

Chapter 3.5

Plant, Wildlife and Fish Habitat Protection, Conservation and Enhancement



Protection, conservation, and restoration of forest and rangeland wildlife habitat are critical to maintaining and enhancing the rich biodiversity of our nation. Major threats to fish and wildlife habitat result from the patchwork of public-private ownership associated with urbanization and uncharacteristic wildfire (excerpted from the U.S. Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

KEY FINDINGS

Current Status and Trends

- California is a biological hotspot of plant, wildlife and fish diversity. Climate, geology and ecological processes (fire, water, nutrient cycles, etc) combine to create and maintain the many habitats and high biodiversity found in the state.
- Since the California (1984) and federal (1973) Endangered Species Acts were passed, the general trend has been an increase in the number of both animals and plants listed as threatened or endangered.
- Other non-game wildlife and plant population trends are difficult to discern as data are lacking.
- California's native fish are well adapted to natural disturbance regimes, but they are having great difficulty adapting to human induced changes, such as introduction of exotic species and habitat degradation.
- At least 45 percent of California's 62 native fish species are considered by the California Department of Fish and Game (DFG) as those of greatest conservation need.
- There are 28 fish taxa listed as state or federally threatened or endangered.

- Black bear, pronghorn antelope, bighorn sheep, deer and elk populations are generally stable, but are now at much lower numbers than in the pre-European settlement era.

Habitat Threats and Protection

- The California Wildlife Action Plan (DFG, 2007a) presents at least 20 different threats to plant, wildlife and fish populations and their habitats. Four occur statewide: growth and development, water management conflicts, exotic invasive species and climate change. Five others occur in multiple regions: pollution and urban and agricultural runoff, excessive livestock grazing, altered fire regimes (due to fire suppression and wildland urban interface expansion), recreational pressure/ human disturbance, and other land management conflicts.
- In this section wildfire threat to natural blocks and essential connectivity areas identified in the California Essential Habitat Connectivity Project (CEHCP), and habitat in protected areas are analyzed. Over 14 percent of the state was determined to be in high priority landscapes and over 12 percent is medium priority landscape, suggesting that nearly a third of the state is considered protected habitat but is at risk from uncharacteristic wildfire. The medium and high priority landscapes are concentrated in the Sierra, Klamath/North Coast, Modoc and Central Coast bioregions. Lands managed by federal agencies dominate the priority landscapes.
- Other assessment chapters contain analyses related to wildlife, plant and fish species and their habitats:
 - Chapter 1.1 analyzes the threat from projected development on ecosystem health. Annual Grass, Coastal Scrub, Montane Hardwood and Blue Oak Woodland are at most risk of loss due to development. Bioregions with the largest proportion of ecosystem acres at risk include the South Coast, Bay/Delta, and portions of the Sierra.
 - Chapter 2.1 analyzes the threat to ecosystem health from uncharacteristic fire. The most at risk ecosystems are Klamath and Sierran Mixed Conifer and Douglas-fir in the Klamath/North Coast, Modoc and Sierra bioregions. Shrub types most at risk are Sagebrush, Coastal Scrub and Mixed Chaparral.
 - Chapter 2.2 analyzes the threat from forest pests to ecosystem health. Ecosystems currently suffering the most extensive damage are Sierran Mixed Conifer, Eastside Pine, Red Fir and White Fir. Those at greatest risk from future damage include White Fir, Red Fir and Lodgepole Pine.
 - Chapter 3.1 uses a water quality model to highlight areas where important water quality assets coincide with elevated threats to water quality. High priority areas are concentrated in the Klamath/North Coast bioregion watersheds and in certain basins located in the Sierra as well as portions of the South Coast bioregion.
 - Chapter 3.7 uses predictive models to analyze how vegetation species ranges might change as a result of climate change. Temperature increases coupled with declines in precipitation rates will result in shifts for certain key tree species ranges, typically to higher elevations and northern latitudes.
- A large amount of work has been completed or is underway in California to identify, preserve and protect important wildlife, plant and fish habitat. For example, nearly \$200 million in grant monies has been awarded by DFG alone for fish habitat restoration in 26 counties since 1981.

INTRODUCTION

This chapter reports briefly on the status and trends of threatened and endangered species in the state, patterns of their distributions, and population trends for select species of large mammals. It also lists the plans, programs and other efforts underway to conserve wildlife habitat. Finally, the relative risk to important wildlife habitat from uncharacteristic wildfire is analyzed and mapped across the state.

CURRENT STATUS AND TRENDS

California abounds with rich plant, animal and ecosystem diversity, claiming the highest number of species in the United States and the greatest number of our nation's endemics – species that occur nowhere else in the world (Mittermeier, 1999). Climate, geology and natural processes (e.g., fire, water, nutrient cycles) combine to create and shape the many different habitats and high biodiversity found in the state.

It is beyond the scope of this report to paint a complete picture of species of concern and the complex environmental changes that may be affecting them. More complete information can be found in other publications (see the California Wildlife Action Plan (2007) and *Life on the Edge* (Thelander, 1994)). A brief overview of threatened and endangered species, broad patterns of their distributions and trends in the state and highlights of some flagship species and their status is provided in the section that follows. Tracking population trends can be a valuable tool for identifying species ranges, evaluating management practices, resource planning and assessing whether populations are increasing, remaining stable or in decline and are at risk.

Threatened and Endangered Species and Other Species of Concern

Special-status species, with limited populations or ranges, are of particular interest for conservation and protection. Species determined to be in danger of extinction are listed as threatened or endangered under either the California Endangered Species Act of 1984 (CESA), the federal Endangered Species Act of 1973

(ESA), or both. A number of factors are considered in evaluating whether a species should be listed. These include the condition of the species habitat range, pressures from commercial, recreation, scientific or educational use, disease or predation, poor management practices, or any other natural or man-made factors affecting the species' existence.

Species that have been listed under either act are then protected from activities that may result in "takings" or activities that may jeopardize their continued existence. "Take" is defined by DFG as "to hunt, pursue, catch, capture or kill, or attempt to hunt, pursue, catch, capture or kill a species." Activities resulting in take without a permit issued under the California Endangered Species Act can result in significant fines and penalties. The state and federal ESA prohibits the harvesting, import, export and ownership of any threatened or endangered species, and it also grants federal authorization to preserve and protect the listed species through the designation of critical habitat. The greater the rarity, the more extensive the regulations required to ensure its protection. Surveying and monitoring the status of these animals takes significant time, money and effort.

Since the California (1984) and federal (1973) Endangered Species Act were passed, the general trend has been an increase in the number of taxa listed. Figure 3.5.1 shows recent trends in listing for animal Classes (mammals, birds, amphibians, fish, reptiles), three additional Classes (insects, crustaceans and gastropods) and plants. Information on the insects, crustaceans and gastropods tends to be very limited, thus relatively few species are shown to be threatened or endangered. The trends for listed bird, mammal and fish species tend to be broadly similar, with fish species listings increasing most sharply over the last two decades.

