the Pacific Coast and Rocky Mountain populations. The Survey—which did not include California because the state is outside the breeding range—indicated a total annual growth rate of 6.6% (1968–2015). The 2015 North American population size estimate was the largest since the survey began in 1968. Very small numbers of Trumpeter Swans occur infrequently and irregularly in the state during the nonbreeding season. Most observations have been in the Sacramento Valley and northeastern California between November and March and consist of no more than a handful of birds.

The range trend is estimated to be stable to increasing, as in recent years, observations of the species in California have increased. The Pacific Coast and Rocky Mountain populations have both exceeded population objectives.

Current and Past Monitoring

The North American Trumpeter Swan Survey was conducted by Pacific Flyway partners (including state, provincial, and federal agencies) at 5-year intervals from 1968–2015 but has since been discontinued. Data generated from these surveys included abundance estimates and distribution for North American breeding populations; however, Trumpeter Swans do not breed in California, so the state is not included in the survey area. Financial and logistical constraints have always influenced the degree to which cooperators have been able to meet the survey objectives, and the survey was discontinued following many years of increasing population numbers. As there have been no surveys since 2015, there is no current information on the species population and trends.

Comprehensive Monitoring Plan

The Trumpeter Swan does not breed in California. The state is on the edge of the wintering range for Trumpeter Swan and the species occurs in very small numbers during the winter. Given this, a comprehensive monitoring plan is not warranted.

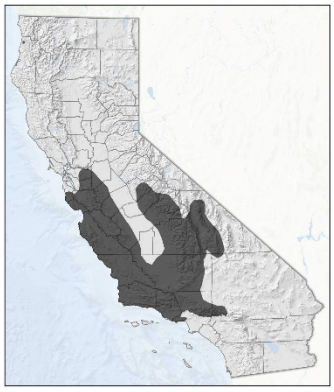
Resources Needed to Implement Comprehensive Monitoring

There is no breeding population of Trumpeter Swans in California and very few occur in the state during the nonbreeding season. Adequate resources are currently available to conduct breeding season waterfowl surveys, which could detect breeding Trumpeter Swans if they were to become established in California. Observations of swans during the nonbreeding season are uncommon, and usually attributed to bird watching members of the public. Therefore, no additional resources are proposed for monitoring of this species.

CALIFORNIA CONDOR
Gymnogyps californianus

Species Description and Listing Status

The California Condor is North America's largest raptor; its habitat includes large areas of undeveloped land that contain large trees for roosting and cavities or cliffs for nesting—grasslands, oak woodlands, forests, and coastal areas bordering mountains. Its current range in California is limited mostly to areas where it has been reintroduced including mountains in the southern part of the state, the central coast, and a new population in far northwestern California. It is listed as endangered under both CESA and the ESA. The primary threat to California Condors is lead poisoning which accounts for approximately 50% of the annual mortality. Additional threats include micro-trash ingestion, Highly Pathogenic Avian Influenza, habitat loss, illegal shooting, powerline collisions and electrocutions, wildfires, predation, and wind energy development.



California Condor and its California range represented in gray on the map. Photo Credit: California Department of Fish and Wildlife.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	High

The California Condor Recovery Program, led by the U.S. Fish and Wildlife Service, tracks every condor in the total population, both captive and wild free flying birds. As of 2022, the total world population size (wild free flying and captive birds) was 561, and the total free flying population was 347. The California-only wild free flying population is 191 individuals (USFWS 2022). The population trend is slowly increasing but requires supplemental feeding, chelation therapy for lead poisoning, and captive breeding and releases into the wild population each year. Although the current range of condors is much smaller than the historical range, the range is expanding with new experimental populations being reintroduced. The latest population is the northern

California flock managed by the Northern California Condor Restoration Program, a partnership between the Department, the Yurok Tribe, U.S. Fish and Wildlife Service, and National Park Service, which currently manages eight free flying individuals.

Current and Past Monitoring

The California Condor Recovery Program closely monitors the entire population. The recovery program includes several zoos, captive breeding facilities, release locations, organizations that manage individual flocks, state agencies, and other partners (e.g., non-profit organizations, national parks, tribes). Population data are compiled and analyzed on an annual basis. Data generated from these efforts include population size, trend, movement, home range/territory sizes, reproductive success, and mortalities. The recovery program is funded through various federal and state grants, private donations, and other funding sources. Funding is still needed to implement long-term support for non-lead outreach. There are no important data gaps for this species.

Comprehensive Monitoring Plan

The California Condor Recovery Program provides all necessary efforts for comprehensive monitoring.

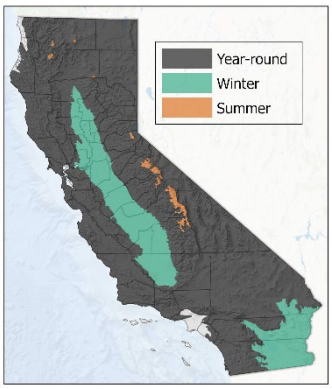
Resources Needed to Implement Comprehensive Monitoring

Adequate resources are currently available to conduct the comprehensive monitoring program. Therefore, no additional resources are identified for monitoring of this species.

GOLDEN EAGLE
Aquila chrysaetos

Species Description and Listing Status

The Golden Eagle is a large raptor that inhabits open habitats—such as grassland, chapparal, and shrubland—throughout the Northern Hemisphere. Golden Eagles range statewide in California. In certain high mountain areas (e.g., Sierra Nevada), they are only present in the summer, while the Central Valley and southeasternmost California are winter-only habitat. They are present year-round in the rest of the state. The species is not listed under CESA or the ESA. While not on the current list of California Bird Species of Special Concern (Shuford and Gardali 2006), Golden Eagles were a Species of Special Concern on the previous two lists (Remsen 1978; CDFG 1992). Threats to Golden Eagles in California include habitat loss (land conversion), wind energy collisions, powerline collisions and electrocution, lead poisoning, illegal shooting, and rodenticides.



Golden Eagle and its California range represented in gray (year-round range), green (winter range) and orange (summer range) on the map.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	High
Range Trend	Low
Threats	High

There is limited information available on the population status of Golden Eagle in most of California. However, there is good information available for the resident breeding Golden Eagle population in the East Bay/Diablo Range (Wiens et al. 2020) and the resident breeding population in Riverside and San Diego counties (Wiens et al. 2022). The Diablo Range Study Area, encompassing 5,169 km^2 and including the Altamont Pass Wind Resource Area, supports an estimated 280 pairs of Golden Eagles (Wiens et al 2015), and the resident breeding population in Riverside and San Diego counties consists of about 60 pairs (Weins et al. 2022). Telemetry studies

indicate the Diablo Range population is mostly resident (Hunt 1998, 2002). Outside of these two study areas, we know very little about Golden Eagles in California.

The U.S. Fish and Wildlife Service conducts annual surveys in the interior west but does not include California, and no updated population estimates have been released since 2016 (Millsap et al. 2016). The U.S. Fish and Wildlife Service estimates suggest that the population of Golden Eagles is stable in the western United States (Millsap et al. 2016). California Golden Eagles are genetically distinct from other, migratory Golden Eagles in western North America (Doyle et al 2016).

Current and Past Monitoring

The U.S. Geological Survey and East Bay Regional Parks survey for Golden Eagles annually in the Diablo Range. The U.S. Geological Survey and Bloom Biological, Inc. surveyed in southern California in 2016–2017. Within those two study areas, these surveys provided abundance estimates, occupancy and detection probability estimates, numbers of territorial pairs, and a monitoring framework for future monitoring efforts. These monitoring efforts, however, do not have reliable funding and staffing for the future and cover only a small portion of the species range. The U.S. Fish and Wildlife Service surveys occur annually in the interior west but do not include California.

Comprehensive Monitoring Plan

An accurate statewide breeding population estimate for Golden Eagles would include a randomized survey design where survey sites are selected from a grid with cell sizes equal to a Golden Eagle territory (~1,385 ha), which is consistent with other Golden Eagle survey designs for comparable data collection and results (e.g., Pagel et al. 2010; Wiens et al. 2015, 2022). A minimum of two consecutive survey years would be required for a single estimate, but more years would result in more precise and accurate estimates and would be required to determine population trend. Survey efforts should be repeated every 5–10 years.

Resources Needed to Implement Comprehensive Monitoring

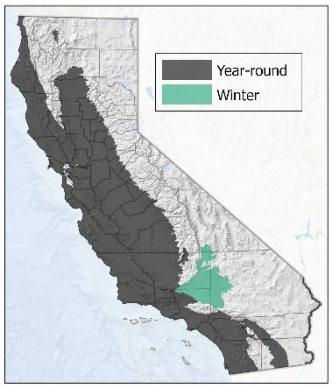
Required resources would include those needed for staff, travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

A State Wildlife Grant proposal in 2019 to conduct a one-time Golden Eagle statewide population survey following the survey design of Weins et al. (2022) had an estimated total project cost of $311,000. A State Wildlife Grant proposal in 2023 to conduct a statewide Swainson's Hawk population survey following a similar survey design as Golden Eagle surveys had an estimate total project cost of $384,000. Both proposals included staff to coordinate survey efforts and manage and analyze data, contract services to train and coordinate volunteers, and 50–100 volunteers to conduct surveys. Depending on resources available, a comprehensive monitoring program could be carried out for all three fully protected raptor species (Golden Eagle, White-tailed Kite, and Southern Bald Eagle).

WHITE-TAILED KITE
Elanus leucurus

Species Description and Listing Status

The White-tailed Kite is a small raptor common in grasslands, open woodlands, marshes, and other relatively open habitats. The historical range of the species covers most of the Central Valley, San Franciso Bay Area, coastal southern California, and the Coast and Transverse ranges. It is not listed under CESA or the ESA. While not on the current list of California Bird Species of Special Concern (Shuford and Gardali 2006), White-tailed Kites are on the "watch list" (meaning they may qualify as a Species of Special Concern in the future, depending on population trends and other factors). Threats for White-tailed Kites include habitat loss, illegal shooting, decreased prey populations, natural and agricultural land conversion and development, and possibly pesticide and rodenticide exposure.



