Chapter 1.1
Population Growth and Development Impacts

In many parts of the United States, forests and other open space are being fragmented and converted to development. Forestry agencies can work with partners, stakeholders and communities to identify and protect priority forest landscapes through land acquisition, conservation easements, and land use policies. Forestry agencies can also provide technical assistance to communities to help them strategically plan for and conserve forests and other open space.

Factors contributing to loss include residential, commercial and industrial development; expansion of utility infrastructure and transportation networks; and planning, zoning, and policies that favor conversion. Consequences include the outright loss of public benefits associated with forests or the marginalization of those values provided by contiguous forested landscapes. Fragmentation also includes "parcelization," or the fracturing of large singular ownerships into numerous smaller ones.

Assessments and strategies should attempt to identify, protect and connect ecologically important forest landscapes, and open space, thus maintaining a green infrastructure, particularly around and within areas of, population growth and development (excerpted from the U.S. Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

KEY FINDINGS

- California's population continues to increase, particularly in Southern California. An estimated 3.9 million residents will be added over the next decade. This continued trend will place increasing pressure on land development and ecosystems in the state.

- Population impacts occur through urbanization, rural development and parcel fragmentation. The latter two impacts are not always driven by population increases but can arise from shifting internal demographics (retirement communities, second homes, etc.).
- Over the next decade between 200,000 and 550,000 acres of undeveloped or underdeveloped land will be required to accommodate the needs of new urban residents, depending on average housing densities. About 55 percent of this total will come from rangelands or other natural or near-natural land cover types.
- The habitat type in California with the most acres at risk from development statewide is Annual Grassland, followed distantly by Coastal Scrub, Montane Hardwood and Blue Oak Woodland.
- The bioregions with the highest proportion of acres at risk are: the South Coast, Bay/Delta and the central and northern foothill areas of the Sierra. Habitat types found to be most at risk in these regions:
  - *South Coast*: Coastal Scrub, Annual Grassland and Mixed Chaparral
  - *Bay/Delta*: Annual Grassland, Coastal Oak Woodland, Montane Hardwood and Redwood
  - *Sierra*: Montane Hardwood, Blue Oak Woodland, Annual Grassland and Montane Hardwood-Conifer
- Other habitat types of much smaller extent show up as threatened in local areas of other bioregions, for example, Blue Oak-Foothill Pine type in the northern Sacramento Valley bioregion.

INTRODUCTION

California contains a wide variety of topography, climates, and soils across its ten bioregions (http://biodiversity.ca.gov/bioregions.html). This variation has given rise to rich and diverse ecosystems with many and contrasting natural vegetation types, from cool-moist redwood forests in the northwest, to hot subtropical deserts in the southeast. From amphibians to mammals, the state's numerous species of wildlife depend on these habitats. California's rich biodiversity, the number of native and endemic species of flora and fauna, is unparalleled in the western hemisphere north of the tropics (http://www.biodiversityhotspots.org/).

Since settlement by Spain in the late 18th century and colonization by Euro-Americans in the 19th century, many formerly natural landscapes in California have undergone major transformations. These changes have occurred directly from activities including historical overgrazing by cattle, development, land reclamation and conversion to agriculture, and indirectly from the introduction and widespread colonization of non-native plant and animal species, recent livestock grazing, timber harvesting, and in recent decades, wildfire suppression. Much of the state's natural habitat has been lost or severely degraded in quality from the cumulative effects of these pressures (CAL FIRE, 2003).

With about 38.3 million residents in the year 2009, California is the most populous state in the union and will likely be for the foreseeable future. The most recent projections show its population increasing to about 42.2 million by 2020, and 46.4 million residents by the year 2030 (U.S. Census Bureau, 2005). A population growth rate of about 1.5 percent is expected for future years thereafter. This trend, plus the growing movement of more residents into rural areas, will likely continue impacting natural landscapes and habitats in areas of the state.

Ecosystems and Past Development

Historically, the ecosystems most adversely impacted by development have been low elevation coastal plains, flat valley bottoms and wetlands where large areas of formerly natural landscapes have been transformed into farms and cities (CAL FIRE, 2003). Over large tracts of the Central Valley, land reclamation projects converted riparian forests, marshes and grasslands into agricultural fields. A report from the 1970s estimated at that time that less than two

percent of the original riparian forests still remained in the northern Sacramento Valley (Swift, 1984). An even larger proportion of this high-value habitat type was converted in areas of the Central Valley to the south.

Profound changes have occurred also in other regions of the state. The coastal sage scrub and oak savannas that once dominated Southern California's coastal plains and alluvial fans were diminished first by citrus groves, and more recently by huge expanses of urban and suburban development. Large areas of grasslands, oak savannas and hardwood tree dominated habitat types have been developed in other portions of the state. The high number of narrowly-distributed endemic plant and animal species and sharp decline in the extent of some ecosystems has contributed to California's many varieties of plants and animals that are now threatened, endangered or of other special concern (DFG, 2009; Thelander, 1994). This is particularly true around the state's two largest urbanized areas in the South Coast and Bay/Delta bioregions.

CURRENT STATUS AND TRENDS

This section gives an overview of historic and current expansion of urban and rural development in California, as well as some tools and organizations that help guide development and address its adverse impacts.

Growth of Urban Development

Over the past decades urban development has steadily expanded into areas of formerly undeveloped or agricultural lands. Sleeter et al., (2010) estimated from satellite data that from 1986 to 2000 an average of 64,000 acres was converted annually in California from other land uses to urban development. A different study indicates that about 70 percent of that total (average of 44,000 acres/year) was previously agricultural land, approximately 15,500 acres of which was rangeland formerly used for grazing stock (California Department of Conservation, 2006). The remainder (about 20,000 acres/year) came from converting lands from a natural or near-natural state.