Birds

The first list of California Birds of Special Concern (those which had experienced severe population declines or were vulnerable to future extinction)

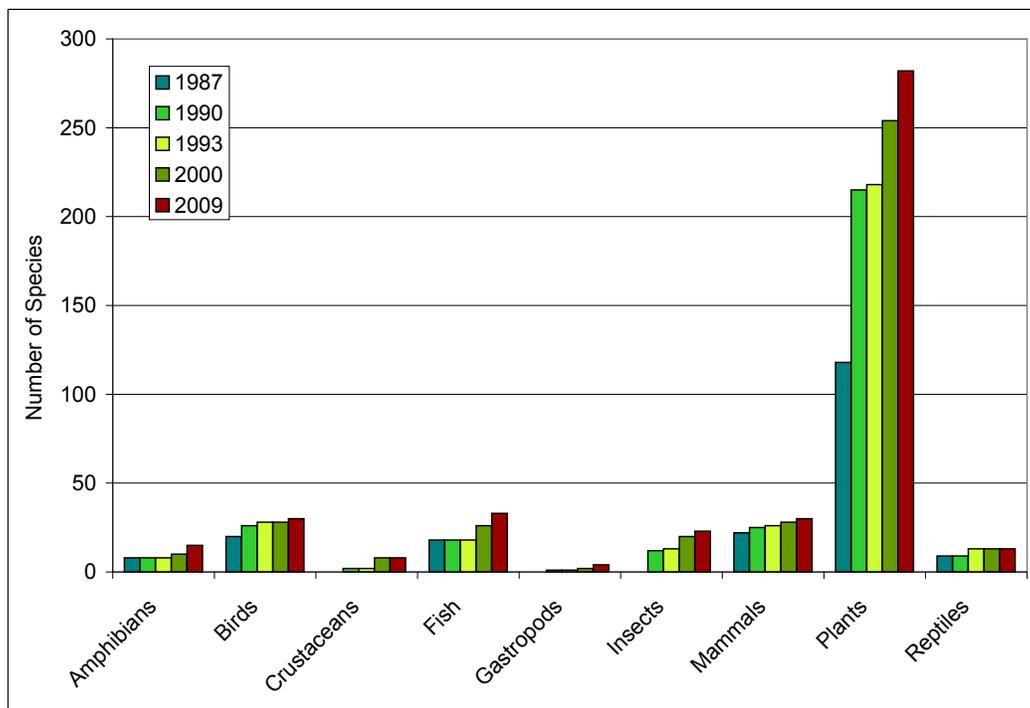


Figure 3.5.1. Recent trends of listed species by taxa. Data Source: California Natural Diversity Database, Department of Fish and Game, 2009; CAL FIRE, 2003

published in 1978, included 61 taxa. By 1992 the number increased to 73, with one species added in the last 18 years, bringing the current total to 74 (Shuford and Gardali, 2008). There are 24 state listed threatened or endangered birds and 18 appearing on the federal threatened and endangered species lists. Species listed under DFG’s Fully Protected classification may not be taken or possessed at any time, with exceptions made for research and recovery efforts. This designation has the most strict “take” regulations. There are 10 bird species considered Fully Protected (DFG, 2009c). These birds’ foremost threat is habitat loss and degradation, including fragmentation. Disease outbreaks have also played a role in large-scale mortality of some bird species.

Much of the state experiences high bird richness throughout phases of the year. While the Bay/Delta bioregion maintains the predicted high richness throughout the year, the Modoc and Klamath/North Coast bioregions contain the highest predicted number of bird species during the summer months (Figure 3.5.2), and the South Coast, the Central

Coast, the Sacramento Valley and San Joaquin Valley bioregions see the most bird species during the winter months (Figure 3.5.3). The California Wildlife Action Plan (CWAP) has listed growth and development, climate change, invasive plants and animals, water management conflicts, degradation of aquatic ecosystems, loss of riparian habitat and intensive agriculture as serious pressures to all of these bioregions identified as having the highest bird species richness in the state.

Amphibians

Frogs, toads and salamanders comprise the Class Amphibia (cold-blooded, aquatic vertebrates with gills in early life stages, developing lungs during metamorphosis, characterized by smooth skin). They are sensitive to changes in their environment (e.g., decreased humidity, increased pollution). For more than a decade, many amphibian populations have been declining in California and worldwide. There are 13 species of amphibians listed as state, or federally threatened or endangered, including the California red-legged frog (*Rana draytonii*) and

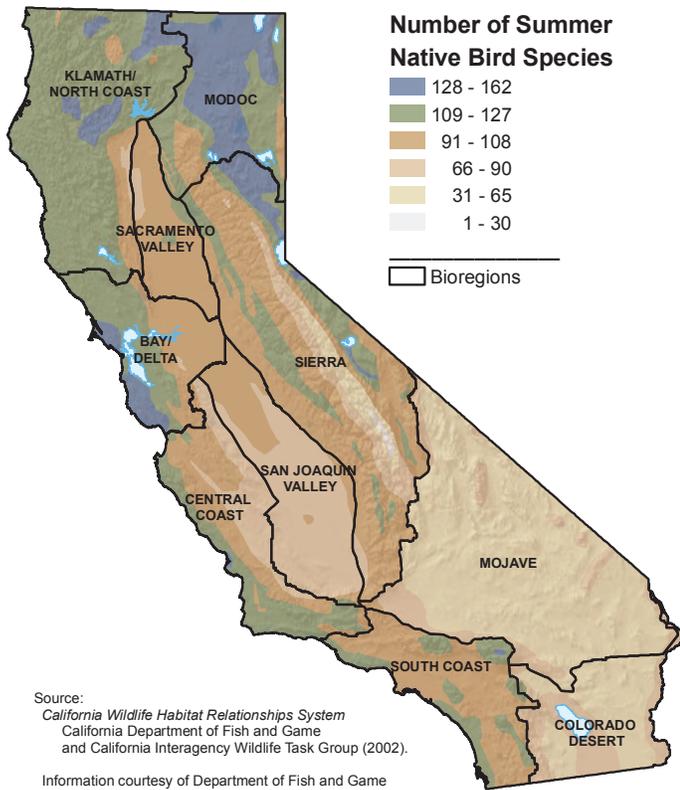


Figure 3.5.2. Summer bird species richness.

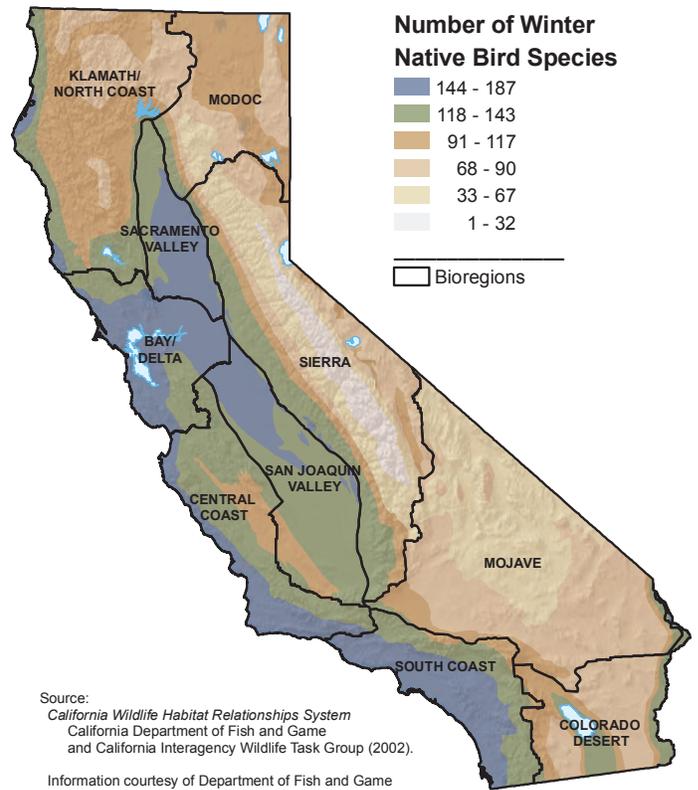


Figure 3.5.3. Winter bird species richness.

the Sierra Nevada yellow-legged frog (*Rana sierrae*). Twenty-six species of amphibians are listed as California Species of Special Concern (DFG, 2009b). Species that are placed on these lists are recognized as having declining populations, limited ranges, or are vulnerable to extinction and merit monitoring. DFG is working with University of California Davis to update the list of California Amphibian and Reptile Species of Special Concern. At this time, 80 species are under consideration for the updated list. A report is expected to be available from DFG by July 2010.