White-tailed Kite and its California range represented in gray (year-round range) and green (winter range) on the map.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	Medium

There is no recent information on White-tailed Kite population size in California. Past studies included a master's thesis that monitored nests in Orange County (Niemela 2007) and a master's thesis that studied a population in northwestern California on Fay Slough Wildlife Area in Eureka (Dunk 1992). Another study monitored 22 nests in the Sacramento Valley (Erichsen et al. 1996). There is also no recent information on kite population trends. In southern California, it was believed kites may have been declining in the early 2000s after initially recovering from a period of near-extinction from the 1930s–1970s (Niemela 2007). Other experts suggest a population increase overall has occurred in recent decades (Bloom and Bailey 2005). Breeding Bird Survey (BBS) data suggest a significant declining trend between 1982 and 1991 across much of California; the most significant decline occurred in southern California with an estimated 38.7% annual

decline from 1982–1991 (Dunk 2020). However, BBS data may not be optimal for detecting trends in relatively rare species such as kites.

There is no recent information on range size or trends in California. There is some anecdotal evidence that White-tailed Kites may be expanding their range in southern California (i.e., eBird records of resident breeding pairs in new locations), and there may be an overall range expansion across California (Bloom and Bailey 2005).

Current and Past Monitoring

There are no rangewide monitoring efforts for White-tailed Kites in California. Monitoring for White-tailed Kite has included surveys conducted by Humboldt State University (in northern California), Bloom Biological, Inc. (in southern California), and the U.S. Geological Survey and University of California, Davis (in Suisun Marsh). None of the surveys occurred regularly, and most are several decades old. The data available from these surveys include reproductive status, nest locations and territories, nest habitat characteristics, and relationship to prey cycles. None of the surveys resulted in a population size or density estimate. There is no current monitoring or funding for monitoring of the species. As a result, we know very little about kite populations in California, and statewide surveys and monitoring are needed.

Comprehensive Monitoring Plan

To obtain a statistically valid statewide population estimate for White-tailed Kites, a randomized survey design similar to other statewide raptor survey designs (see the Golden Eagle and Bald Eagle species accounts) is required. A minimum of two consecutive survey years would be required, but more years would result in more precise and accurate estimates and would be required to establish population trends. Survey efforts should be repeated every 5–10 years.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, volunteers, travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

A State Wildlife Grant proposal in 2019 to conduct a one-time statewide population survey for Golden Eagle had an estimated total project cost of $311,000. A State Wildlife Grant proposal in 2023 to conduct a statewide Swainson's Hawk population survey following a similar survey design as Golden Eagle surveys had an estimate total project cost of $384,000. Both proposals included staff to coordinate survey efforts and manage and analyze data, contract services to train and coordinate volunteers, and 50–100 volunteers to conduct surveys. Depending on resources available, a comprehensive monitoring program could be carried out for all three fully protected raptor species (Golden Eagle, White-tailed Kite, and Southern Bald Eagle).

SOUTHERN BALD EAGLE
Haliaeetus leucocephalus

Species Description and Listing Status

The Bald Eagle is a large raptor that ranges throughout North America. In California, the species is most abundant in the northern part of the state and the Sacramento Valley; in southern California, Bald Eagles are restricted to southern coastal areas and the Channel Islands. About 60% of the statewide range is winter-only habitat. Bald Eagles are listed as endangered under CESA but have been delisted from the ESA. The most significant threat to survival of the Bald Eagle in the twentieth century was the widespread use of the pesticide DDT in the decades after World War II, which caused abnormalities in eggshells, resulting in widespread nesting failures. Other adverse impacts have included habitat modification from road, housing, and other developments; agriculture; timber harvest; pesticides and contaminants, including lead poisoning; off-road vehicles and other human disturbances; electrocution and collision at power lines; and illegal shooting.

Bald Eagle and its California range represented in gray on the map. Photo Credit: Jason Crotty.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	Medium
Range Trend	Medium
Threats	High

In California the Bald Eagle population is small but slowly increasing. There is a large resident breeding population in northeastern California. The U.S. Fish and Wildlife Service conducts population surveys for Bald Eagles approximately every six years to update population estimates and to inform take, but these surveys do not always include California or cover all eagle management units (EMU), and are used to extrapolate estimates across the conterminous U.S. Additionally, the southern Pacific Flyway eagle management unit, which includes all of California south of 40-degree latitude, is excluded from the U.S. Fish and Wildlife Service population assessment. Therefore, population monitoring for most of California is lacking.

Large efforts have been made to restore the Channel Islands population through captive breeding and translocations and have included annual monitoring of all territories since 1980. Breeding pairs now occur on five of eight Channel Islands (Sharpe 2022). From 1986 to 2000, the Ventana Wildlife Society released 70 captive-bred juvenile Bald Eagles into central California; this area is regularly monitored by the society and 30 breeding territories have been established. Otherwise, there has been little systematic effort to monitor mainland populations in California. The Department tracks breeding territories statewide, with data largely being reported to the California Natural Diversity Database by permit holders. However, these data are not collected via a systematic or statistically rigorous survey design and thus do not provide population estimates. As of 2016, there were 375 known reported territories (both historical and current) in California. The breeding range of Bald Eagles is expanding in California.

Current and Past Monitoring

Monitoring of Bald Eagles on the Channel Island is conducted annually by the Institute for Wildlife Studies (in collaboration with the Department, the U.S. Fish and Wildlife Service, Santa Catalina Island Conservancy, the National Park Service, and The Nature Conservancy). North of 40 degrees latitude (approximately the latitude of Corning), surveys are conducted by the U.S. Fish and Wildlife Service every 5–10 years. Data generated from these surveys includes population size, abundance, territories/pairs, and breeding success, depending on the survey location. No other mainland, interior, south of 40-degree latitude systematic surveys or monitoring is occurring for the species.

Comprehensive Monitoring Plan

To obtain a statistically valid statewide population estimate for Bald Eagles, a randomized survey design and a dual-frame sampling design following that used by the U.S. Fish and Wildlife Service for their rangewide/eagle management unit surveys (USFWS 2020) would be required. Bald Eagle surveys would be conducted almost entirely via aerial surveys due to the nature of nest locations, but ground or boat surveys would be required for a portion of the range. A minimum of two consecutive survey years would be required, but more years would result in more precise and accurate estimates and would be required to establish trends. Survey efforts should be repeated every 5–10 years.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, volunteers, travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

A State Wildlife Grant proposal in 2019 to conduct a one-time statewide population survey for Golden Eagle had an estimated total project cost of $311,000. A State Wildlife Grant proposal in 2023 to conduct a statewide Swainson's Hawk population survey following a similar survey design as Golden Eagle surveys had an estimate total project cost of $384,000. Both proposals included staff to coordinate survey efforts and manage and analyze data, contract services to train and coordinate volunteers, and 50–100 volunteers to conduct surveys. A survey design for Bald Eagles, as well as the effort required to develop and implement this survey, would be similar, though a larger portion of the survey would be conducted via aerial surveys rather than ground surveys. Depending on resources available, a comprehensive monitoring program could be

carried out for all three fully protected raptor species (Golden Eagle, White-tailed Kite, and Southern Bald Eagle).

CALIFORNIA BLACK RAIL
Laterallus jamaicensis coturniculus

Species Description and Listing Status

The California Black Rail is a small wading bird that lives in fresh, brackish, and salt marsh wetlands; it is most common in tidal salt marshes dominated by pickleweed. They range throughout the San Francisco Bay area and Suisun Marsh, in small pockets of southeastern California (Salton Sea and lower Colorado River regions), and disjunct populations in the Sacramento-San Joaquin Delta and Sierra Nevada foothills. They may occasionally occur in other areas of coastal northern and southern California. The species is listed as threatened under CESA and is not listed under the ESA. Threats to California Black Rails include habitat loss, climate change, and sea level rise.


California Black Rail and its California range represented in gray on the map. Photo Credit: Ed Harper.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Medium
Range Trend	Low
Threats	Medium

There have been no rangewide population studies of the California Black Rail; therefore, there is no available information on population and range size or trend. Localized surveys have occurred across most of the range in California, but the techniques used for these efforts have varied, sometimes providing occupancy or abundance estimates and sometimes just documenting local presence and distribution.

Current and Past Monitoring

Surveys for California Black Rail across the range have been somewhat sporadic. After a new population of California Black Rails was discovered in the northern Sierra Nevada foothills in 1994, the University of California, Berkeley conducted surveys and estimated occupancy rates at 164 small, widely scattered marshes (Richmond et al. 2008).

Surveys have been conducted widely across the San Francisco Bay Area portion of the range, but survey goals and results have varied. Evens and Nur (2002) conducted surveys broadly across the northern San Francisco Bay region in 1996 to document distribution and relative abundance of California Black Rails. Spautz and Nur (2002) surveyed 34 tidal marshes in San Pablo, Suisun, and northern San Francisco Bays, and western Marin County in 2000–2001. They provided estimates of distribution, abundance, and total population per region. Veloz et al. (2011) estimated that, in 2010, there were 8,800 Black Rails in Suisun Marsh and 10,600 in San Pablo Bay. Tsao et al. (2009) captured 130 Black Rails and radio-marked 48 in 2005–2006 in the San Francisco Bay to examine home range, habitat selection, and movements.

In the Sacramento-San Joaquin River Delta, Tsao et al. (2015) conducted Black Rail surveys in 2009–2011 and detected 44 Black Rails at 21 of 107 sites surveyed.

No recent studies have resulted in population size or density estimates for the California Black Rail across the range, and the local survey efforts described above do not have reliable sources of funding or staff. Data gaps include accurate information on population size and trend, range size and trend, current threats, and connectivity and movement between subpopulations.

Comprehensive Monitoring Plan

Standardized protocols for California Black Rail have been established for several regions across the California range (Wood et al. 2017 for the Bay Area, Richmond et al. 2008 for the Sierra Nevada foothills, Conway et al. 2011 has frequently been applied in southern California). These protocols are similar and involve survey transects where calls of the species are broadcast, followed by a listening period to detect the species if present; multiple visits (usually 3–6) are required per survey location. Each protocol can result in local occupancy estimates for the rail. For a rangewide estimate of occupancy, repeat visits would be made to survey locations across the range throughout the breeding season. Multiple survey years are required to establish population trends.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (for rail populations occurring primarily in Regions 2, 3, and 6) to plan the survey effort, conduct training, perform surveys, manage and analyze data, and prepare reports. Additional required resources include travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

LIGHT-FOOTED RIDGWAY'S RAIL

Rallus obsoletus levipes

Species Description and Listing Status

The Light-footed Ridgway's Rail (formerly known as Light-footed Clapper Rail) is a medium-sized wading bird found in brackish tidal marshes and lagoons along the coast of southern California and Baja California, Mexico. It is listed as endangered under both CESA and the ESA. Threats include habitat loss (estimated 70–90% of southern California lagoons have been converted by human development) and reduced quality in remaining habitat. Climate change and the associated sea level rise and severe storms have caused extreme high water events that reduce critical cover and increase predation rates.