Data modeled by decade for the period 1950–2000 show a similar but somewhat lower estimate over a longer time frame (U.S. Environmental Protection Agency, 2009). On average, about 55,000 acres per year were converted from other uses to urban/suburban land use (Figure 1.1.1). Overall, during the past two decades or more the rates of conversion to urban land use have varied due to economic and other factors, but show a slight downward trend. Moreover, recent planning policies are favoring higher population densities than historically typical, so the acreage conversion rates may continue to decline.

Growth of Low Density Rural Development

Movement of low density development into new areas can be difficult to determine spatially. A central challenge is selecting a characteristic scale and buffer area with which to generalize the development across landscapes into sparse housing densities. Different methodologies and standards used in studies can thus make comparisons difficult.

Estimates were made of low density housing growth in rural areas using data from the U.S. Environmental Protection Agency (2009), shown in Figure 1.1.1 as the newly parcelized acres by decade, from 1950–2000. Newly parcelized acreage peaked in the 1970–1980 at about 110,000 acres per year, decreasing steadily to just over 75,000 acres per year in the 1990 to 2000 time frame. Data for the current decade will be available with completion of the 2010 census now in progress.

The Regulatory Environment

California's system of laws and regulations that have bearing on new development is one of the most complex in the nation (CAL FIRE, 2003; Governor's Office of Planning and Research, 2009). Some operate at the local level, such as those enacted in the 478 incorporated cities in the state, while others apply across county or broader regional or statewide scales. At the local level, zoning and city ordinances regulate

the types of development that are allowed within specified areas of the city limits (California Legacy Project, 2004).

Counties, and their Local Agency Formation Commissions and Regional Transportation Planning Agencies, actively plan and manage development. In addition, at least 25 Metropolitan Planning Organizations and Councils of Government form multi-agency regional planning bodies in California (Office of Planning and Research, 2009). Counties, major metropolitan areas and other areas of the state coordinate land use planning and development through these agencies at much larger scales and around the most burgeoning cities and communities.

The California Environmental Quality Act (CEQA) was first enacted in the 1970s to provide systematic examinations of the environmental consequences of new development projects. CEQA requires new developments comply with negative declarations (where there is no significant impact) or create an Environmental Impact Report to elaborate on the likely impacts of a proposed project. The California and federal Endangered Species Acts (CESA and ESA) can have bearing on land development in areas where threatened and endangered species and their habitats occur or are potentially present, and where federal species recovery plans determine critical habitat areas. The Clean Water Act can also affect types and locations of development in watersheds that are listed 303(d) and where Total Maximum Daily Loads (TMDLs) of pollutants have been established to limit further potential sources of pollution.

Other statewide legislation has been enacted in response to broad concerns about development threats to certain land uses and habitat types. These include the Williamson Act of 1965 and the Forest Tax Reform Act of 1976, the Natural Communities Conservation Planning Act (NCCPA) of 1991 and the Oak Woodlands Conservation Act of 2001. The voluntary Williamson Act reduces the property tax on owners of agricultural lands in return for it not being

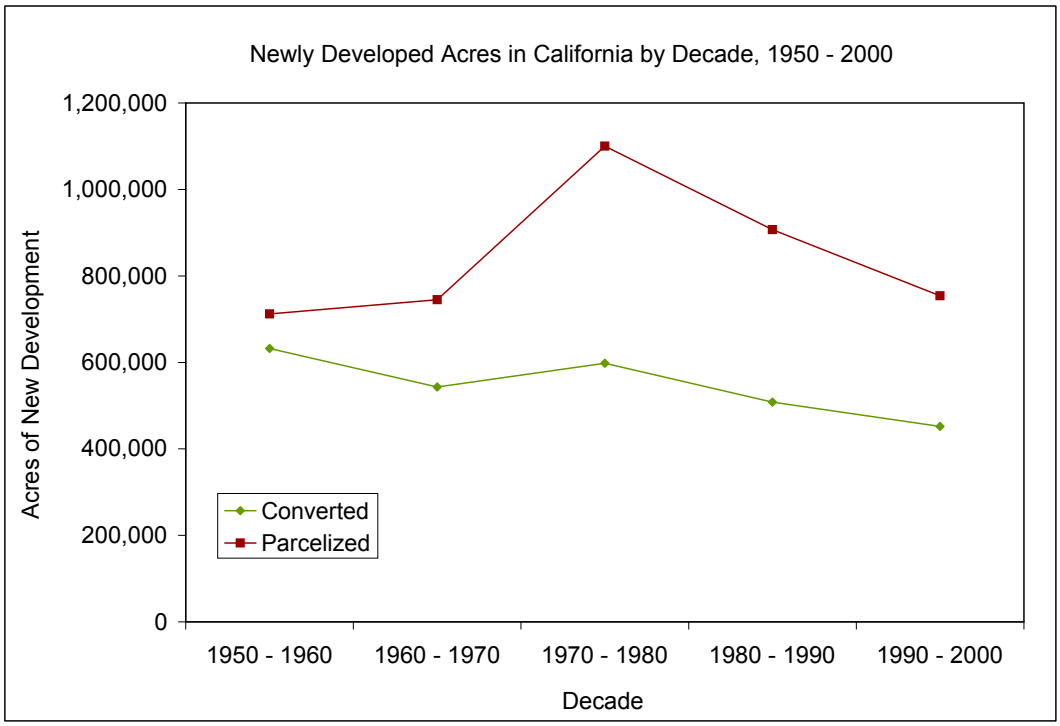


Figure 1.1.1.
Growth of development in two density categories shown by decade from 1950 through 2000. Converted and parcelized acres correspond to housing density categories urban/exurban and low density rural, respectively. These density categories were also used in the risk analysis for this chapter.
Data Source: U.S. Environmental Protection Agency, 2009