Areas of the highest predicted amphibian richness (Figure 3.5.4) were identified to be in the Klamath/North Coast, the Central Coast, the South Coast and parts of the Sierra bioregion. Some of the primary threats to these four bioregions that were identified by the CWAP were growth and development, climate change, water management conflicts, degradation of aquatic ecosystems and loss of riparian habitat.

These types of threats are expected to have a direct impact on amphibian species.

Mammals

There are currently 30 terrestrial mammal species and subspecies listed as either state or federally threatened or endangered. Included are species of mouse, squirrel, kangaroo rat, fox and bighorn sheep, as well as a shrew, bat, rabbit, beaver, vole and wolverine. Sixty-seven terrestrial mammals are listed as California Species of Special Concern. There are five mammal taxa listed as Fully Protected (DFG, 2009c).

The Sierra, Klamath/North Coast and Modoc bioregions have the highest predicted mammal species richness (Figure 3.5.5). Small, forest dwelling mammal taxa, such as the squirrel and chipmunk families, have the highest species richness, which explains the high concentration of species in those heavily wooded bioregions (DFG, 2003). The CWAP has

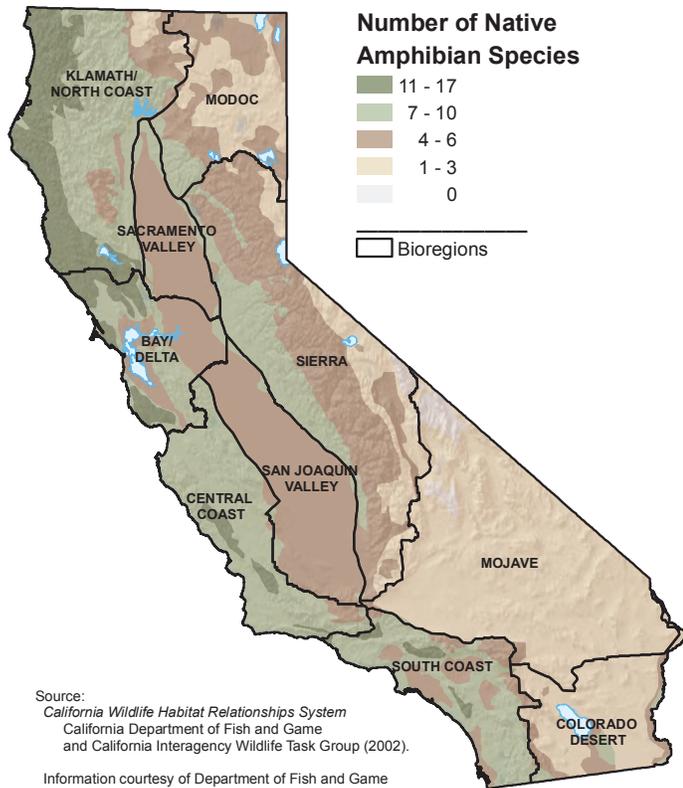


Figure 3.5.4. Amphibian species richness.

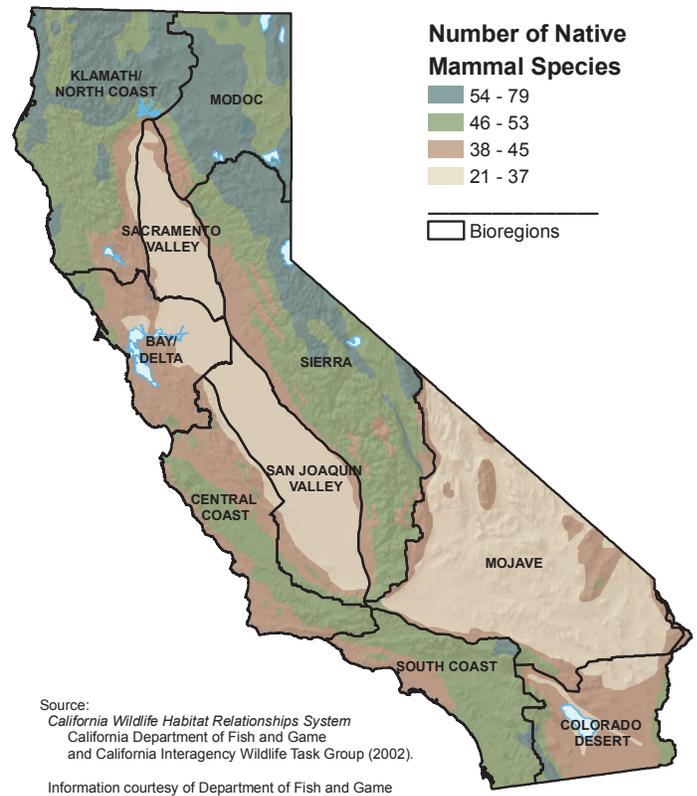


Figure 3.5.5. Mammal species richness.

listed climate change, water management conflicts, degradation of aquatic ecosystems, loss of riparian habitat and forest management conflicts as stressors affecting wildlife habitat in all of the bioregions that were identified as having the highest mammal species richness in the state.

Reptiles

Snakes, lizards and turtles make up the Class Reptilia (cold-blooded, terrestrial vertebrates born fully developed with lungs and scaly skin). There are ten species of reptiles listed as state or federally threatened or endangered. Two examples include the giant garter snake (*Thamnophis gigas*) and the blunt-nosed leopard lizard (*Gambelia sila*). Twenty-five species of reptiles are listed as California Species of Special Concern (DFG, 2009b).

Reptiles have adapted well to dry areas and extreme environments, naturally making the Mojave, Colorado Desert and South Coast the bioregions with the

highest predicted reptile species richness (Figure 3.5.6). The CWAP has identified growth and development, off-highway vehicle use, invasive plants, water management conflicts and climate change as major stressors that are degrading and disrupting wildlife habitat in all of these desert dominated bioregions. Low year round temperatures in the Sierra Nevada mountains and the Central Valley's historical wet expanses contribute to the fact that these bioregions have the lowest reptile species richness (DFG, 2003).