Light-footed Ridgway's Rail and its California range represented in gray on the map. Photo Credit: Alan Vernon.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	High
Range Size	High
Range Trend	High
Threats	Medium

Census surveys have been conducted annually since 1980 by Department and U.S. Fish and Wildlife Service contractors. The number of breeding pairs detected has varied considerably over the 44-year survey period, with the smallest census size of 142 in 1985 and the largest census size of 656 occurring in 2016. In the 2023 census, 266 pairs were detected (Zembal and Hoffman 2023). These surveys have also indicated that the range has contracted in recent decades.

Current and Past Monitoring

Department and U.S. Fish and Wildlife Service contractors have led annual surveys and reported on the number of breeding pairs detected since 1980. Funding for the surveys has come from a variety of sources and has not been reliable. The survey has relied on participation of volunteers (under the guidance of the contractor) to fill gaps in the survey area. Additional funding is needed

if these surveys are to continue in the future; a reliable source of funds would relieve the Department and others of the ongoing effort to secure funding for these important surveys. Most of these surveys have occurred only in the United States, and relatively little is known about the population in Mexico, which may be larger than the U.S. population.

The Rail Recovery Plan (USFWS 1985) states: "*The majority of Light-footed Clapper Rails reside in marshes within Baja California, Mexico…The relationship of the U.S. and Mexican populations is unclear at this time. The Mexican population is roughly estimated at a minimum of 800 pairs (Zembal, pers. comm.).*" Given the extremely small population size of the species, the Department has implemented a project to survey for Light-footed Ridgway's Rail in lagoons in Mexico in 2022 and 2023. These surveys have been conducted in cooperation with U.S. and Mexican partners and preliminary results have shown low numbers in these lagoons.

Continued surveys in the U.S. and more comprehensive surveys in Mexico are needed to fully implement the Recovery Plan and recover the species given the current scenario of climate change and human development that compounds the threats and stressors for this species.

Comprehensive Monitoring Plan

Current surveys, which have been ongoing since 1980, report the number of breeding pairs detected each year but do not provide a population estimate. The U.S. Fish and Wildlife Service is working with the University of Idaho to determine the most appropriate way to sample for a statistically valid population estimate of Light-footed Ridgway's Rails. For an accurate estimate, 3–5 years would be needed as the lagoon systems this species inhabits can be very dynamic. To establish a trend, surveys would be needed every other year.

Resources Needed to Implement Comprehensive Monitoring

Required staff resources will be identified in the U.S. Fish and Wildlife Service's monitoring strategy. To maintain the current survey effort, contractor team resources would be required. The benefits of having the established contractor team perform the survey include the logistical ease of having one team conduct the surveys on a variety of land ownerships (the Department, U.S. Fish and Wildlife Service, Department of Defense, and universities), maintenance of consistent observers for comparison to previous surveys, and a single entity to compile and analyze data. Required resources would include those needed for staff, travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

Resources are also recommended to support surveys at lagoons in Mexico. Having concurrent surveys in California and Mexico is critical to document the comprehensive status of this species.

CALIFORNIA RIDGWAY'S RAIL
Rallus longirostris obsoletus

Species Description and Listing Status

The California Ridgway's Rail (formerly known as California Clapper Rail) is a medium-sized wading bird found in brackish tidal marshes along the coast of northern and central California. It is listed as endangered under both CESA and the ESA. Threats include habitat loss and fragmentation from climate change (sea level rise and severe storms) and ongoing development, potential levee failure, invasive species, catastrophic human-caused events (e.g., oil spills), and other human-related disturbances (e.g., dogs off leash).


California Ridgway's Rail and its California range represented in gray on the map. Photo Credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	High
Range Trend	High
Threats	High

Point Blue Conservation Science conducted rangewide surveys, compiled data from 2019–2021, and estimated the total California Ridgway's Rail population size to be 1,426 individuals (Wood et al. 2022). Liu et al. (2009) estimated a very similar average population size from surveys conducted in 2005–2008, suggesting that the population has been somewhat stable since the mid-2000s. The current range is well known due to recent species monitoring supplemented with radiotelemetry studies, although there are unsurveyed portions of the range that result in uncertainty regarding species distribution (i.e., the areas at which rails occur within the range). Accounts of the species before extensive habitat conversion and market hunting have informed the historical range. The species previously occurred in large tidal estuaries from at least as far north as Marin County south to San Luis Obispo County. They are now restricted entirely to marshes in the San Francisco Bay Area.

Current and Past Monitoring

When funding allows, rangewide monitoring has been conducted by multiple researchers who contribute data to the Avian Knowledge Network (Ballard et al. 2008); this information is compiled by Point Blue Conservation Science. The surveys have resulted in both population size and density estimates. Funding for these efforts is not reliable as it comes from a variety of sources. Current data gaps include knowledge regarding movement of the species outside of the greater Bay Area, such as through the Carquinez Strait and Suisun Marsh.

Comprehensive Monitoring Plan

Rangewide population estimates and trends have been obtained through two rangewide surveys conducted since 2005 (Liu et al. 2009, Wood et al. 2022). The surveys used broadcasts of rail calls to elicit vocalizations along established survey transects, with multiple survey visits per transect. A long-term monitoring plan could be accomplished by replicating those surveys at regular intervals. Surveys should occur in all four San Francisco Bay regions (San Pablo Bay, Suisun Bay, Central San Francisco Bay, and South San Francisco Bay). A full rangewide survey to track population trend over time should be conducted at least every five years (Wood et al. 2022). Annual surveys are warranted at a subset of locations because the tidal environment where the species occurs is heavily impacted by climate change (e.g., sea level rise and intense storm events). This threat leads to increased rail mortality, which is especially concerning due to the very small population size. Annual monitoring will also allow for evaluation of the impact of invasive plants and habitat restoration efforts. Surveys will take place during the late winter and early spring period (mid-January to mid-April) when California Ridgway's rails have established their breeding territories (Wood et al. 2017).

In addition to the call-broadcast surveys described above, autonomous recording units should be deployed to explore sites that have no prior survey data to determine if the rail is present.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (to plan the surveys, coordinate with other agencies, conduct training, perform surveys, and analyze and report on data), travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

YUMA RIDGWAY'S RAIL
Rallus obsoletus yumanensis

Species Description and Listing Status

The Yuma Ridgway's Rail (formerly known as Yuma Clapper Rail) is a medium-sized wading bird found in marshes of inland southern California near the lower Colorado River and Salton Sea. It is listed as threatened under CESA and endangered under the ESA. Threats include habitat loss due to drought, water transfers, drain maintenance, and development. Additionally, high levels of selenium in water sources may impact breeding success. Threats specific to the Salton Sea population include development for dust suppression and geothermal projects.

Yuma Ridgway's Rail and its California range represented in gray on the map. Photo Credit: Audubon Southwest.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	Medium
Range Trend	Medium
Threats	Medium

The Department and others carry out regular surveys for the Yuma Ridgway's Rail on public managed lands (e.g., state and federal wildlife areas and refuges), but there is little coverage in other portions of the range. There is also some indication that the species may have naturally expanded to new areas, including drainages and fringe habitat, but these areas receive little survey coverage. For the portion of the range that was surveyed in 2023, the population size was estimated at 334 individuals. This is based on sums of counts at surveyed areas. Data limitations for some sites make it unclear whether the population is stable or declining.

The species' range within California is known; however, information regarding the range to the south of California is less clear. There is limited information on whether individuals in the California range are resident or migrants. Little is known about range trend since most of the monitoring is only taking place at managed public sites. Around the Salton Sea, the species' local

range is growing due to new suitable habitat forming as the lake recedes. The degree to which the species range is expanding or contracting in other areas is unknown.

Current and Past Monitoring

Current monitoring efforts consist of annual surveys covering managed public lands in California. Surveys are conducted during the breeding season by the Department or other partners that own or manage land (e.g., the U.S. Fish and Wildlife Service and U.S. Geological Survey). These surveys use the Standardized North American Marshbird Monitoring Protocol (Conway 2011) which implements call-broadcast surveys from March to mid-May. The surveys can determine if there are paired birds with an established breeding territory and can provide population counts for the specific marshes surveyed. There is no funding or staff for surveys in other portions of the range.

Data gaps exist for habitat that is not surveyed within the range. There are large questions and concerns regarding selenium risk in occupied habitats. Selenium occurs naturally in the watershed of the lower Colorado River, but it is unknown whether species are tolerant of elevated selenium. Ongoing research is investigating selenium levels in the water and biota of occupied habitats. Nests are being monitored for evidence of developmental impacts due to selenium. Much of the water available for restoration or maintenance of existing marshes is high in selenium; therefore, understanding the risks will inform management and habitat creation for the species.

Comprehensive Monitoring Plan

For this species, comprehensive monitoring would require presence/absence surveys over all suitable habitat to determine the current species distribution and occupancy estimates. The survey protocol consists of 3–6 visits to each site in the range to listen for individuals present during the 2.5-month survey period. An area is only considered unoccupied after all visits are completed without detecting a bird. This protocol does not result in a population estimate, but it is an accepted standard approach for marsh birds and is more comprehensive than surveys currently conducted in much of the range. These surveys should occur annually in the breeding season for a minimum of five years to provide an accurate estimate of species trends. Higher intensity surveys should be conducted in areas of suitable habitat in the vicinity of known occupied sites (within 20 miles) that have not been covered previously. For areas that are difficult to access, autonomous recording units may make broader survey coverage more feasible.

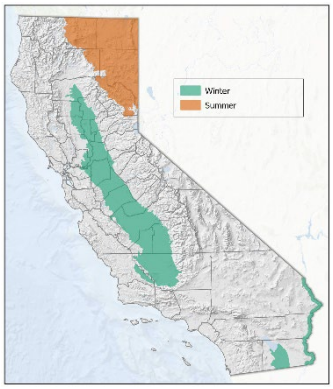
Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (there are several thousand acres of potential habitat in the range to be surveyed), travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

GREATER SANDHILL CRANE
Antigone canadensis tabida

Species Description and Listing Status

The Greater Sandhill Crane is a large crane found in wetland areas including marshes, wet meadows, and prairies. The breeding range in California is limited to the northeastern corner of the state; in winter, the species occurs throughout much of the Central Valley and smaller parts of southern California (including the Lower Colorado River and the Imperial Valley). The species is listed as threatened under CESA and is not listed under the ESA. Threats to Greater Sandhill Cranes include drought, irrigated pasture/cereal grain conversion, reduced availability of suitable roost sites, and powerline collisions.