parcelized or developed. Timber Production Zones (TPZ), under the Forest Tax Reform Act of 1976, replaced the Williamson Act on timberland. This program helps keep forestlands in timber production by reducing assessed property taxes. The NCCPA, administered by the California Department of Fish and Game (DFG), promotes voluntary conservation planning and enables exchanges of development rights for protecting other local areas of land with high value habitat, the process referred to as conservation and mitigation banking.

Public Agencies

Public agencies have been involved in land use planning and open space conservation for many decades. City and county level general plans, with seven required elements that include land use, conservation and open space, have played major roles in guiding the locations of development in California since at least the 1960s. From county general plans, zoning ordinances are put in place to regulate the land use in counties and cities. In many counties, special districts for parks, open space and agricultural land preservation have been created in recent decades. Some of the larger ones are the East Bay Regional Park District, Midpeninsula Regional Open Space District and the Sonoma County Agricultural Preservation and Open Space District. State government conservancies operating at the regional level include the San Joaquin River, Santa Monica Mountains, Coastal, Tahoe and Sierra Nevada Conservancies. Through planning, easements and land acquisition, these agencies have aided efforts to minimize adverse regional impacts to ecosystem values caused by new development.

At the state level, the role of the Governor's Office of Planning and Research (OPR) has been to coordinate planning across all 58 counties. A primary mission of OPR has been to "formulate long-range goals and policies for land use, population growth and distribution, urban expansion, land development, resource preservation, and other factors affecting statewide development patterns." Key publications include the California Planning Guide and the annual California Planners' Book of Lists, which summarizes statewide the status of county general plans and agencies of all levels involved in planning. However, OPR does not administer land use policy or directly affect local land use decisions.

In 2008, state legislation created the Strategic Growth Council (SGC), a cabinet level committee tasked with coordinating other State agencies with duties that include:

- Improving air and water quality
- Protecting natural resource and agricultural lands
- Assisting State and local entities in planning sustainable communities and meeting AB32, the Global Warming Solutions Act and SB375, Redesigning Communities to Reduce Greenhouse Gases Act

The SGC currently awards program funding for urban greening, planning for sustainable communities and modeling incentives proposals geared towards improving regional transportation network efficiencies.

The California Outdoor Recreation Plan (CORP) is a statewide master plan developed with a multi-agency public participation process led by the California State Parks' Planning Division (http://www.parks.ca.gov/?page_id=23880). CORP provides guidance to agencies, from federal to local, involved in planning and implementing recreational lands, facilities and services. CORP also is the primary means of prioritizing Land and Water Conservation Fund Act grant allocations for local governments.

Private Groups—Land Use Policy and Regulation and Purchase of Land or Conservation Easements

As of 2005, nearly two hundred land trusts were operating in California, with about 1.73 million acres acquired, under easement or re-conveyed to another land holding agency. Most of these land trusts operate at a local or regional level, such as the Sonoma Land Trust or Save the Redwoods League, with the

View of the Verdugo Mountains.The city of Glendale, California is visible in the foreground.

area each has conserved ranging from a few hundred to many tens of thousands of acres. Some, like The Nature Conservancy and the Trust for Public Land, are active in the state and across the entire country. Recent years have seen strongly increasing trends in both the number of smaller land trusts and their activity levels, driven by bond and tax funded measures.

The private non-profit Local Government Commission provides "inspiration, technical assistance, and networking to local elected officials and other dedicated community leaders who are working to create healthy, walkable and resource-efficient communities." Members of this group authored the Awhanee Principles, which outline a set of guidelines for communities that have influenced city and county planning since their creation in 1991.

The community activist organization Greenbelt Alliance has been working for 50 years to influence policy and regulations to conserve high value landscapes in the impacted Bay/Delta bioregion. Their 2006 report provides detailed maps of landscapes at risk of development across the bioregion (Greenbelt Alliance, 2006).

The severe contraction in the economy and state budgets since 2008 has decreased the activities of private organizations involved in land conservation and management. Many are dependent in large part on bond measures and local taxes, which have fallen off dramatically in recent years. Although the economic downturn has diminished the cash donations to land trusts overall, a countering effect has been reduction in the price of land. In California the cost of real estate has decreased to the point where some areas are much more affordable, and some well-endowed land trusts are now taking advantage of this opportunity.

Coalitions, Consortia, and Initiatives

In some areas, land trusts are partnering together in their efforts to conserve land. For example, the North Sierra Partnership is a joint effort of the Sierra Business Council and four land trusts (two regional and two national): Feather River, Truckee-Donner, The Nature Conservancy and the Trust for Public Land.

With shared planning and resources, a partnership can plan more efficiently to acquire lands and allocate financial and other resources. A southern Sierra partnership is now under development.

The Southern California Association of Governments (SCAG) unites a number of municipalities across six counties, from Ventura in the northwest to Imperial in the southeast, excluding San Diego County. Cities and towns in San Diego County belong to San Diego Association of Governments, similar in mission to SCAG. The Association of Bay Area Governments has one hundred member municipalities in nine Bay Area counties. Regional planning among neighboring communities has the advantage of providing a more synoptic view of growth, and looking at potential problems caused by pushing development into the outreaches of metropolitan areas.