Fish

At least 45 percent of California's 62 native fish species are considered by DFG to be of greatest conservation need (Moyle et al., 2009). There are 32 fish taxa listed as threatened or endangered by either the state or the federal government, and nine species classified as Fully Protected (DFG, 2009c). A considerable amount of work has been completed or is underway to identify important habitat for preservation and restoration. However, the nexus between

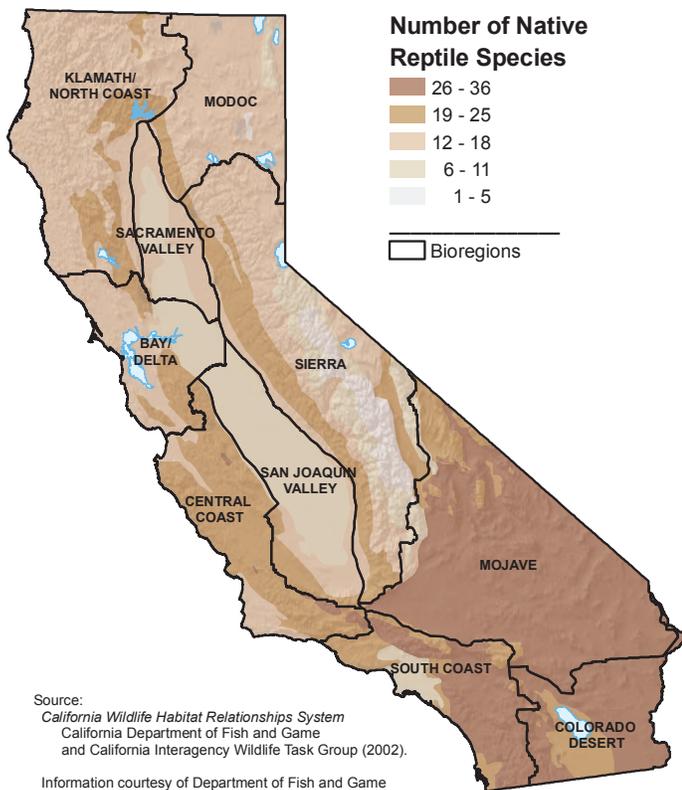


Figure 3.5.6.
Reptile species richness.

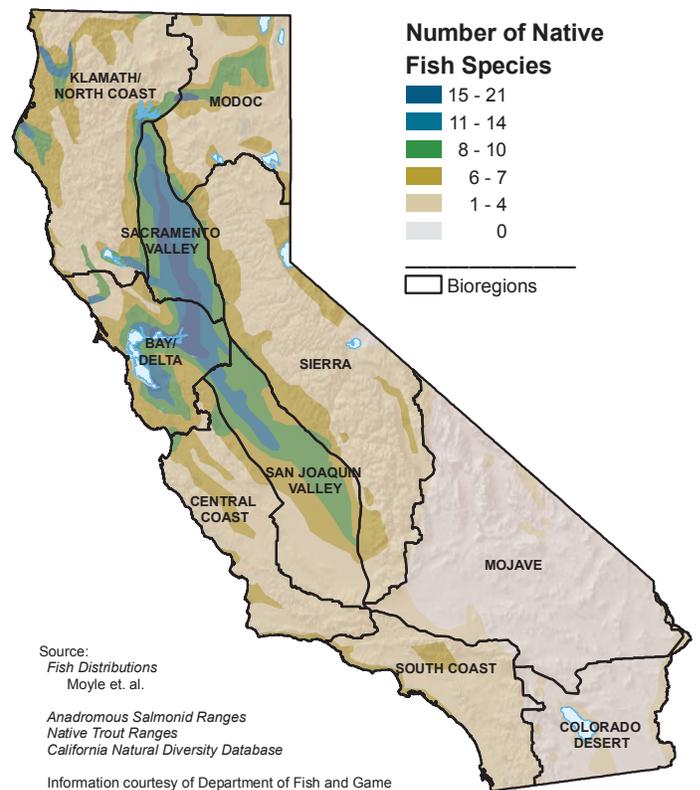


Figure 3.5.7.
Freshwater fish species richness.

threats, restoration and fish survival is not completely understood. A collaborative effort will be needed between federal entities, the state, private land owners and other stakeholders for watershed protection and species recovery.

The Sacramento Valley, San Joaquin Valley and Bay/Delta bioregions have the highest predicted freshwater fish richness (Figure 3.5.7). This is mostly based on highly productive habitats in the large rivers and estuary and bay system (DFG, 2003).

Invertebrates

Invertebrates are animals without backbones. Currently, there are 34 threatened or endangered species of mollusks, crustaceans, insects and arachnids as listed by the State.

Plants

The list of special-status plants far outnumber animals and fish, in part because the diversity of plant

species reflects the multitude of unique habitats and microclimates found throughout the state. Many species have very limited geographical ranges making them more vulnerable to extinction (Dobrovlny, 2009).

The California Native Plant Society (CNPS) maintains, in cooperation with DFG, a listing system for plant species at risk. Plants given a 1B status describe plant species considered rare, threatened or endangered both in California and elsewhere. List 2 plants are described as species that are rare, threatened or endangered in California, but are more common elsewhere. The Department of Fish and Game classifies CNPS Lists 1B and 2 plant species as rare and regulates them accordingly. In 2001 there were 1,021 species on this list. By the end of 2009 the number increased to 1,089 species (DFG, 2009a).

The Klamath/North Coast and Sierra bioregions have the highest predicted plant species richness in the

state (Figure 3.5.8). The high plant diversity in these areas is largely due to dramatic topography, large elevation gradients and a wide range of climate conditions (DFG, 2003). The CWAP has identified growth and development as a particularly critical stressor in the Sierra bioregion, while climate change, water management conflicts, degradation of aquatic ecosystems, loss of riparian habitat, invasive plants and animals, livestock grazing, forest management conflicts and altered fire regimes have been identified as some of the leading stressors in both bioregions.

Selected Mammal Population Trends

The Department of Fish and Game has a program that focuses on managing and monitoring large mammals that are classified as big game species, which includes black bear, pronghorn antelope, bighorn sheep, deer, elk and wild pig. They also manage mountain lion populations as large mammals that are considered specially protected species, not game species. Game animal populations are the most extensively tracked, as populations are generally abundant and managed through recreational hunting. Population trends are subject to environmental conditions such as climate extremes, loss of cover and food source availability, at times resulting in large population shifts on a year-to-year basis. Significant changes in their populations can indicate problems related to a populations' overall health and reproduction, impacts to important habitat, or other issues which may need to be examined more closely.

Game species and charismatic megafauna (e.g., mountain lions, bald eagles and deer) tend to garner the most attention by California's citizenry, and as a result, much more data is available to evaluate population trends than other, lesser known species (Dobrovolny, 2009).

Black Bear (*Ursus americana*)

Records of black bear populations over the last 18 years show a slow but steady increase in population. Statewide estimates in 1983 were around 7,000 (DFG, 2006, DFG, 2001a), and are now thought to be about 35,000 animals (Updike, 2009).

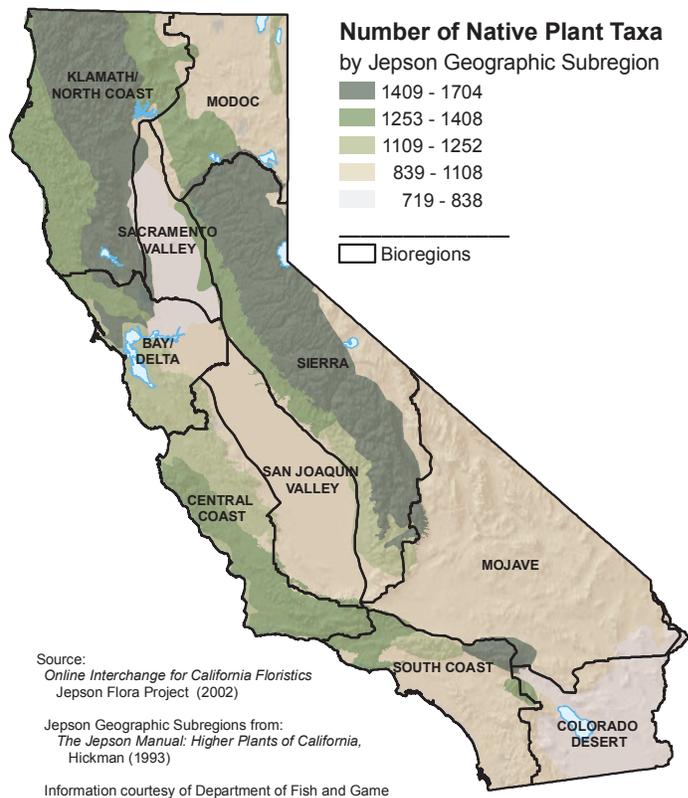


Figure 3.5.8. Plant species richness.