Greater Sandhill Crane and its California range represented in green (winter range) and orange (summer range) on the map. Photo Credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	Medium*
Population Trend	Medium*
Range Size	High
Range Trend	High
Threats	High

*Certainty Scores are High for only the breeding population

The Department conducts an annual Breeding Population Survey for waterfowl and other water birds, and in 2023 estimated the number of breeding Greater Sandhill Cranes in California to be 2,691 (Brady and Weaver 2023). This is 36% above the long-term average (2003–2023) with an increasing trend since reliable and standardized counts began in 2003.

Historically, the Greater Sandhill Crane was a fairly common breeder in northeastern California (Grinnell and Miller 1944) and the Intermountain West. The population declined and breeding distribution contracted due to habitat loss and other impacts. The range trend since 2003 appears to be stable based on the Department's Breeding Population Survey. The current breeding distribution is restricted to wet meadows and marsh habitats.

The Department estimates an annual wintering population index of cranes in California based on the Midwinter Waterfowl Survey; the index has been stable in recent years with an average of 38,887. However, this index includes the much more abundant Lesser Sandhill Crane and therefore does not reflect the wintering population of Greater Sandhill Crane in California. The midwinter survey has been conducted in California since 1955.

Current and Past Monitoring

Monitoring for the species has occurred annually since the late 1940s, and the breeding population has been estimated using a standard procedure and transects since 2003 by Department staff. This monitoring, which has a reliable funding source through the Department's Waterfowl Program via Pittman-Robertson and Duck Stamp funds, has resulted in robust population estimates for the breeding population. The breeding population survey covers all suitable nesting habitat in California.

Comprehensive Monitoring Plan

There are no data gaps in the breeding season survey and the Department has a reliable funding source with staff for monitoring in the breeding area. While the Midwinter Waterfowl Survey does monitor the nonbreeding, winter population of Sandhill Cranes in California, subspecific status cannot be determined from aircraft. To estimate the wintering population, a periodic ground survey to obtain the ratio of subspecies in observed flocks should occur.

Resources Needed to Implement Comprehensive Monitoring

The ground survey to determine the ratio of Greater to Lesser Sandhill Crane subspecies could be conducted every two years. Required resources would include those needed for staff, travel-related expenses, vehicles, training, and monitoring equipment. See Appendix A for a summary of resource needs.

CALIFORNIA LEAST TERN
Sterna antillarum browni

Species Description and Listing Status

The California Least Tern is a medium-sized seabird that breeds primarily in the bays of the eastern Pacific Ocean. The known breeding range in California spans from San Francisco to the Mexico border, and the species migrates out of California for the winter. The species also nests in Mexico on the Pacific side of the Baja Peninsula and on the gulf near La Paz. The species is listed as endangered under both CESA and the ESA. Threats to the California Least Tern include habitat loss, predation, limited prey availability due to overfishing or climate impacts, human disturbance, and off-leash dogs. These threats are well documented during their breeding season, but the threats that they experience during the non-breeding season (September–March) are less well known.

California Least Tern and its California range represented in gray on the map Photo Credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	Medium
Range Trend	Medium
Threats	Medium

California Least Tern nesting colony locations in California are monitored annually, and the data are periodically compiled and published. The most recent published estimate of the number of breeding pairs was 4,097 in 2017. The most recent draft data is from 2022 and indicates that the statewide number of breeding pairs has since declined to 3,354. The status of the species in Mexico is not well known as not all nesting locations are monitored. In 2019, the estimate for 15 monitored locations in Baja California, Mexico was 956 adults and in 2021, the estimate was 583. There are 59 known sites at which California Least Terns have nested in Mexico.

San Francisco Bay area colonies appear to be stable or increasing as evidenced by a new colony in the Eden Landing Ecological Reserve in 2017 and a steady increase in total breeding pairs over

the last 30 years. However, the fledgling per pair ratio for the San Fransisco Bay area colonies has been declining over that same 30-year time span suggesting the increase in breeding pairs may not continue, or that the region is a population sink. Statewide, total breeding pairs and fledgling production have declined significantly since 2009, and fledgling production is at the lowest levels recorded since 2012. The population in Mexico appears to have experienced similar downward trends.

The Department has high certainty of information regarding the breeding season range and low certainty of information for the non-breeding range. The annual information received from population surveys indicates the range is currently stable.

Current and Past Monitoring

Annual nesting colony surveys are conducted in California by the Department, the U.S. Fish and Wildlife Service, California State Parks, San Francisco Bay Bird Observatory, East Bay Regional Park District, and many other partners. San Francisco Bay Bird Observatory has conducted surveys at Eden Landing Ecological Reserve since 2018, when Least Terns were first observed breeding at the site. East Bay Regional Park District has monitored a Least Tern colony in Hayward Regional Shoreline for more than a decade. USFWS has monitored the large colony at Alameda National Wildlife Refuge for decades. The Department and State Parks regularly survey birds in southern California and the central coast. The surveys result in counts for adults, nests, and fledglings, as well as observations of mortality and predation events. The number of nests observed are sometimes used as a proxy for number of breeding pairs at a location, but there is some concern that the reliance on nests to estimate total breeding pairs may lead to an overestimate of breeding pairs (i.e., it is not known whether all observed nests are being attended by a breeding pair). The effect of this practice on statewide population estimates is unclear.

Although annual surveys are conducted in many parts of the species' range, there is not reliable funding or staffing for ongoing survey efforts statewide. Some regional efforts are well-funded, and the proportion of sites with regular funding is considered in the section on required resources below. Data gaps include a lack of understanding of what is driving the current decline, what threats exist at overwintering locations and their influence on nesting season productivity, how near-colony prey dynamics influence nest attendance and overall fledgling production, and potentially missing isolated breeding sites. More monitoring efforts are also needed in Mexico to better understand the trend of the species. Specifically, the California Least Tern Recovery Plan (USFWS 1985) identifies the following:

> *Properly managed, suitable habitat of sufficient size must be available for nesting purposes; foraging, roosting, and wintering habitat must be preserved and properly managed. The status of Least Tern in Baja California, Mexico must be determined and the role of such colonies in the overall recovery must be assessed.*

Since 2017, the Department has been collaborating with Mexican government entities, universities, and non-governmental organizations to understand the species' range during nesting season in Mexico. Through these collaborations, it has become more apparent that Mexico needs assistance in protecting known tern colonies from predation and human disturbance, improving habitat, and conducting consistent monitoring.

Comprehensive Monitoring Plan

Many local monitoring efforts have occurred across the species range, however, a comprehensive and coordinated approach to monitoring is lacking, and funding for many local efforts is unreliable. Protocols for colony monitoring are available; however, broad coordination across regions is required and additional funding is needed to achieve statewide surveys. The Department is evaluating current monitoring protocols to investigate ways to reduce human presence in colonies during the breeding season and may recommend collecting intensive breeding metrics every 3–5 years. Studies are needed to track the species in its winter ranges and to investigate threats and stressors to the species during the non-breeding season.

Resources Needed to Implement Comprehensive Monitoring

To fill gaps in existing monitoring efforts and to ensure consistent funding for ongoing surveys, required resources would include those needed for staff (to plan for and carry out surveys, conduct training of volunteers, coordinate across multiple Department regions, manage and analyze data, and prepare survey reports), travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

MORRO BAY KANGAROO RAT
Dipodomys heermanni morroensis

Species Description and Listing Status

The Morro Bay Kangaroo Rat is a medium-sized rodent that is a habitat specialist for Baywood fine sands, a type of soil found on California's central coast. The subspecies, which has not been observed since 1986, is restricted to a small area south of Morro Bay near the town of Los Osos in San Luis Obispo County. It is listed as endangered under both CESA and the ESA. Threats to the Morro Bay Kangaroo Rat include habitat loss from urban development, habitat fragmentation, a lack of the preferred early seral stage scrub, and habitat degradation from invasive nonnative veldt grass. Habitat loss and degradation have continued since the species was last documented, and nonnative veldt grass is now the dominant plant in much of the kangaroo rat's historical range. This has changed the composition and structure of the habitat, from dune scrub with open, sandy substrate between shrubs, to a dense, grassy habitat with fewer sandy openings and fewer native, annual food plants.

Morro Bay Kangaroo Rat and its California range represented by the black point on the map. Note: true range is smaller than represented. Photo Credit: Moose Peterson, U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	High

The species has not been observed in the wild since 1986.

Current and Past Monitoring

There are no regular surveys or monitoring for this species. A scat detection dog and camera trapping attempt to find the species was completed in 2016 at multiple historically occupied locations by the U.S. Fish and Wildlife Service and California State Polytechnic University, San Luis Obispo. Department staff currently have camera traps deployed targeting small mammals at

the Morro Dunes Ecological Reserve. Data gaps include a lack of surveys in extensive portions of the historical range. An expansion of the historical range to incorporate additional state park land was recently suggested (Villablanca et al. 2021); these lands have never been surveyed. Access to some key private lands has never been secured, and therefore surveys have not been conducted. Many other public and private ownerships within the range have not been surveyed for several decades. Because of the data gaps, it is unknown whether the Morro Bay Kangaroo Rat has become extinct (Villablanca et al. 2021).

Comprehensive Monitoring Plan

Sampling and population monitoring are not goals for this species. Rather, the goal is to determine whether it is extant or extinct. This will require a comprehensive survey of all remaining habitat, with scat dogs and camera trapping, followed by live trapping to obtain samples if any detections are made. With sufficient staff and resources, and access to private land, this comprehensive survey could be completed in one year.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

SALT-MARSH HARVEST MOUSE
Reithrodontomys raviventris

Species Description and Listing Status

The Salt-marsh Harvest Mouse is a small rodent that is a habitat specialist of the saline and brackish waters of the San Francisco Bay Estuary. It is listed as endangered under both CESA and the ESA. There are two subspecies, with a northern subspecies (*R. r. halicoetes*) occurring on the Marin Peninsula, in the Petaluma, Napa, and Suisun Bay marshes, and in northern Contra Costa County. A southern subspecies (*R. r. raviventris*) is mostly restricted to the Central and South San Francisco bays, from San Mateo and Alameda counties south to Santa Clara County. Threats to the species include habitat loss and fragmentation from sea level rise and ongoing development, low genetic diversity in small, isolated populations, invasive plants, potential levee failure, catastrophic human-caused events (e.g., oil spills), disease (tularemia), parasites (ticks), and domestic dogs and cats.