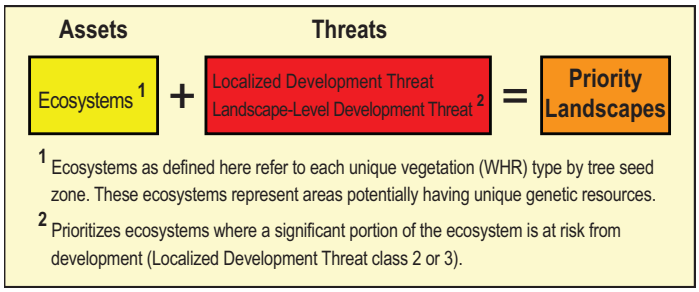
In addition to the direct efforts to conserve lands, there are coalitions and initiatives which include both public agencies and private organizations working together to promote policies for better development and land use planning. The Smart Growth Network is comprised of 40 public and private institutions nationwide, and promotes rebuilding vital communities in city centers and older suburbs. Among their principles, Smart Growth lists preserving "open space, farmland, natural beauty, and critical environmental areas." The Bay Area Open Space Council has over one hundred member organizations from both the public and private sector working to "foster an interconnected system of healthy communities with parks, trails, agricultural lands, and natural areas throughout the region."

These many organizations work, plan and promote development that maintains landscapes with high value ecosystems. Taken together, they represent a movement towards growth that is based on a thorough examination of the land, its resources and values, and the needs of communities to grow and develop. Balancing these competing goals is a difficult task. The strategies for dealing with the threat posed to ecosystems by development are likely to involve the empowerment and support of such institutions, initiatives and coalitions.

POPULATION GROWTH AND DEVELOPMENT IMPACTS

Analysis

The analytical framework used to identify ecosystems at risk from development is shown in the below diagram. Development threats and the ecosystem asset were combined to identify the priority landscape.



Assets

As shown in the above diagram, to represent the ecosystem asset, digital spatial data of California Wildlife Habitat Relationships (WHR) vegetation types (Mayer and Laudenslayer, 1988; DFG, 1988–1990) were used. WHR types were originally developed to help biologists and planners determine the suite of animal species that may use a given habitat or cover type. Sixty-five land habitat and cover types are in the WHR system, 43 of which are of natural vegetation (Statewide Land Use / Land Cover Mosaic, FRAP (2006)). A statewide map of WHR types can be found on the FRAP website (http://frap.fire.ca.gov/data/frapgismaps/select.asp?record=fvegwhr_map).

A Geographic Information Systems (GIS) layer of the 87 tree seed zones in California was used to capture regional variations within each WHR type. The U.S. Forest Service and the California Department of Forestry and Fire Protection (CAL FIRE) developed these zones as guides to seed collecting and planting of native tree species to help maintain their geographic genetic diversity and integrity (Buck, et

al., 1970). Figure 1.1.2 shows the delineations of the 87 zones and the total number of natural vegetation WHR types that occur within each. For the purposes of this model, each WHR type in each tree seed zone is considered equally important to protect.

Threats

Two GIS data layers were combined to create the composite future development threat.

Localized Development Threat

The threat to a specific small area from future development was represented by the spatial data created for the EPA Integrating Climate and Land Use (ICLUS) program that modeled increasing housing densities in California projected for the years 2010, 2020, 2030 and 2040 (EPA, 2009). Housing density changes from lower densities to more than one house per five acres were termed 'converted', and sparser densities moving up to one house per 20 acres were defined as 'parcelized'. The threat ranks were then derived according to the projected change in housing density and the decade for which the change was projected. In general, the higher projected densities and closer dates were rated higher threats, and for sparser densities and more distant future decades the threat was downgraded. Threat ranks of zero were assigned to all lands off-limits to private residential and commercial development due to federal management, ownership, easements or other legal restrictions.

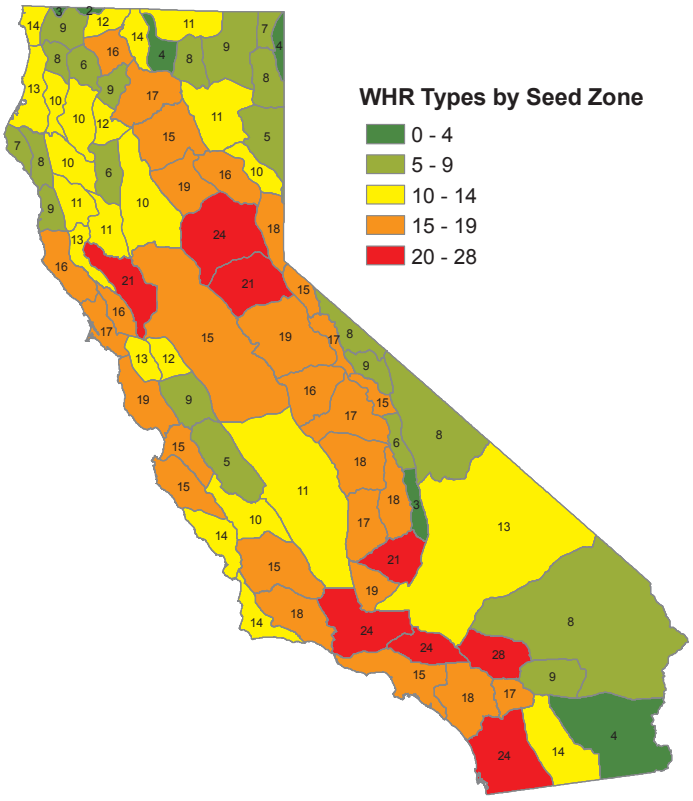


Figure 1.1.2.
U.S. Forest Service and CAL FIRE tree seed zones, with the shading and labels indicating the number of natural vegetation WHR types found within each zone.
Data Sources: Statewide Land Use / Land Cover Mosaic, FRAP (2006); California Tree Seed Zones, Buck, et al. (1970)

The resultant threat ranking data was modified according to a statewide GIS data layer of county general plan zoning (Commission on Local Governance for the 21st Century, 2000), reducing threat ranks in areas where current zoning ordinances prohibit the near-term level of development projected in the ICLUS data. The mapped results of projected development risk are shown in Figure 1.1.3.