Pronghorn (*Antilocapra americana*)

The pronghorn was possibly once the most common land mammal in California (Pyshora, 1997), but their population was estimated to have dropped to a mere 1,100 in the 1920s, peaked near 8,000 in the mid-1990s and has subsequently fallen to an estimated 4,773 in 2009 (DFG, 2001b; Hobbs, 2009).

Black-Tailed Deer (*Odocoileus hemionus*)

Estimated to be between 500,000 to 600,000 before the gold rush, black-tailed deer may have increased to as much as 900,000 by the 1950s (DFG, 2001c). They are estimated to be close to 484,400 currently (based on population models), and stable in most areas. In other areas, they are showing a slow decline (Stowers, 2009). According to DFG, this decline is due to habitat loss resulting from fire suppression, the reduction and decadence of shrub-dominated habitats, herbicide treatments to reduce vegetative competition with young conifer plantings, and winter

recreational use in deer wintering grounds (Stowers, 2009).

Elk (*Cervus elaphus nanodes*, *C. e. roosevelti*, *C. e. nelsoni*)

Beginning in the mid-1800s, the population of elk decreased precipitously, and by 1971 the number of endemic Tule elk (*C. e. nonodes*) had declined to a total of 500 wild animals. As a result of an active elk management program, the population increased to 2,680 by 1989 (DFG, 2007b). The number of animals was estimated to be 3,580 in 2009 (Hobbs, 2009). Roosevelt elk (*C. e. roosevelti*) are estimated to have increased from 4,000 to 6,000 between 2000 and 2009. Rocky mountain elk (*C. e. nelsoni*) have held steady at an estimated 1,500 since 2000 (DFG, 2007b; Hobbs, 2009).

Bighorn Sheep (*Ovis canadensis sierrae* and *O.c. nelsoni*)

The Sierra Nevada bighorn sheep (*O.c. sierrae*) is both state and federally listed as endangered. Their population was estimated at 250 in 1979, 150 in 1996 (Graber, 1996) and is 60 percent recovered at 400 animals as of 2007 (Wehausen et al., 2007). A distinct population segment of the Nelson bighorn (*O. c. nelsoni*), called the peninsular bighorn sheep, is state listed as threatened and federally listed as endangered. Nelson bighorn sheep management is directed by Fish and Game Code. Based on its distribution and abundance, limited sport hunting of mature rams as managed and directed by DFG is allowed. In 1989, the listed Peninsular bighorn sheep population was 334 and in 2006 it was estimated at 791 (DFG, 2001e; Rubin, 2000; Wakeling, 2007).

Mountain Lion (*Puma concolor*)

Mountain lion populations have generally been increasing. The population was estimated to be around 2,400 in 1973, and is currently estimated to be between 4,000 to 6,000 individuals (Updike, 2009; Sitton and Wallen, 1976; CAL FIRE, 2003).

Threats to Wildlife Habitat and Conservation Programs and Plans

The key to long-term preservation of wildlife is the conservation, improvement, reestablishment and management of their natural habitats. A myriad of pressures are impacting wildlands. An array of programs is now in place to help preserve and maintain the remaining wild places and the species to which they are home.

California Department of Fish and Game is the lead agency responsible for managing the state's wildlife, plant and fish resources. Other state agencies that influence wildlife habitat are Department of Parks and Recreation, the State Lands Commission, State and Regional Water Quality Control Boards, the Department of Pesticide Regulation, Department of Water Resources, CAL FIRE and various conservancies. Several federal agencies such as the Environmental Protection Agency, National Marine Fisheries Service and the U.S. Fish and Wildlife Service have considerable information and significant programs regarding species populations or habitat. Other federal agencies such as the U.S. Forest Service, National Park Service, Bureau of Land Management and Department of Defense (DOD), also have data and management programs that deal with species and habitat.

Recent or ongoing efforts by DFG related to habitat threats and protection include: the California Wildlife Action Plan (CWAP), the Natural Community Conservation Planning Program (NCCP), the newly released California Essential Habitat Connectivity Project and the Areas of Conservation Emphasis (ACE) program. These DFG endeavors are briefly summarized below.

California's Wildlife Action Plan (CWAP)

The California Wildlife Action Plan (DFG, 2007a) summarizes threats affecting all wildlife, including mammals, fish, birds, reptiles, amphibians and plants, and suggests actions needed to maintain habitats and diversity in the future. CWAP does not present a detailed spatial analysis. The report lists and describes approximately 20 different threats to

wildlife and plant populations and their habitats. Four threats occur statewide: growth and development, water management conflicts, invasive species and climate change. Five others occur in multiple regions: pollution and urban and agricultural runoff, excessive livestock grazing, altered fire regimes (due to fire suppression and wildland urban interface expansion), recreational pressure, human disturbance and other land management conflicts. For purposes of this assessment, Table 3.5.1 summarizes the most important threats by bioregion.

Natural Community Conservation Planning Program (NCCP)

The primary objective of the NCCP is to conserve natural communities at the ecosystem scale while

accommodating compatible land use. The program seeks to anticipate and prevent the controversies and gridlock caused by species' listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

California Essential Habitat Connectivity Project (CEHCP)

The CEHCP is a Department of Fish and Game and California Department of Transportation (Caltrans) sponsored, public/private project to meet legal obligations to map wildlife corridors and habitat linkages (Spencer et al., 2010). The goal is to produce a matrix summarizing the biological values of the linkages, a strategic plan that frames a methodology for finer-scale analysis and local and regional connectivity

Table 3.5.1. Threats to wildlife and habitat by region, identified by DFG's CWAP

Threat	Klamath/ North Coast	Modoc Plateau	Sierra Nevada/ Cascade	Mojave Desert	Colorado Desert	South Coast	Central Coast	Bay/ Delta	Sacramento Valley	San Joaquin Valley
Growth and Development			x	x	x	x	x	x	x	x
Off-Highway Vehicle Use			x	x	x					
Livestock Grazing	x	x	x	x			x			
Wild Burro or Horse Grazing		x		x						
Invasive Animals	x		x		x	x	x	x	x	x
Invasive Plants	x	x	x	x	x	x	x	x	x	x
Military Land Management Conflicts				x						
Mining				x						
Water Management Conflicts	x	x	x	x	x	x	x	x	x	x
Altered Fire Regime	x	x	x			x				
Recreational Pressure		x	x			x	x			
W. Juniper Expansion		x								
Forest Management Conflicts	x	x	x	x						
Climate Change	x	x	x	x	x	x	x	x	x	x
Water Pollution								x	x	x
Degradation of Aquatic Ecosystem/Loss of Riparian Habitat	x	x	x		x	x	x	x	x	x
Loss/Degradation of Dune Habitats					x					
Intensive Agriculture	x	x					x	x	x	x
Substantial In-Stream Gravel Mining	x									
Watershed Fragmentation			x							

Data Source: California Department of Fish and Game, 2007

plans and a habitat connectivity map (Parisi, 2009). The plan will assist planners in maintaining and restoring habitat connectivity while making infrastructure projects more cost-effective (Spencer et al., 2010).