Salt-marsh Harvest Mouse and its California range represented in black/gray on the map. Photo Credit: William Thein.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	High

No rangewide population estimate has been developed for the Salt-marsh Harvest Mouse. Long-term trends are available for one portion of the range, the Suisun Marsh, and suggest a stable population with large seasonal and annual variation. Stathem et al. (2022) estimated genetic effective population sizes (an estimate of the number of breeding adults in a population) of 15 and 329 for the smallest and largest Suisun Bay area populations, respectively. During a 2022 rangewide survey for the species, 57 sites were surveyed across the range. Preliminary results show that average capture efficiency (an index of local population density) was highest in San Pablo Bay at 9.35%, followed by Suisun Bay at 7.83%, and Central/South San Francisco Bay at

5.49%. While these relative high capture efficiencies are promising, populations of this species vary widely across seasons and years. To evaluate the effects of heavy winter rains in 2022 on the species, the Department re-trapped a subset of sites in 2023 that were part of the 2022 rangewide survey. At all but one site, captures were lower than the previous year, and there was a significant decrease in capture efficiencies (suggesting population declines following the heavy winter rains). With potentially large variations season to season and year to year, it is important to conduct multiple years of surveys to fully characterize the status of the population.

It is uncertain if the species' range is changing significantly, but it is suspected that the range is contracting. The species is faring poorly in marshes across the Central San Francisco Bay and has been extirpated in several locations where it historically occurred, including near Marin and Oakland. The remaining animals from the Richmond area have extremely low genetic diversity—indicative of a low population size and isolation from other populations (Alyward et al. 2022, 2023).

Current and Past Monitoring

Field identification for the northern and southern subspecies has been questionable even with the aid of identification keys. Statham et al. (2016, 2021) have shown that field identification of the southern subspecies is only 50% accurate. With the low identification accuracy and physical variability within the species, genetic techniques are often necessary for species identification.

The Department and partners (WRA Environmental Consultants, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, University of California Davis, Environmental Science Associates, and Rincon Consultants, Inc.) completed a onetime rangewide survey for Salt-marsh Harvest Mouse in 2022, but there is no ongoing monitoring rangewide. Since 2000, the Department has conducted annual surveys in the Suisun Marsh. Sporadic survey efforts have also occurred in Napa-Sonoma, the Petaluma Marsh Wildlife Area, and Eden Landing Ecological Reserve; however, there is no reliable funding for surveys at these locations. Past funding for the Suisun Marsh area has come from a Department of Water Resources contract for the Suisun Marsh Preservation Agreement. WRA Environmental Consultants has also consistently performed surveys at five wetland areas in the South Bay in recent years (2–4 years per area). Data generated from these surveys include capture efficiencies from live trapping and presence information from fecal DNA.

Comprehensive Monitoring Plan

An accurate rangewide occupancy estimate for Salt-marsh Harvest Mouse would include capture-mark-recapture surveys using live traps, supplemented with fecal collection (for DNA) to confirm presence (or lack thereof) in small and/or isolated areas. Fecal DNA should be collected in areas of marginal habitat where species presence has not yet been documented and to obtain a conversion factor to compare to live trapping estimates. These surveys can be modeled after the 2022 rangewide survey. In addition to the monitoring for rangewide occupancy estimates, several permanent sentinel sites should be created and surveyed seasonally to track trends over time—these surveys should be repeated over multiple years and seasons within each bay so that results are not biased by factors like drought or wet years. A minimum of two sentinel sites in each of the three bays should be surveyed at least three times per year for a minimum of six years.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff (to plan for and coordinate surveys, train volunteers, conduct surveys, collect tissue samples, manage a database, and provide analysis and reporting), travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

GUADALUPE FUR SEAL
Arctocephalus townsendi

Species Description and Listing Status

The Guadalupe Fur Seal is a member of the family of "eared seals", Otariidae. The species is sexually dimorphic, with males being much larger and heavier than females. Breeding grounds occur primarily on Guadalupe Island, Mexico, with recent re-colonization of the islands within the San Benito Archipelago, Baja California, Mexico. A small number of breeding pairs have been reported to occur on San Miguel Island, California since 2008. The species has been sighted from Mexico as far north as Graham Island and Vancouver Island, British Columbia. The current population of Guadalupe fur seals is considered a single population since the majority of individuals come from the Guadalupe Island breeding colony.

Since the passage of the Marine Mammal Protection Act in 1972, the National Marine Fisheries Service has maintained primary management authority of Guadalupe fur seals. The Marine Mammal Protection Act designates the species as protected and depleted throughout its range. The Guadalupe Fur Seal is listed as threatened under both the CESA and ESA. The species is listed as an Appendix I species throughout its range by the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Appendix I species are those threatened with extinction and trade in specimens of these species is permitted only in exceptional circumstances. Known threats to the Guadalupe Fur Seal include entanglement, military activities, oil spills, ocean noise pollution, and climate change.

Guadalupe Fur Seal and its California range represented in gray on the map. Photo Credit: Marine Mammal Center.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	Medium
Range Trend	Medium
Threats	High

Current and Past Monitoring

The National Marine Fisheries Service sporadically conducts Guadalupe Fur Seal stock assessments that incorporates outside research. The most recent stock assessments were published in 2019, 2016, and 2000. The stock assessments include population size, current population trends, current & maximum net productivity rates, potential biological removal (the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population), human-caused mortality & serious injury, other mortality & serious injury, and status of stock. Given the lack of routine stock assessments and external research, funding for ongoing monitoring should be considered unreliable. It is also important to note that stock assessments primarily focus on the main breeding grounds for the species in Mexico with minimal data from the San Miguel Island breeding ground. Most of the California data of Guadalupe Fur Seals during the non-breeding season comes from sightings and strandings of the species.

Comprehensive Monitoring Plan

No additional monitoring is identified as the primary management authority for the Guadalupe Fur Seal has been maintained by the National Marine Fisheries Service since the passage of the Marine Mammal Protection Act.

Resources Needed to Implement Comprehensive Monitoring

No additional resources are identified as the primary management authority for the Guadalupe Fur Seal has been maintained by the National Marine Fisheries Service since the passage of the Marine Mammal Protection Act.

NORTHERN ELEPHANT SEAL
Mirounga angustriostris

Species Description and Listing Status

The Northern Elephant Seal is the largest in the family of "true" seals, Phocidae. The Northern Elephant Seal is found in the central and eastern North Pacific Ocean and primarily breed in rookeries in California and Baja California. Since the passage of the Marine Mammal Protection Act in 1972, the National Marine Fisheries Service has maintained primary management authority of the Northern Elephant Seal. The species is not listed under CESA or the ESA. Known threats to the Northern Elephant Seal include entanglement, oil spills, vessel strikes, ocean noise pollution, and climate change.

Northern Elephant Seal and its California range represented in gray on the map. Photo Credit: NOAA Fisheries.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	Medium
Threats	High

Current and Past Monitoring

The National Marine Fisheries Service has completed a stock assessment for the species roughly every seven years. The stock assessments include a compilation of the most recent studies conducted on the species and include estimates of population and trend, current and maximum net productivity rate, potential biological removal (the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population), and human-caused mortality and serious injury. While the Northern Elephant Seal range along the entire California coast, regular stock assessments have only occurred in Central and Southern California. Because the National Marine Fisheries Service regularly produces stock assessments and independent researchers consistently study the species, ongoing funding for the monitoring should be

considered reliable. For example, researchers at UC Santa Cruz have conducted long-term demographic monitoring during the breeding and molting season at Año Nuevo Natural Reserve in San Mateo County.

Comprehensive Monitoring Plan

No additional monitoring is identified as the primary management authority for the Northern Elephant Seal has been maintained by the National Marine Fisheries Service since the passage of the Marine Mammal Protection Act.

Resources Needed to Implement Comprehensive Monitoring

No additional resources are identified as the primary management authority for the Northern Elephant Seal has been maintained by the National Marine Fisheries Service since the passage of the Marine Mammal Protection Act.

SOUTHERN SEA OTTER
Enhydra lutris nereis

Species Description and Listing Status

The Southern Sea Otter is among the smallest marine mammals and one of three subspecies of sea otter in the North Pacific. Southern sea otters' range in California is from Pigeon Point in San Mateo County south to Gaviota in Santa Barbara County. The Southern Sea Otter subspecies is geographically isolated from the others. The other two subspecies occur in nearshore waters of the Western Pacific and from the Aleutian Islands down to Washington State respectively.

Since the passage of the Marine Mammal Protection Act in 1972, the U.S. Fish and Wildlife Service has maintained primary management authority of Southern Sea Otters. The Department has been actively involved in southern sea otter population monitoring and conservation efforts but has no jurisdiction related to the species management. The Southern Sea Otter is listed as a threatened species under the ESA and designated as depleted under the Marine Mammal Protection Act. The species is listed as an Appendix I species throughout its range by the Convention of International Trade in Endangered Species of Wild Fauna and Flora. Appendix I species are those threatened with extinction and trade in specimens of these species is permitted only in exceptional circumstances. Known threats to Southern Sea Otter include shark bites, harmful algal bloom intoxication, cardiac disease, protozoal infection, land-to-sea pathogen pollution, other pathogens, human causes (shootings, boat strikes, entanglement, oil spills), and climate change.

The Southern Sea Otter and its California range represented in gray on the map. Photo Credit: Michael Harris, California Department of Fish and Wildlife.

Information Availability

Metric	Certainty Score
Population Size	Medium
Population Trend	Medium
Range Size	High
Range Trend	High
Threats	High

Current and Past Monitoring

For over 50 years, the Department has led an intensive effort to monitor Southern Sea Otter mortality. All reported Southern Sea Otter strandings are verified and carcasses are collected for post-mortem examinations to monitor causes of mortality. Since the 1980's the U.S. Geological Survey has led a collaborative effort along with the U.S. Fish and Wildlife Service, the Department, Monterey Bay Aquarium, and other research scientists to monitor the population abundance and distribution every year. These monitoring efforts are planned to continue, however, loss of dedicated, experienced federal staff and changes to aerial support resources are presenting significant challenges at maintaining these long-term monitoring efforts.

Comprehensive Monitoring Plan

There is currently a comprehensive Southern Sea Otter population monitoring in California, conducted by the U.S. Geological Survey, the U.S. Fish and Wildlife Service, the Department, and Monterey Bay Aquarium.

Resources Needed to Implement Comprehensive Monitoring

The monitoring program is facing challenges related to federal staffing shortages and aerial support. Department planes are functional for the survey method. Contracted aerial support is often restricted by funding or issues surrounding requirements of the funding source (federally funded air support must use Department of Interior certified planes and pilots—very limited options). Securing aerial resources (funding for contracts or Department Air Services) is needed for continuing the long-term monitoring effort.

Note: feasibility issues occur due to the U.S. Fish and Wildlife Service maintaining primary management authority of southern sea otters since the passage of the Marine Mammal Protection Act.