Landscape Level Development Threat

The threat to ecosystem values posed by projected future development at landscape scale was expressed by taking the percentage of the total area of each WHR type within each seed zone that was shown to be under medium to high risk of development. Medium risk was defined as where 10 percent but less than 25 percent of the area of WHR type was shown as likely to be developed, whereas high risk were those types with 25 percent or more of their area in that category.

Results

High priority landscapes, shown for the state in the map in Figure 1.1.4, are areas with significant threats at both the localized and landscape level and identify the most at risk stands within the most at risk ecosystems.

The number of acres of high priority landscape is summarized by WHR type and bioregion in Table 1.1.1. The analysis indicates the WHR type with the most area at risk is Annual Grassland, followed by Coastal Scrub and Montane Hardwood. Annual

Grassland is typically dominated by species such as wild oats, soft chess, ripgut brome and others. Coastal Scrub is made up of a number of shrub species including California sagebrush, California buckwheat, black and purple sages, coyotebush, coffeeberry and various kinds of ceanothus. Montane Hardwood habitat type areas are often comprised of oaks (interior live, coast live, canyon live, California black, Oregon white, tanoak), and in some areas with giant chinquapin, Pacific madrone and California laurel (DFG, 1988). For each of these, more than a half million acres is at risk across the state. Bioregionally, the largest areas of WHR types at risk occur in the Sierra, South Coast and Bay/Delta bioregions, each with well over a million acres.

Area at risk totals for the top ten counties are shown in Table 1.1.2. With the exception of Ventura County, each has about 200,000 acres or more in high priority. Riverside County heads this list, with over 464,000 acres, followed by Los Angeles and San Bernardino. Along with San Diego, four of the top five counties are in the South Coast bioregion. Four of the top ten counties are all or partly in the Sierra bioregion: El Dorado, Madera, Placer and Nevada counties. Sonoma County is the sole representative of the Bay/Delta bioregion in this list. However, this bioregion faces a significant development threat but contains small counties that cannot compete when using total acres as the measure.

Discussion

In general, development can negatively affect natural habitats in several ways depending on the intensity of the conversion. Areas converted to high density housing, for example, typically have high impacts by removing most or all of the natural vegetation cover, which eliminates habitat for native animals and plants. Less impacting parcelization can leave some natural vegetation structure intact, but often affects the natural processes that maintain these habitats. Management of the latter, as required for safety from wildfires, can involve clearing and removal of most or all understory plants. This may locally simplify the native species composition, eliminate some native plant species and the cover they provide to small animals, and can also inhibit recruitment of young trees that would eventually replace the older canopy dominants. Vegetation removal also reduces the total carbon sequestered in the area.

Given the patterns of projected future development, the areas of threatened ecosystems identified are for the most part expected. In general, projected development is most likely to occur in close proximity to areas that are already urbanized, especially along major transportation routes. The nearness to urban development in many cases has already compromised the ecosystem values that are most likely to be developed in the near-term. High levels of fragmentation, relative isolation and negative impacts spilling over from surrounding development often characterize these areas.

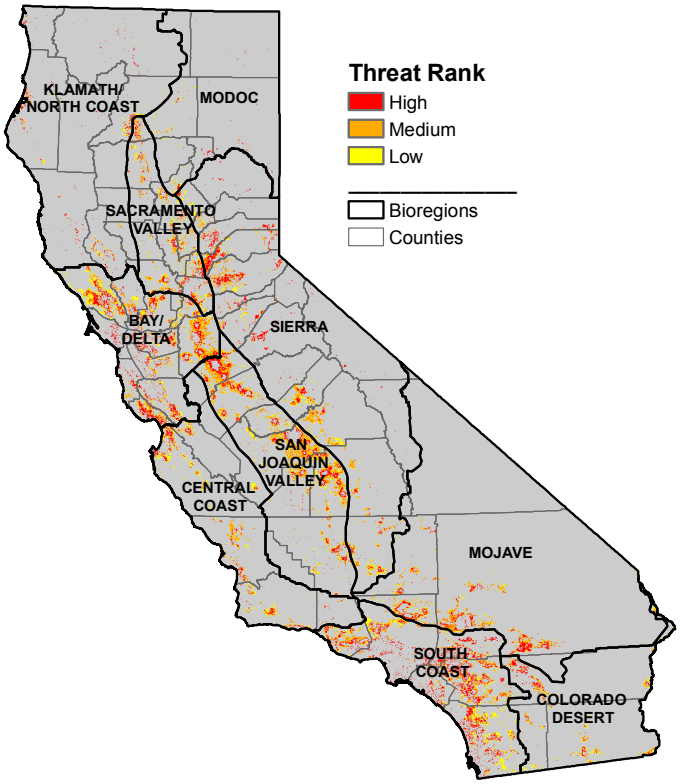


Figure 1.1.3.
Localized development threat.
Data Sources: U.S. Census Bureau (2000); ICLUS, U.S. Environmental Protection Agency (2009); Commission on Local Governance for the 21st Century (2000)