Areas of Conservation Emphasis (ACE)

The Department of Fish and Game will soon complete a report called Areas of Conservation Emphasis (ACE). The purpose of ACE is to identify high priority areas for conservation based on threats to biodiversity and endemism, as well as key critical areas of habitat and habitat types. The study should provide a comprehensive analysis of wildlife habitat assets and threats, with a focus on lands that are not currently managed for wildlife conservation.

THREATS TO WILDLIFE HABITAT: RESULTS FROM OTHER CHAPTERS

Efforts to analyze wildlife habitat were constrained by a number of factors, including data limitations and the complexity of the interaction of various threats on habitat. However, material in other assessment chapters is relevant to habitat threats.

Development Threat to Ecosystem Health

Chapter 1.1 analyzed the threat from projected development on ecosystem health. The analysis identified priority areas most threatened by immediate development, as well as entire ecosystems where the cumulative landscape-level threat has the potential to impact unique genetic resources, biodiversity and associated ecosystem services. Key findings include:

- Annual Grassland, Coastal Scrub, Montane Hardwood and Blue Oak Woodland habitat types are at the most risk of loss due to development.
- Bioregions with the largest proportion of ecosystem acres at risk include the South Coast, Bay/Delta and portions of the Sierra.
- Other habitat types of much smaller extent show up as threatened in local areas of other

bioregions, for example Blue Oak-Foothill Pine in the northern Sacramento Valley.

Forest Management Threat to Ecosystem Health
Sustainable Working Forests and Rangelands reported harvesting trends. In connection with forest management activities, CWAP listed a range of impacts, including the cultivation of even-aged stands, clear cutting and forest structure simplification, fire suppression, clearing of dead and downed wood, road building and maintenance and post-harvest herbicide use. It pointed to the cumulative effects of even-aged timber harvesting, and the elimination of older trees and snags and the biodiversity they foster.

Such activities can impact forest and stream habitats for wildlife. Timber harvesting practices can alter forest structure and the larger landscape scale patterns of habitat. Often impacts are species or habitat specific, and effects can be beneficial, neutral or negative depending on the species of interest. Impacts of harvesting and related management can affect such things as:

- Species behavior such as feeding, migration, reproduction
- Forest habitat structure such as increasing or decreasing specific seral stages (i.e., early or late seral stage)
- Configuration and extent of habitat, such as impacts along the edge of areas harvested
- Increased edge effects and the quantity and quality of habitat connection or integration
- Presence, absence or recruitment of specific habitat elements like nest trees, snags and large woody debris
- Overall richness, complexity, diversity and productivity of habitat
- Status of in-stream and adjacent riparian habitat, such as shade, sediment movement and available nutrients
- Establishment and spread of undesired habitat elements, such as invasive species

CWAP identified forest practices as potentially impacting the streams of San Mateo and Santa Cruz

county areas of the Bay/Delta bioregion, as well as those of the Klamath/North Coast bioregion. The plan also indicated that forest management conflicts and their past and current effects are major stressors on forest habitats in the Sierra, Klamath/North Coast and Modoc bioregions. The Plan emphasizes the maintenance of old growth forests, now mostly on federal lands, in addition to efforts to reduce the risk of catastrophic fires through thinning of densely packed understory trees.

Rangeland Management Threat to Ecosystem Health

Large rangeland areas provide continuous open space critical for wildlife movement and ecological function (DFG, 2007a). The recent CEHCP report finds that extensive rangelands (e.g., along the edges of the Central Valley) provide essential connectivity habitat for wildlife (Spencer et al., 2010).

Proper management of livestock grazing, the main use impacting rangelands, is important to retaining high quality habitat for both terrestrial wildlife and aquatic species. Excessive grazing can lead to problems with invasive species, soil erosion and loss, habitat loss for ground nesting birds and overall habitat degradation. In some areas, endangered species such as the kit fox can be severely impacted by the effects of livestock grazing. Seasonal timing, number of livestock and degree of grazing are important to rangeland management. In more wooded rangelands, grazing can reduce understory plants and eliminate habitat for wildlife species dependent on it for protection and cover.

Riparian areas in grazed rangelands have historically suffered impacts from livestock trampling, browsing and direct urination and defecation into streams. Many streams flowing through rangelands are listed under 303 (of the Clean Water Act) as having impairment from the effects of rangeland and riparian livestock grazing. In addition, cattle trails can be an important mode of sediment transport into rangeland streams, further degrading water quality (George, et al., 2004).

CWAP listed the Mojave, Central Coast, Klamath / North Coast, Modoc and Sierra bioregions all as having excessive livestock grazing as a major wildlife stressor. Riparian habitat degradation was highlighted in the Sierra bioregion, with livestock grazing as a listed cause. Invasive plants, a problem often exacerbated by excessive grazing, is also listed as a stressor for the Mojave, Modoc and Sierra bioregions.

Wildfire Threat to Ecosystem Health

Wildfire Threat to Ecosystem Health and Community Safety analyzed the threat to ecosystem health from uncharacteristic wildfire. This chapter identified important trends related to increased acres burned, fire severity, and departure from historic fire regimes which is impacting vegetation communities that are adapted to, or even dependent on natural wildfire.

Key findings include:

- The most at risk ecosystems are Klamath and Sierran Mixed Conifer and Douglas-fir in the Klamath/North Coast, Modoc and Sierra bioregions. Shrub types most at risk are Sagebrush, Coastal Scrub and Mixed Chaparral.

Forest Pest Threat to Ecosystem Health

Forest Pests and Other Threats to Ecosystem Health and Community Safety analyzed the threat from forest pests to ecosystem health. This chapter highlighted the widespread commercial, aesthetic, economic and environmental impacts throughout California's ecosystems being caused by various native and exotic forest pests. Key findings include:

- Ecosystems currently suffering the most extensive damage are Sierran Mixed Conifer, East-side Pine, Red Fir and White Fir.
- Those at greatest risk from future damage include White Fir, Red Fir and Lodgepole Pine.

Threats to Water Quality and Quantity

Water Quality and Quantity Protection and Enhancement analyzed threats to water quantity and quality, both of which play a key role in wildlife and fish related habitat in California. The water quality analysis compares water quality assets such as anadromous

fish-bearing streams, riparian vegetation canopy cover, wild and scenic rivers, forest meadows and natural lakes to water quality stressors such as impaired waterbodies, post-fire erosion, development and impervious surfaces. Key findings include:

- High priority areas for water quality are concentrated in North Coast watersheds and in certain basins located in the Sierra as well as portions of the South Coast.