RINGTAIL
Bassariscus astutus

Species Description and Listing Status

Ringtails are medium-sized mammals in the raccoon family that occur in various rocky or brushy areas, often associated with streams or other water bodies. They occur in riparian habitats, and in brush stands of most forest and shrub habitats in California, at low to middle elevations. The species occurs across much of the state. Three subspecies of Ringtail (southern California, Palo Verde Mountains, and Yuma) are considered California Mammal Species of Special Concern; however, the species is not listed under CESA or the ESA. Threats to Ringtails include habitat fragmentation and reduced dispersal corridors, predation, road mortality, competition with non-native Virginia opossums, and anticoagulant rodenticides at cannabis sites.


Ringtail and its California range represented in gray on the map. Photo Credit: Robert Body.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Medium
Range Trend	Low
Threats	High

There is no current estimate of the population size and trends in California. Several localized studies have shown decreasing trap success, but no studies on abundance have occurred. Data from camera traps and citizen science observations suggest that the species is broadly distributed across the state, but many data gaps exist, and the Department range map has not been updated since 1988.

Current and Past Monitoring

There are no regular surveys or monitoring for this species. The Department deploys camera traps for numerous projects, some of which incidentally capture Ringtails. Additionally, citizen science databases and observations (such as iNaturalist), road mortality records, and incidental trapping

during CDFW and other research and monitoring efforts provide irregular Ringtail detections. Camera trap data from other entities (e.g., the U.S. Forest Service) is another potential source of detection information. CDFW currently has no dedicated funding or staff available for Ringtail monitoring. Data gaps include a statewide survey for occupancy or abundance and studies of habitat use, genetic population structure, and diversity.

Comprehensive Monitoring Plan

To improve our understanding of Ringtail range and distribution, an initial step would be to coordinate with biologists from across the Department and federal agencies to compile available camera trap data on Ringtail (from existing survey efforts for other species), and compile Ringtail observation data from public citizen science data platforms (e.g., iNaturalist). These data could be used to evaluate effectiveness of current localized survey efforts at detecting Ringtail and to identify gaps in the known distribution. A sampling scheme would then be developed to expand the statewide camera trapping effort to fill data gaps for this widespread species. Multiple years of expanded camera trapping would build a database with which to estimate detection probabilities and occupancy rates across the species range. Long-term trends would be established by repeating the survey and analysis every 5–10 years. Additionally, a statewide analysis of Ringtail genetic diversity and population structure could be conducted to better inform camera trap survey design (e.g., focus effort on populations that are unique or of limited geographic extent) and conservation efforts. The statewide genetic analysis would use any existing Ringtail DNA material housed within the Department but would also expand that database using scent detection dogs. Scent dogs are a quick and efficient tool that could be used to detect and collect Ringtail scats, and those detections could also supplement the camera trap data to inform the occupancy analysis.

Resources Needed to Implement Comprehensive Monitoring

Required resources would include those needed for staff, travel-related expenses, vehicles, training, monitoring equipment, and contract services. See Appendix A for a summary of resource needs.

WOLVERINE
Gulo gulo

Species Description and Listing Status

The Wolverine, the largest terrestrial member of the weasel family, occurs primarily in boreal and tundra habitats. Historically, the species ranged throughout high-elevation montane habitats in the Sierra Nevada and possibly other northern California ranges. However, Wolverines were extirpated and do not currently occur in the state. The species is listed as threatened under both CESA and the ESA. Threats to the Wolverine include loss of habitat from reduced snow cover due to climate change, disturbance due to winter recreational activity, and low genetic diversity and associated small population effects.

Wolverine. This species does not currently have a known range in California. Photo Credit: Andrew Gainer.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	Medium

Historically, Wolverines were found in the alpine and subalpine regions of the Sierra Nevada and possibly in the southern Cascades, Klamath Mountains, and North Coast ranges (Grinnell et al. 1937, Aubry et al. 2007). By the mid-twentieth century, the species had apparently been extirpated from the state, apparently due to persecution and isolation from other populations. There is currently no evidence of a breeding Wolverine population in California. However, in the last 15 years, two cases of Wolverines dispersing into the state have been verified. The first occurred in 2008 when a single Wolverine was photographed in the Tahoe National Forest by a remote camera station (Moriarity et al. 2008) and was later identified as a male that shared ancestry with a population in the Sawtooth Mountains of western Idaho. Continuous monitoring determined the solo Wolverine occupied a territory in the Tahoe National Forest for approximately ten years. The second case occurred in the winter of 2023, with multiple verified observations (photos and video) of a presumed dispersing Wolverine in the Sierra Nevada.

Current and Past Monitoring

In the last decade, there have been multiple surveys targeting carnivores and other species within known and potential historical Wolverine habitat, including surveys for the Sierra Nevada Red Fox, Pacific Marten, Fisher, and Bobcat. These projects use camera stations with meat and/or scent lures to draw in a wide variety of carnivores and are very effective in detecting territorial Wolverines when present. Additionally, when the Department receives a report of a credible Wolverine observation, a biologist is often dispatched to the approximate location to search for scat and any other sign and to potentially install a camera survey station or stations nearby. No population estimates are produced from these types of surveys. It is important to note the distinction between detecting a breeding population versus the occurrence of a single dispersing animal (e.g., the two recent examples outlined above). Because resident Wolverines have extremely large home ranges and are detectable using baited camera stations, many remote camera surveys occur each year, and many people visit and recreate in California's montane environments, it is likely a resident Wolverine population would be detected within several years after establishment.

Comprehensive Monitoring Plan

The Department will continue to compile its statewide remote camera survey data, collaborate with land management agencies (e.g., U.S. Forest Service, National Park Service), and investigate public reports to determine the detection of single or multiple Wolverines. If a breeding population is discovered, Department staff would then utilize various survey methods to determine the population size, distribution, and habitat use.

Resources Needed to Implement Comprehensive Monitoring

There is not currently a breeding population of Wolverine in California. Adequate resources are currently available to conduct camera surveys that could detect resident wolverines, should they become established. Therefore, no additional resources are identified for monitoring of this species.

BIGHORN SHEEP
Ovis canadensis

Species Description and Listing Status

Bighorn Sheep are large, hooved mammals that inhabit a variety of habitats including deserts, mountains, and foothills. Their range in California includes much of the southern part of the state—southern Sierra Nevada and foothills, southern mountain valleys, southern Great Basin, and Mojave and Sonora deserts. While all California Bighorn Sheep populations are considered fully protected, some subspecies and populations are also listed pursuant to the ESA and CESA. The Sierra Nevada subspecies (*O. canadensis sierrae*) and Peninsular Distinct Population Segment of the desert subspecies (*O. canadensis nelsoni*) are both listed as endangered under the ESA; under CESA, the Sierra Nevada subspecies is listed as endangered and the Peninsular Distinct Population Segment is listed as threatened. At the full species level, Bighorn Sheep are also considered a Mammal Species of Special Concern in California. Individual rams of the desert Bighorn Sheep subspecies that are legally taken through sport hunting (by a Bighorn Sheep tag holder) are not considered to be fully protected. Threats to Bighorn Sheep in California include disease transmission from domestic sheep and goats, mountain lion predation, drought, and severe winters associated with climate change.

Bighorn Sheep and its California range represented in gray on the map. Photo Credit: U.S. Fish and Wildlife Service.

Information Availability

Metric	Certainty Score
Population Size	High
Population Trend	High
Range Size	High
Range Trend	High
Threats	High

The population size of Bighorn Sheep in California is well understood and regularly monitored via helicopter and ground surveys combined with an adequate proportion of collared animals that can be used for mark-recapture population estimation. Sierra Nevada Bighorn Sheep populations have fluctuated over time. In 1995, there were only 105 Sierra Nevada Bighorn Sheep remaining.

The population then grew to over 500 by 2022 before dropping to below 300 in early 2023 due to extremely heavy snowfall in the winter of 2022–2023. From 2000 to 2010, the Peninsular Bighorn Sheep population increased from approximately 400 individuals to 955.

Current and Past Monitoring Efforts

Bighorn Sheep are surveyed across their entire range in California annually by the Department, generating population estimates and other information on the status of populations (e.g., recruitment, mortality, and reproductive rates). This monitoring program has a reliable source of funding and dedicated staff. As threats to bighorn populations vary over time, continual population monitoring is necessary.

Comprehensive Monitoring Plan

To obtain population estimates, Department staff used a power analysis to determine the required sampling effort. Accurate estimates require data from 1–4 years for Sierra Bighorn Sheep, 2 years for the Peninsular Distinct Population Segment, and 2–4 years for the rest of the Desert Bighorn Sheep population. As large variations in population numbers have occurred in recent years due to extreme climate events, yearly sampling is required. Department staff resources include 2–4 permanent staff to conduct surveys for Sierra Bighorn Sheep, two permanent staff to conduct surveys for the Peninsular Distinct Population Segment, and two permanent staff to conduct surveys for the remainder of the desert Bighorn Sheep population. Additional resources include a contract helicopter for captures and surveys, GPS collars for one-third of the females in each herd and a varying proportion of rams, and a contract with universities to aid in analysis.

Resources Needed to Implement Comprehensive Monitoring

Adequate resources are currently available to conduct the comprehensive monitoring program. Therefore, no additional resources are identified for monitoring of this species.

NORTH PACIFIC RIGHT WHALE
Eubalaena japonica

Species Description and Listing Status

The North Pacific Right Whale is one of the rarest marine mammals with length upwards of 68 feet. Since the passage of the Marine Mammal Protection Act in 1972, the National Marine Fisheries Service has maintained primary management authority of the North Pacific Right Whale. The Marine Mammal Protection Act designates the species as protected and depleted throughout its range. The North Pacific Right Whale is listed as endangered under the ESA. It is also listed as an Appendix I species throughout its range by the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Appendix I species are those threatened with extinction and trade in specimens of these species is permitted only in exceptional circumstances.

The North Pacific Right Whale inhabits the North Pacific extending from Japan in the West to the U.S. in the east. Sightings of the species have been reported in the eastern North Pacific as far south as central Baja California, in the Central North Pacific as far south as Hawaii, and as far north as the sub-Arctic waters of the sea of Okhotsk and the Bering Sea during the summer months. The species does not have a year-round population in California waters and while migratory patterns are unknown it is thought that the whales utilize those waters during winter migrations. Our knowledge of the species range outside of California and U.S. Federal waters, as well as the location(s) of winter calving grounds and migratory routes, is incomplete.

North Pacific Right Whale and its California range represented in gray on the map. Photo Credit: Brenda Rone, NOAA Fisheries.