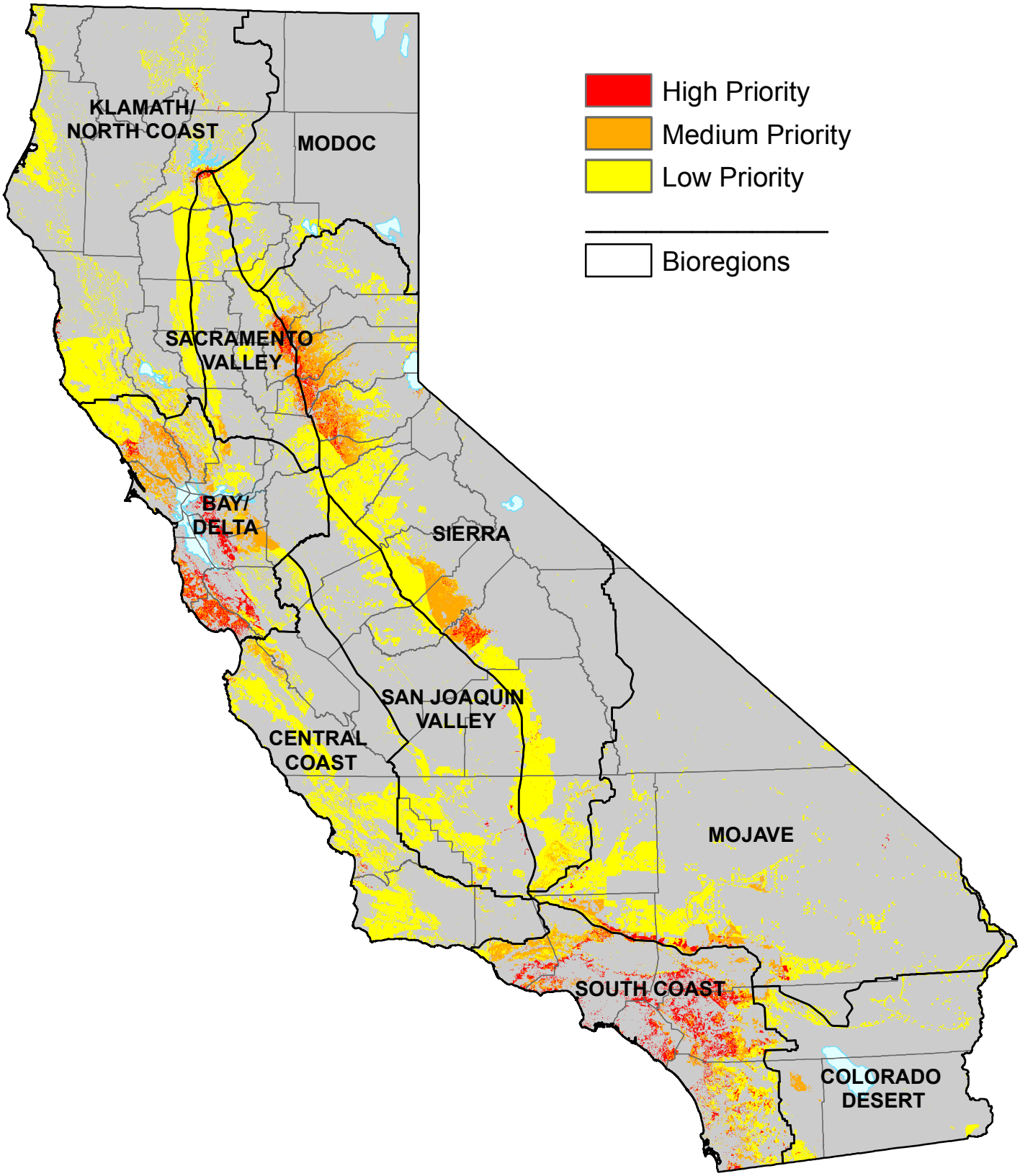


Figure 1.1.4.
Population growth and development impacts priority landscape.
Data Sources: Commission on Local Governance for the 21st Century (2000); California Tree Seed Zones, Buck, et al. (1970); Statewide Land Use / Land Cover Mosaic, FRAP (2006); ICLUS, U.S. Environmental Protection Agency (2009)

Table 1.1.1. High priority landscape – acres potentially at risk (high or medium) from development – WHR types by bioregion (acres rounded to nearest hundred)