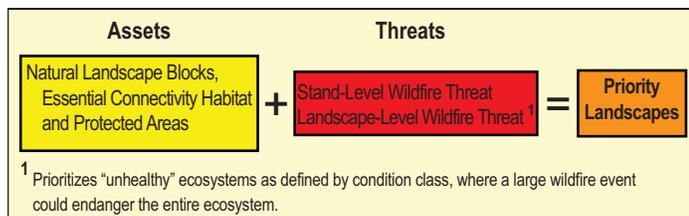
Climate Change Threat

Chapter 3.7 discusses the potential effects of climate change on California’s ecosystems, such as changes in species distribution ranges, tree growth and disturbance regimes. Predictive models were used to analyze how vegetation species ranges might change as a result of climate change. Key findings include:

- Projected temperature increases coupled with steady or declining precipitation rates may result in longer dry seasons and shifts for tree species ranges, typically to higher elevations and more northern latitudes. Most affected would likely be habitats situated at the highest elevations of mountain ridges, with types in some areas being eliminated. Most wildlife can follow the movement of suitable habitat, but there may be a net loss of habitat overall for species inhabiting higher elevations in the state.

WILDFIRE THREAT TO AREAS PROTECTED FOR HABITAT

Analysis



In this section wildfire threat to natural blocks, essential connectivity and protected areas are analyzed. These lands are a key foundation for existing wildlife

diversity and may be even more critical as wildlife and other species attempt to adapt to climate change. This approach is being used as an interim analysis until ACE data becomes available for a more extensive habitat analysis.

As outlined in California’s Wildlife Action Plan, many threats exist to wildlife habitat in the state. One of the most common threats is high severity or frequent wildland fire. Wildfire can have varied impacts on habitat, depending upon many factors (fire behavior, frequency, duration, seasonality and landscape alterations). Generally speaking, as the intensity of fire increases, the severity of impacts also increases. An exception occurs when habitat is adapted to high intensity fire (e.g., chaparral, lodgepole pine). The vast majority of habitats in California are not resistant to high severity wildfire.

Fire suppression practices have reduced fire frequency in most areas of the state over the past 50 years, resulting in a buildup of wildland fuels. This has greatly increased the threat of high intensity or uncharacteristic wildfire. High intensity wildfires often cause more severe ecological damage in less resilient ecosystems. Intensely burned landscapes are often unusable to even specially-adapted plants and animals generally expected to be found in post-fire habitats.

The priority landscape (Figure 3.5.10) identifies natural blocks, essential connectivity and protected areas which are most at risk from uncharacteristic wildfire. Identification of protected habitat threatened by high intensity wildfire is a step in conserving, protecting and restoring habitats crucial to sustaining and enhancing the rich biodiversity of California.

Asset

Protected Areas, Natural Landscape Blocks and Essential Connectivity Habitat Areas

Areas of three designations were combined to produce the GIS coverage of the habitat asset layer: natural habitat blocks, essential corridor habitat (both defined by the California Essential Habitat

Connectivity Project (CEHCP)) and protected areas. The CEHCP delineated natural landscape blocks and essential connectivity areas deemed important to facilitate the movement and long-term viability of wildlife populations throughout the state (Spencer et al., 2010). While not geared to any particular species or guild, the GIS data and maps are offered as spatial guides to regional conservation planning rather than delineating specific areas recommended for some form of protected status.

For the purposes of this analysis, protected areas are defined as land that is legally established in public ownership, private land trusts, or in similar status that provides wildlife habitat values and is likely to remain as habitat into perpetuity. The protected areas asset layer used for this analysis was derived from the California Protected Areas Database (GreenInfo Network, 2009). This dataset includes all protected areas within California from small, local and regional parks to large federal lands, preserves, reserves, conservancies, land trusts, foundations and easements. Department of Defense lands, given their in-depth resource management plans, were added to the protected areas asset layer.

This analysis gave all habitat asset areas the same rank, regardless of their ecological health and level of management, assuming that all of these lands currently offer high quality habitat, or have the potential to offer good habitat once improved or restored. Such areas may be key to landscape-scale wildlife habitat improvement and other adaptive management strategies for climate change. The asset layer is shown in Figure 3.5.9.

Threat

Wildfire Threat

Wildfire threat represents a combination of the level of impact and severity that a wildfire causes, and the frequency with which an area is expected to burn; the higher the rank the higher the likelihood of a damaging fire event. The fire threat layer used considers both landscape and stand level wildfire risk. See

Chapter 2.1 for additional information on threats from wildfire.

Results

The wildlife habitat asset layer was combined with the threat layer to create a statewide priority landscape depicting high value areas that are at highest risk for uncharacteristic wildfire. The priority landscape is shown in Figure 3.5.10. About 62 percent of the state was determined to be in asset areas. The analysis shows that over 14 percent of the state is considered high priority (both protected and high wildfire threat), while over 12 percent is medium priority and 35 percent is low priority. The high and medium priority landscapes (HMPL) are at most risk, and these are concentrated in the Sierra, Klamath/North Coast and Modoc bioregions (Table 3.5.2).

The priority landscape is largely characterized by public land managed by federal agencies. The



Figure 3.5.9.

Protected and wildlife corridor areas asset.

Data Sources: California Protected Areas Database (CPAD), GreenInfo Network (2009); California Essential Habitat Connectivity Project, DFG (2010)

bioregions with the most medium and high priority landscape (Sierra, Klamath/North Coast and Modoc) are all dominated by federal lands. Lands administered by the U.S. Forest Service (USFS) comprise the majority of this designation overall. The Modoc bioregion has more high and medium priority landscape held by the Bureau of Land Management (BLM) than any other bioregion (Table 3.5.3). About 89 percent of the high and medium priority landscape is managed by federal agencies, three percent falls on state lands, and less than one percent is owned by non-profit agencies. The Sacramento Valley bioregion contains the most non-profit and state owned high and medium priority landscape.

Discussion

The results suggest that over one-quarter of the wildlife habitat asset acres in California are at high or medium risk from uncharacteristic wildfire. Lands managed by federal agencies dominate the priority landscapes. To the extent that these lands are considered key to effective wildlife conservation, and catastrophic wildfire would severely alter or destroy this habitat, efforts should be directed to reduce this threat and restore a more characteristic fire regime to these key ecosystems.

This analysis was limited by factors including:

- Some areas important to wildlife may have been inadvertently omitted. The areas used as wildlife habitat assets were derived from protected status, natural block and essential corridor work, but may be incomplete in some areas. Areas not included in the analysis may also potentially be of high value for wildlife habitat.
- Despite numerous programs, regulations and efforts put in place to protect wildlife species and their habitat, there is still a general trend of species decline across all California taxa. The CWAP has identified the leading stressors responsible for these continuing declines. Updating of the CWAP, completion of ACE by DFG and other studies by governmental agencies

with jurisdiction over wildlife, fish and water quality could significantly add to and refine lands considered as key for habitat protection, and mechanisms for other protection measures.

Tools

A large amount of work has been completed or is underway in California to identify, preserve, protect and restore important wildlife, plant and fish populations and their habitat. The Department of Fish and Game, other agencies, universities and other stakeholders are also active in examining the potential impacts of climate change on species and habitat and are designing mitigation and adaptation strategies. Many broad-scale and local efforts recognize the value of collaboration and include multi-agency agendas in their planning efforts.

Below is a partial list of efforts underway related to wildlife habitat planning and conservation. These are covered further in the strategies document.