Information Availability

Metric	Certainty Score
Population Size	Low
Population Trend	Low
Range Size	Low
Range Trend	Low
Threats	High

Known threats to the North Pacific Right Whale include vessel strikes, entanglement, ocean noise pollution, harmful algal bloom intoxication, and climate change. Proposed offshore wind

development along the California coast could potentially exacerbate some of these threats due to increased vessel traffic, ocean noise, and additional infrastructure in the water column.

Current and Past Monitoring

Current monitoring efforts are primarily based on incidental sightings from the National Marine Fisheries Service marine mammal and seabird aerial survey programs that occur along the west coast of the United States. The National Marine Fisheries Service is also currently conducting acoustic studies in Alaskan waters to detect North Pacific Right Whales. Additional marine mammal monitoring surveys are being conducted along the west coast to help evaluate the potential impacts of proposed offshore wind projects in federal waters off the California coast. These studies include, but are not limited to, regional passive acoustic monitoring lead by the National Marine Fisheries Service and boat-based visual surveys conducted by Oregon State University.

Comprehensive Monitoring Plan

No additional monitoring is identified as the primary management authority for the North Pacific Right Whale has been maintained by the National Marine Fisheries Service since the passage of the Marine Mammal Protection Act.

Resources Needed to Implement Comprehensive Monitoring

No additional resources are identified as the primary management authority for the North Pacific Right Whale has been maintained by the National Marine Fisheries Service since the passage of the Marine Mammal Protection Act.

LITERATURE CITED

Aubry, K. B., K. S. Mckelvey, and J. P. Copeland. 2007. Distribution and Broadscale Habitat Relations of the Wolverine in the Contiguous United States. Journal of Wildlife Management 71: 2147–2158.

Aylward, C. M., L. Barthman-Thompson., D. A. Kelt, B. N. Sacks, and M. J. Statham. 2023. Evolutionary history of the salt marsh harvest mouse mitogenome is concordant with ancient patterns of sea level rise. Conservation Genetics. https://doi.org/10.1007/s10592-023-01588-1

Aylward, C. M., L. Barthman-Thompson, W. T. Bean, D. A. Kelt, B. N. Sacks, and M. J. Statham. 2022. Patch size and connectivity predict remnant habitat occupancy by an endangered wetland specialist, the salt marsh harvest mouse. Landscape Ecology38:2053–2067. https://doi.org/10.1007/s10980-023-01683-1

Ballard, G., M. Herzog, M. Fitzgibbon, D. Moody, D. Jongsomjit, and D. Stralberg. 2008. The California Avian Data Center. Petaluma, CA, USA. Available from: https://data.pointblue.org/cadc2/

Biosearch Associates (Biosearch). 2008. Santa Cruz long-toed salamander study, Valencia Lagoon and adjacent drainage channel, Santa Cruz County, CA. Prepared for: Information Center for the Environment, University of California, Davis, CA, USA.

Biosearch Associates (Biosearch). 2015. Santa Cruz long-toed salamander upland habitat study, Ellicott Slough National Wildlife Refuge, Santa Cruz County, California. Prepared for U.S. Fisha and Wildlife Service, Sacramento, CA, USA.

Bloom, P., and S. Bailey. 2005. Life history accounts for species in the California Wildlife Habitat Relationships (CWHR) System. Originally published as Polite, C. 1990. in Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, CA, USA. Updates are noted in accounts that have been added or edited since original publication.

Brady, C., and M. Weaver. 2023. 2023 California Waterfowl Breeding Population Survey Report. California Department of Fish and Wildlife, Sacramento, CA, USA.

Bullard, M., E. L. Best, and J. Hammen. 2022. Native Fish Monitoring in Reach 3 of the Lower Colorado River, 2020 Annual Report. Submitted to the Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada, by the Bureau of Reclamation, Technical Service Center, Fisheries and Wildlife Group, Denver, Colorado.

California Department of Fish and Game (CDFG). 1992. Bird Species of Special Concern. California Department of Fish and Game, Sacramento, CA, USA.

California Department of Fish and Game (CDFG). 2004. Final Report, Grant Agreement E-2-F-19 Threatened and Endangered Fishes, Modoc sucker (*Catostomus microps*) status assessment project. January 2004.

California Department of Fish and Wildlife (CDFW). 2021. Service Based Budgeting Final Report. California Department of Fish and Wildlife, 715 P Street, Sacramento, CA 95814. 19 pp. plus appendices.

California Natural Diversity Database (CNDDB). 2019. Natural Heritage Division. California Department of Fish and Wildlife, Sacramento, CA, USA.

Conway, C. J., 2011. Standardized North American marsh bird monitoring protocol. Waterbirds 34:319–346.

Daniels, R. A., and L. A. Courtois. 1982. Status and proposed management of the rough sculpin, *Cottus Asperrimus rutter*, in California. Inland Fisheries Endangered Species Program Special Publication 82-1, California Department of Fish and Game, Rancho Cordova, CA, USA.

Doyle, J. M., T. E. Katzner, G. W. Roemer, J. W. Cain, III, B. A. Millsap, C. L. McIntyre, S. A. Sonsthagen, N. B. Fernandez, M. Wheeler, Z. Bulut, P. H. Bloom, and J. A. DeWoody. 2016. Genetic structure and viability selection in the golden eagle (*Aquila chrysaetos*), a vagile raptor with a Holarctic distribution. Conservation Genetics 17:1307–1322.

Dunk, J. R. 1992. Black-shouldered kite—small mammal—vegetation relationships in northern California. Thesis, Humboldt State University, Arcata, CA, USA.

Dunk, J. R. 2020. White-tailed kite (*Elanus leucurus*), version 1.0. In A. F. Poole and F. B. Gill, editors. Birds of the World. Cornell Lab of Ornithology, Ithaca, NY, USA.

Erichson, A. L., S. K. Smallwood, A. M. Commandatore, B. W. Wilson, and M. D. Fry. 1996. White-tailed kit movement and nesting patterns in an agricultural landscape. Pages 165–177 in D. M. Bird, D. E. Varland, and J. J. Negro, editors. Raptors in Human Landscapes: Adaptation to Built and Cultivated Environments. Academic Press Ltd, Cambridge, MA, USA.

Evens, J., and N. Nur. 2002. California black rails in the San Francisco Bay region: Spatial and temporal variation in distribution and abundance. Bird Populations 6:1–12.

Goldberg, C. S., M. Ralson, J. A. Manning, C. Mitcham, K. Camara, M. Allaback, C. Wyckoff, I. M. Laursen, S. Fork, and K. Wasson. 2023. Recommendations for inclusion of eDNA in USFWS and CDFW survey protocols for wetland amphibians in coastal central California. Elkhorn Slough Technical Report Series 2023:1.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. Fur-bearing Mammals of California. University of California Press, Berkeley, CA, USA.

Heishman, J. T., B. R. Kesner, and P. C. Marsh. 2023. Reach 4/5 Native Fish Monitoring, 2022 Annual Report. Submitted to the Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada, by Marsh & Associates, LLC, Tempe, Arizona, under contract No.140R3021C0014.

Hunt, W. G. 1998. Raptor floaters at Moffat's equilibrium. Oikos 82:191–197.

Hunt, W. G. 2002. Golden Eagles in a perilous landscape: predicting the effects of mitigation for wind turbine blade-strike mortality. Consultant Report to California Energy Commission under contract P500-02-043F, Public Interest Energy Research, Sacramento, CA, USA.

Kim, R., B. J. Halstead, G. D. Wylie, and M. L. Casazza. 2018. Distribution and demography of San Francisco garter snakes (*Thamnophis sirtalis tetrataenia*) at Mindego Ranch, Russian Ridge Open Space Preserve, San Mateo County, California: U.S. Geological Survey Open-File Report 2018-1063, 80 pp. https://doi.org/10.3133/ofr20181063

Liu, L., J. Wood, N. Nur, D. Stralberg, and M. Herzog. 2009. California Clapper Rail (*Rallus longirostris obsoletus*) Population Monitoring: 2005-2008. Prepared for California Department of Fish and Game by PRBO Conservation Science. Sept. 29, 2009.

Martin, B. A., C. M. Kelsey, S. M. Burdick, and R. J. Bart. 2022. Growth, survival, and cohort formation of juvenile Lost River (*Deltistes luxatus*) and shortnose suckers (*Chasmistes brevirostris*) in Upper Klamath Lake, Oregon, and Clear Lake Reservoir. California—2020 monitoring report: U.S. Geological Survey Open-File Report 2022–1099.

Merced Irrigation District (Merced ID). 2011. Technical Memorandum 7-6: CESA-Listed Amphibians – Limestone Salamander. Merced River Hydroelectric Project, FERC No. 2179. February 2011.

Millsap, B. A., E. R. Bjerre, M. C. Otto, G. S. Zimmerman, and N. L. Zimpfer. 2016. Bald and golden eagles: population demographics and estimation of sustainable take in the United States, 2016 update. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C., USA.

Moriarity, K. M., W. J. Zielinski, A. G. Gonzales, T. E. Dawson, K. M. Boatner, C. A. Wilson, F. V. Schlexer, K. L. Pilgrim, J. P. Copeland, and M. K. Schwartz. 2008. Wolverine confirmation in California after nearly a century: native or long-distance immigrant? Northwest Science 83:154–162.

Niemela, C. A. 2007. Landscape characteristic surrounding white-tailed kite nest sites in southwestern California. Thesis, Humboldt State University, Arcata, CA, USA.

Pagel, J. E., D. M. Whittington, and G. T. Allen. 2010. Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations. U.S. Fish and Wildlife Service.

Rassmussen, J. E. 2011, Status of Lost River Sucker and Shortnose Sucker. Western North American Naturalist 4:442–455.

Reed, R. J. 1979. Population study of the Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) at Valencia Lagoon 1977-78, with notes on habitat and occurrence in Santa Cruz and Monterey Counties. Final report to CDFG, Sacramento, under contract (S-1180). vi+115 pp.

Reid, S. B. 2008. Conservation Review—Modoc sucker, *Catostomus microps*. Final Report submitted to U.S. Fish and Wildlife Service, Klamath Falls Field Office, Klamath Falls, OR, USA. Version date: 31 December 2008.

Remsen, J. V., Jr. 1978. Bird Species of Special Concern in California: an annotated list of declining or vulnerable bird species. Nongame Wildlife Investigations, Wildlife Management Branch, Admin Rep. 78-1. California Department of Fish and Game, Sacramento, CA, USA.