WHR Natural Vegetation Types	Klamath /North Coast	Modoc	Sacra-mento Valley	Sierra	Bay/ Delta	San Joaquin Valley	Mojave	Central Coast	Colo-rado Desert	South Coast	State Total
Annual Grassland	42,200	500	144,300	297,400	601,600		600	100	2,800	323,500	1,413,000
Coastal Scrub					33,200	1,500	7,500	5,500	900	578,000	626,600
Montane Hardwood	600		9,800	493,000	102,600		200	500		7,300	614,000
Blue Oak Woodland	8,300	2,400	64,900	324,100	5,900		3,500	6,200			415,300
Coastal Oak Woodland	1,600				139,900			62,200		71,600	275,300
Montane Hardwood–Conifer				107,300	79,900		4,000		100	9,200	200,500
Mixed Chaparral			100	40,100	20,800					132,800	193,800
Desert Scrub							130,700		7,700	47,200	185,600
Blue Oak–Foothill Pine	9,400	1,900	30,200	61,400			300				103,200
Redwood					100,900						100,900
Chamise–Redshank Chaparral				100	18,300		6,100		200	71,500	96,200
Alkali Desert Scrub				300		13,600	65,600		700	1,000	81,200
Ponderosa Pine	2,900			68,200	1,300					400	72,800
Juniper						400	47,400	300		14,800	62,900
Valley Oak Woodland	2,000		12,600	19,600	11,800	2,600	1,100	7,300		800	57,800
Desert Succulent Shrub							17,700		37,700	500	55,900
Montane Riparian	5,500		900	8,000	16,900	100	700	3,000		11,400	46,500
Valley Foothill Riparian			7,000	1,500	500	4,400	500	1,000	500	23,000	38,400
Sagebrush				4,600			14,800			6,600	26,000
Joshua Tree							8,200		7,700	1,600	17,500
Douglas Fir					16,000						16,000
Sierran Mixed Conifer						100				15,800	15,900
Bitterbrush	600			8,000			3,400			200	12,200
Closed–Cone Pine–Cypress	7,100				1,800			3,000			11,900
Jeffrey Pine	400			9,900						700	11,000
Eastside Pine							100			8,900	9,000
Desert Riparian							7,000		300		7,300
Desert Wash							1,500		600	5,000	7,100
Saline Emergent Wetland					4,300			1,100		1,400	6,800
Fresh Emergent Wetland					3,100				300	1,500	4,900
Wet Meadow			300	1,600	100					2,600	4,600
Perennial Grassland				100		2,100				200	2,400
Montane Chaparral	200										200
Aspen				100							100
Palm Oasis									100		100
Bioregional Totals	80,800	4,800	270,100	1,445,300	1,158,900	24,800	320,900	90,200	59,600	1,337,500	4,792,900

The analysis did not take into account some organizations and regulations that operate on a more local basis and may have additional bearing on the likelihood of development. For example, the California Coastal Commission has jurisdiction over development that occurs within close proximity to the coastline, in some areas extending inland up to five miles. The effect of the Coastal Commission was not modeled, and thus there may be some over-prediction of ecosystems at risk in the Bay/Delta and South Coast bioregions.

Continuing past trends, much development is projected on land currently used for agriculture. For example, the map in Figure 1.1.3 shows high risk of development across large extents of the San Joaquin Valley and the Central Valley delta area of the Bay/Delta bioregion. In these areas the impacts to ecosystem values are much less, since land under intensive cultivation in general does not provide high quality wildlife habitat. (An important exception to this are the rice fields of the Sacramento Valley that are flooded in winter for waterfowl.)

A few bioregions stand out as having large areas where the risk of diminished ecosystem values due to development is potentially high. The largest are around the main urbanized areas of the state, in the South Coast and Bay/Delta bioregions, and are most commonly associated with urban sprawl. In the South Coast bioregion the main WHR types at risk are Coastal Scrub, Annual Grassland and Mixed Chaparral. The rate of growth and development in this region is of such magnitude that in Southern California counties many other WHR types are also at risk (Table 1.1.2). Figure 1.1.5 shows the South Coast bioregion priority landscape in greater detail. Annual Grassland also tops the list of at risk habitat types in the Bay/Delta bioregion, with Coastal Oak Woodland and Montane Hardwood types also challenged in the future.

Areas further away from urbanization are under threat of dispersed (rural or exurban) development in several areas of the state. These lands are often in better ecological condition than the above, and further away from, but still within reach of, large urban areas. The lower west slope of the Sierra bioregion has concentrations of high priority landscapes from Butte County in the north, stretching south to Amador County, and in portions of Fresno and Madera Counties. Primary WHR types at risk in the Sierra

Table 1.1.2. Top 10 counties with the highest number of acres at risk, and their most impacted WHR types (acres rounded to nearest hundred)

WHR Natural Vegetation Types	Riverside	Los Angeles	San Bernardino	El Dorado	San Diego	Madera	Sonoma	Placer	Nevada	Ventura	WHR Total Acres
Annual Grassland	128,500	24,800	51,000	65,200	79,000	64,400	126,400	59,100	27,000	7,400	632,800
Coastal Scrub	141,700	117,100	35,800		127,700					133,400	555,700
Montane Hardwood	1,000		6,500	125,800		76,300	61,500	50,300	71,800		393,200
Blue Oak Woodland		300		36,200		96,500	200	44,700	29,300		207,200
Desert Scrub	20,700	86,800	78,100								185,600
Mixed Chaparral	67,600	29,200	600	22,400	11,900		9,400	4,000	7,200	11,000	163,300
Montane Hardwood–Conifer	2,800		10,500	27,100			6,800	23,300	21,100		91,600
Coastal Oak Woodland	7,800	21,600	1,900		2,500		20,800			32,900	87,500
Chamise–Redshank Chaparral	61,800	1,200	12,900		300		600				76,800
Alkali Desert Scrub	1,000	17,500	48,200		600						67,300
Juniper	600	30,900	26,400							200	58,100
Desert Succulent Shrub	1,100	13,600	4,500		36,200						55,400
Ponderosa Pine			400					13,200	36,600		50,200
Blue Oak–Foothill Pine		100		10,800		22,300		4,000	6,200		43,400
Valley Foothill Riparian	7,900	2,000	1,400		9,300	1,100		200		1,200	23,100
Sagebrush	3,700	1,100	16,100								20,900
Montane Riparian	400	3,600	800				6,000	1,200	400	8,000	20,400
Redwood							18,100				18,100
Joshua Tree	7,700	3,700	6,000								17,400
Sierran Mixed Conifer	3,700		12,100								15,800
Valley Oak Woodland		400		3,300		2,500	500	3,600	1,900	400	12,600
Jeffrey Pine	700			5,600				3,600	100		10,000
Eastside Pine		100	8,900								9,000
Douglas Fir							7,700				7,700
Desert Riparian		800	6,600								7,400
Desert Wash	2,000	800	1,600		1,900					700	7,000
Wet Meadow	2,400						100	400	100	100	3,100
Fresh Emergent Wetland	1,000				600						1,600
Closed–Cone Pine–Cypress							1,300				1,300
Bitterbrush		200	500								700
Saline Emergent Wetland		100								600	700
Perennial Grassland			100								100
Palm Oasis	100										100
Total Acres at Risk by County	464,200	355,900	330,900	296,400	270,000	263,100	259,400	207,600	201,700	195,900	