- Chapter 6 of the CWAP addresses the important elements and needs of effective wildlife habitat conservation efforts in California. It also summarizes the numerous plans, programs and initiatives now underway to meet this challenge.
- The results of the CEHCP have just been released, and data from that project was used in the analysis in this chapter. As part of its analysis, it mapped statewide natural habitat blocks and essential habitat connectivity routes for wildlife moving between these blocks.
- Various efforts by watershed groups, Fire Safe Councils, local communities and other stakeholders often implement important projects related to watershed restoration, fuel reduction and habitat improvement. Local efforts frequently involve non-profit agencies to set up land trusts, easements, preserves and reserves.
- Policies and regulations can be a driving force in enhancing and protecting habitat, such as through the National Marine Sanctuaries Act and the California Forest Practice Rules.

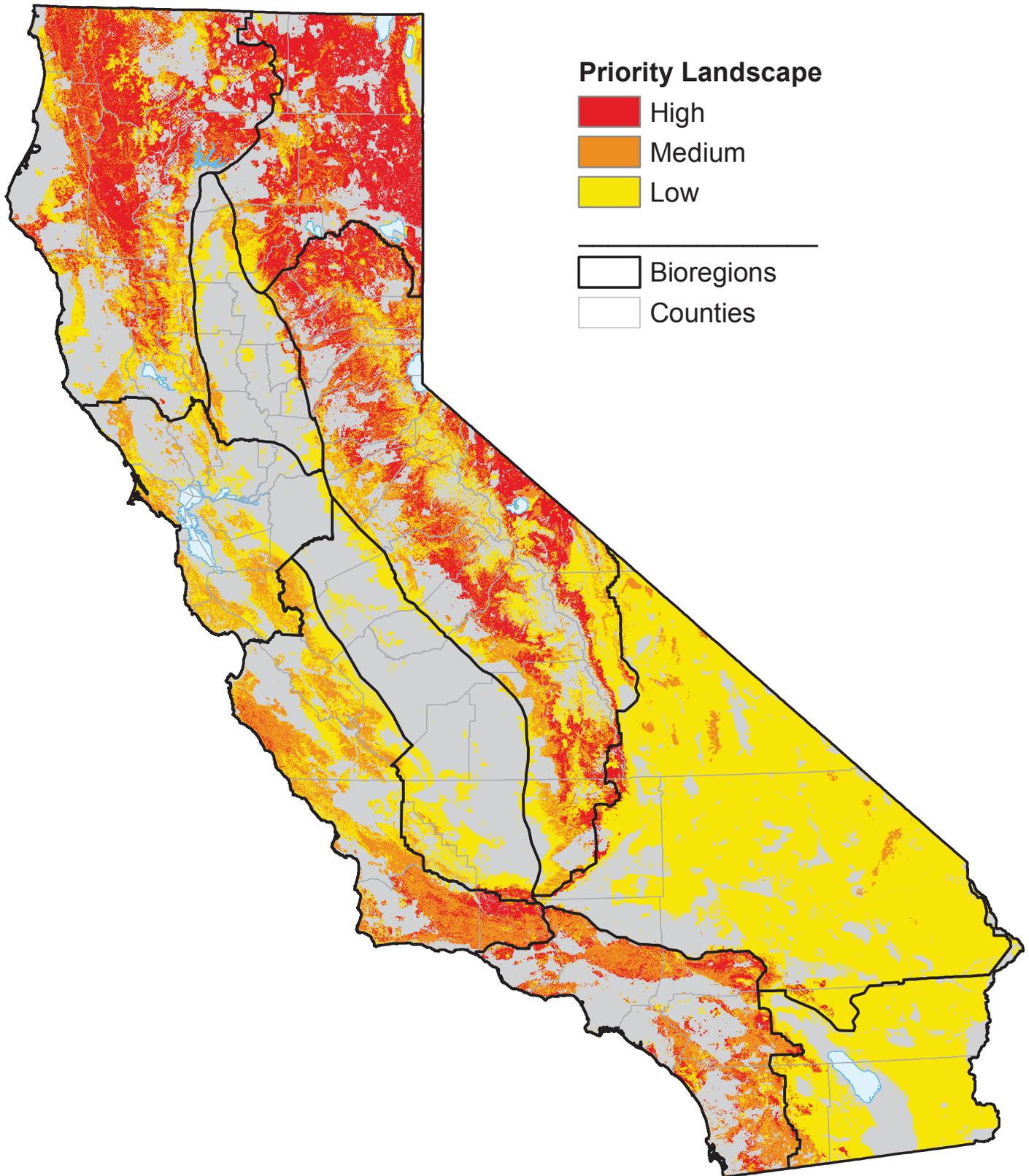


Figure 3.5.10.

Priority landscape of wildfire threat to areas important for wildlife habitat.

Data Sources: California Essential Habitat Connectivity Project, DFG (2010); Protected Areas from California Protected Areas Database (CPAD), GreenInfo Network (2009); Bureau of Indian Affairs lands from California Protected Areas Database (CPAD), GreenInfo Network (2010); Department of Defense lands from Public Conservation Trust Lands, Legacy Project, California Resources Agency (2005); California Fire Regime Condition Class, FRAP (2003); Fire Threat, FRAP (2005)

Table 3.5.2. Priority landscape for wildfire threat to areas protected for habitat by bioregion (acres in thousands)

Bioregion	Total Acres	Low	Medium	High	Percent HMPL of State
Bay/Delta	6,292	1,542	843	4	0.84
Central Coast	7,986	2,107	2,611	577	3.15
Colorado Desert	6,757	4,592	168	64	0.23
Klamath/North Coast	14,383	2,808	2,264	4,367	6.55
Modoc	8,332	772	842	4,094	4.88
Mojave	19,937	15,687	447	252	0.69
Sacramento Valley	3,953	702	192	34	0.22
San Joaquin Valley	8,224	1,619	148	60	0.21
Sierra	18,303	4,912	3,235	4,390	7.53
South Coast	7,059	538	1,980	1,082	3.02
Total	101,226	35,280	12,730	14,923	27.32

Table 3.5.3. High plus medium priority landscapes for wildfire threat to areas protected for habitat by ownership and bioregion (acres in thousands)

Bioregion	USFS	NPS	DOD	BLM	Other Federal	BIA	Other Public	Private	NGO
Bay/Delta	0	46	<1	7	12	<1	245	511	26
Central Coast	1,502	10	149	122	6	<1	114	1,276	10
Colorado Desert	6	<1	0	56	4	29	94	41	1
Klamath/North Coast	1,195	45	0	291	1	129	66	1,481	4
Modoc	2,456	116	14	1,166	16	13	110	1,038	7
Mojave	39	260	29	249	3	<1	13	90	16
Sacramento Valley	0	0	<1	9	1	<1	12	191	13
San Joaquin Valley	66	0	0	40	3	0	7	77	15
Sierra	4,703	499	0	658	16	46	177	1,518	9
South Coast	1,559	19	88	95	48	138	365	723	26
Total	11,526	994	281	2,693	110	355	1,202	6,946	128

- University and academic research and instruction can improve understanding and management and help focus efforts.
- Funding is a key component of the habitat protection, conservation and enhancement process. Nearly \$200 million in grant monies have been awarded by DFG alone for fish habitat restoration in 26 counties since 1981. Voter approved initiatives and bond measures have provided critical funding, especially for land acquisition and water quality improvements.
- The U.S. Fish and Wildlife Service and the U.S. Geological Survey are working together on a “strategic habitat conservation” initiative, which requires the agencies and their partners to set biological goals for priority species populations, inform and make strategic resource management decisions, and constantly reassess and improve conservation actions.
- California Partners in Flight, a partnership of agencies and private groups, have published bird-centered conservation plans for most habitat types in California.