Richmond, J. Q., D. A. Wood, M. F. Westphal, A. G. Vandergast, A. D. Leaché, L. R. Saslaw, H. S. Butterfield, and R. N. Fisher. 2017. Persistence of historical population structure in an endangered species despite near-complete biome conversion in California's San Joaquin Desert. Molecular Ecology 26:3618–3635.

Richmond, O. M., J. Tecklin, and S. R. Beissinger. 2008. Distribution of California black rails in the Sierra Nevada foothills. Journal of Field Ornithology 79:381–390.

Sharpe, P. B. 2022. Bald eagle and golden eagle research on the California Channel Islands: January–December 2022. Prepared for the California Department of Fish and Wildlife. Institute for Wildlife Studies, Arcata, CA, USA.

Shuford, W. D., and T. Gardali, editors. 2006. California Bird Species of Special Concern: a ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds No. 1. Western Field Ornithologists, Camarillo, CA and California Department of Fish and Game, Sacramento, CA, USA.

Spautz, H., and N. Nur. 2002. Distribution and abundance in relation to habitat and landscape features and nest site characteristics of California black rail (*Laterallus jamaicensis coturniculus*) in the San Francsico Bay Estuary. Final Report to the U.S. Fish and Wildlife Service. Point Reyes Bird Observatory. Stinson Beach, CA, USA.

Statham, M. J., C. M. Aylward, L. Barthman-Thompson, E. M. Kierepka, and B. N. Sacks. 2022. Landscape genetics of an endangered salt marsh endemic: identifying population continuity and barriers to dispersal. Conservation Genetics 23:759–771.

Statham, M. J., L. Barthman-Thompson, S. Fresquez, and B. N. Sacks. 2021. Development of a morphological key for the southern salt marsh harvest mouse using genetically verified individuals. California Fish and Wildlife Journal, CESA Special Issue 367-381.

Statham, M. J., S. U. Aamoth, L. Barthman-Thompson, S. Estrella, S. Fresquez, L. D. Hernandez, R. Tertes, and B. N. Sacks. 2016. Conservation genetics of the endangered San Francisco Bay endemic salt marsh harvest mouse (*Reithrodontomys raviventris*). Conservation Genetics 17:1055–1066.

Tordoff III, W. 1980. Report of study of the limestone salamander on the Merced River. Report for Bureau of Land Management, Contract No. CA-040-CTO-09.

Tsao, D., J. Takekawa, I. Woo, J. Yee, and J. Evens. 2009. Home range, habitat selection, and movements of California black rails at tidal marshes at San Francisco Bay, California. The Condor 111:599–610.

Tsao, D., R. Melcer, and M. Bradbury. 2015. Distribution and habitat associations of California black rail (*Laterallus jamaicensis coturniculus*) in the Sacramento-San Joaquin Delta. San Francisco Estuary & Watershed Science 13(4): article 4.

U.S. Fish and Wildlife Service (USFWS). 1985. Recovery Plan for the California least tern, *Sterna antillarum brownii*. U.S. Fish and Wildlife Service, Portland, OR, USA.

U.S. Fish and Wildlife Service (USFWS). 1985. Recovery Plan for the Light-footed Clapper Rail. U.S. Fish and Wildlife Service, Portland, Oregon, USA.

U.S. Fish and Wildlife Service (USFWS). 1985. Recovery Plan for the San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). U.S. Fish and Wildlife Service, Portland, OR.

U.S. Fish and Wildlife Service (USFWS). 2007. Lost River (*Deltistes luxatus*) 5-year review: Summary and evaluation. Klamath Falls, Oregon, USA.

U.S. Fish and Wildlife Service (USFWS). 2007. Shortnose sucker (*Chamistes brevirostris*) 5-year review: Summary and evaluation. Klamath Falls, Oregon, USA.

U.S. Fish and Wildlife Service (USFWS). 2009. Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*) 5-Year Review: Summary and Evaluation. USFWS. Ventura Field Office. Ventura, California.

U.S. Fish and Wildlife Service (USFWS). 2013. Modoc sucker (*Catostomus microps*) species report. Klamath Falls Fish and Wildlife Office, Klamath Falls, OR, USA.

U.S. Fish and Wildlife Service (USFWS). 2015. Modoc sucker (Catostomus microps) post-delisting monitoring plan. Klamath Falls Fish and Wildlife Field Office, Klamath Falls, OR, USA.

U.S Fish and Wildlife Service (USFWS). 2018. Species status assessment report for the razorback sucker *Xyrauchen texanus*. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

U.S. Fish and Wildlife Service (USFWS). 2019. 5-Year Review: Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*). USFWS. Ventura Field Office. Ventura, California.

U.S. Fish and Wildlife Service (USFWS). 2019. Species Status Assessment for the Endangered Lost River Sucker and Shortnose Sucker. Klamath Falls Fish and Wildlife Office, Pacific Southwest Region, U.S. Fish and Wildlife Service. March 2019.

U.S. Fish and Wildlife Service (USFWS). 2020. Bald eagle population size: 2020 update. Final Report, U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C., USA.

U.S. Fish and Wildlife Service (USFWS). 2020. Species Status Assessment for the San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), Version 1.0. May 2020. Sacramento, California.

U.S. Fish and Wildlife Service (USFWS). 2022. California Condor Recovery Program: 2022 annual population status. California Condor Recovery Program, U.S. Fish and Wildlife Service, Ventura, CA, USA.

Veloz, S., N. Nur, L. Salas, D. Stralberg, D. Jongsomjit, J. Wood, L. Liu, and G. Ballard. 2011. Tidal marsh bird population and habitat assessment for the San Francisco Estuary under future climate change conditions. Version 1.0. Report to the California Landscape Conservation Cooperative. U.S. Fish and Wildlife Service, Sacramento, CA, USA. Available from: http://data.prbo.org/apps/sfbslr/PRBOLCCSFBaySLRFinalReport.pdf

Villablanca F. X., C. P. Kofron, L. Oliver, M. J. Walgren, L. E. Andreano, and A. Thiel. 2021. Survey for Morro Bay kangaroo rat: a rare mammal of uncertain status. Journal of Fish and Wildlife Management 12:263–270.

Wang, I. J. 2009. Fine-scale population structure in a desert amphibian: landscape genetics of the black toad (*Bufo exsul*). Molecular Ecology 18:3847–3856.

Wiens, J. D., P. H. Bloom, M. C. Madden, P. S. Kolar, J. A. Tracey, and R. N. Fisher. 2022. Golden eagle occupancy surveys and monitoring strategy in coastal southern California, United States. Frontiers in Ecology and Evolution 9:665792.

Wiens, J. D., P. S. Kolar, M. R. Fuller, W. G. Hunt, and T. Hunt. 2015. Estimation of occupancy, breeding success, and predicted abundance of golden eagles (*Aquila chrysaetos*) in the Diablo Range, California, 2014. U.S. Geological Survey Open-File Report 2015-1039. U.S. Geological Survey, Reston, VA, USA.

Williams, D. F. 1990. Assessment of potential habitat for the blunt-nosed leopard lizard and San Joaquin kit fox in western Madera County, California. U.S. Fish and Wildlife Service, Endangered Species Office, Sacramento, CA, USA.

Wood, D. A., J. P. Rose, B. J. Halstead, R. E. Stoelting, K. E. Swaim, and A. G. Vandergast. 2020. Combining genetic and demographic monitoring better informs conservation of an endangered urban snake. PLoS ONE 15(5):e0231744.

Wood, J. K., L. Salas, M. Elrod, N. Nur, and S. Veloz. 2022. California Ridgway's rail population estimate for 2019–2021. Point Blue Conservation Science (Contribution No. 2429), Petaluma, CA, USA.

Wood, J. K., N. Nur, L. Salas, and O. M. W. Richmond. 2017. Site-specific Protocol for Monitoring Marsh Birds: Don Edwards San Francisco Bay and San Pablo Bay National Wildlife Refuges. Prepared for the U.S. Fish and Wildlife Service, Pacific Southwest Region Refuge Inventory and Monitoring Initiative. Point Blue Conservation Science. Petaluma, CA.

Zembal, R., and S. Hoffman. 2023. Light-footed Ridgway's (Clapper) Rail in California: 2023 Season. Report to the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife, Sacramento, CA, USA.

APPENDIX A—RESOURCES REQUIRED FOR MONITORING AND STATUS ASSESSMENT

Table A1. Estimated resources required to implement a comprehensive monitoring program for each fully protected species. Blue=Fish, Green=Amphibians and Reptiles, Orange=Birds, Brown=Mammals.

Species	Staff Resources (Yes/No)	Contract Services (Yes/No)	Operating, Equipment, and Vehicle Needs* (Yes/No)
Colorado Pikeminnow	No	No	No
Mohave Tui Chub	Yes	No	Yes
Modoc Sucker	Yes	No	Yes
Shortnose Sucker	No	No	No
Lost River Sucker	No	No	No
Razorback Sucker	No	No	No
Owens Pupfish	Yes	No	Yes
Unarmored Threespine Stickleback	Yes	No	Yes
Rough Sculpin	Yes	No	Yes
Santa Cruz Long-toed Salamander	Yes	Yes	Yes
Limestone Salamander	Yes	Yes	Yes
Black Toad	Yes	No	Yes
Blunt-nosed Leopard Lizard	Yes	Yes	Yes
San Francisco Garter Snake	Yes	Yes	Yes
Trumpeter Swan	No	No	No
California Condor	No	No	No
Raptors** Golden Eagle, White-tailed Kite, and Southern Bald Eagle	Yes	Yes	Yes
California Black Rail	Yes	Yes	Yes
Light-footed Ridgway's Rail	Yes	Yes	Yes
California Ridgway's Rail	Yes	Yes	Yes
Yuma Ridgway's Rail	Yes	No	Yes
Greater Sandhill Crane	Yes	No	Yes
California Least Tern	Yes	Yes	Yes
Morro Bay Kangaroo Rat	Yes	Yes	Yes
Salt-marsh Harvest Mouse	Yes	Yes	Yes
Guadalupe Fur Seal	No	No	No
Northern Elephant Seal	No	No	No
Southern Sea Otter	No	Yes	No
Ringtail	Yes	Yes	Yes
Wolverine	No	No	No
Bighorn Sheep	No	No	No
North Pacific Right Whale	No	No	No

*Includes travel expenses (lodging, per diem, fuel), vehicles and maintenance, field training, field gear and safety gear, etc.

**The three raptor species (Golden Eagle, White-tailed Kite, Southern Bald Eagle) surveys could be coordinated with one survey team. Each species survey would run for two years, followed by four years during which the other species are surveyed (rotate among species with monitoring conducted every year).