bioregion are Montane Hardwood, Blue Oak Woodland and low elevation Annual Grassland, with Montane Hardwood Conifer coming in a distant fourth.

Future residents will require housing, roads, and places to work, shop and recreate. Redevelopment efforts within cities can absorb some of these people without significantly developing more natural lands (Commission on Local Governance for the 21st Century, 2000). However, if new settlement holds to past patterns of 6.9 people per developed acre, the addition of 3.9 million residents over the next decade could still require developing more than 565,000 acres of land now used for intensive agriculture and wildland, including wildlife habitat. Higher average densities of 15 to 20 persons per acre, now occurring in the urban/suburban fringe areas, would greatly reduce this ten-year estimate to between 195,000 to 260,000 acres of new development.

Recent county-based population data support the analytical findings cited here and the likely spatial impacts anticipated from future development. Table 1.1.3 shows population increases from 2000 to 2008 for the fastest growing counties in California. In terms of number of residents added, the top-ranked 18 counties absorbed more than 90 percent of the total population growth statewide. Six of the top seven – Riverside, Los Angeles, San Bernardino, San Diego, Orange and Kern – are in Southern California, and taken together these account for nearly 59 percent of all growth over the period. Along with Sacramento, these seven counties account for nearly two-thirds of all state population growth. However, the land use impacts will depend not only on the increase in population but also on the average land consumption per person.

This analysis examined where new land development is most likely to occur over the next 10 years in California and the likely impacts from parcelization and conversion on the ecosystem and habitat values. In some regions, working forests and rangelands are at risk. Since the changes brought by new land development are usually permanent and irrevocable, a statewide perspective on growth in relation to ecosystem

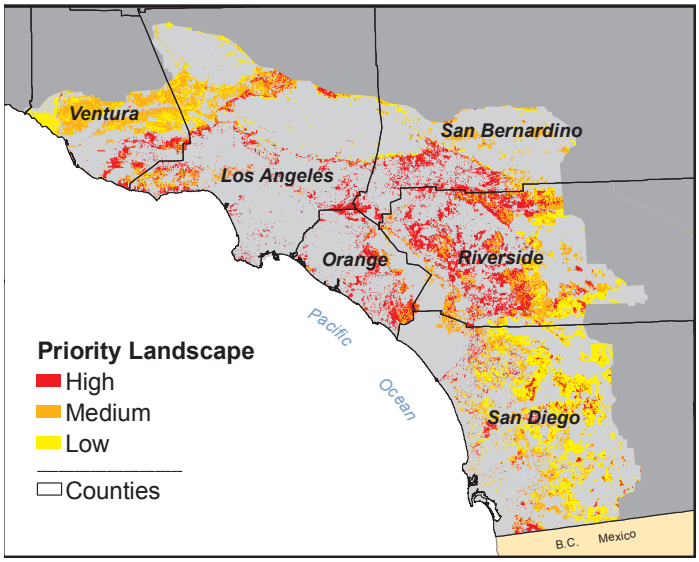


Figure 1.1.5.
Priority Landscapes of WHR types at risk from projected future development in the South Coast bioregion, due mainly from suburban sprawl.
Data Sources: Commission on Local Governance for the 21st Century (2000); California Tree Seed Zones, Buck, et al. (1970); Statewide Land Use / Land Cover Mosaic, FRAP (2006); ICLUS, U.S. Environmental Protection Agency (2009)

Table 1.1.3. Eighteen top state counties of population growth, 2000–2008 (Population in thousands)

County	Year 2000	Year 2008	Newly Added 2000–2008	Percent Change 2000–2008
Riverside	2,100.5	1,559.3	541.2	34.7
Los Angeles	9,862.0	9,544.1	317.9	3.3
San Bernardino	2,015.4	1,718.7	296.7	17.3
San Diego	3,001.1	2,825.4	175.7	6.2
Sacramento	1,394.2	1,230.2	164.0	13.3
Orange	3,010.8	2,856.9	153.9	5.4
Kern	800.5	663.5	137.0	20.6
Fresno	909.2	802.1	107.1	13.3
San Joaquin	672.4	568.0	104.4	18.4
Placer	341.9	251.3	90.6	36.1
Santa Clara	1,764.5	1,686.2	78.3	4.6
Contra Costa	1,029.7	953.3	76.4	8.0
Stanislaus	510.7	449.7	61.0	13.6
Tulare	426.3	368.7	57.6	15.6
Ventura	797.7	756.4	41.3	5.5
Merced	246.1	211.6	34.5	16.3
San Francisco	809.0	777.5	31.5	4.0
Yolo	197.7	169.9	27.8	16.4

Data Source: Commission on Local Governance for the 21st Century, 2000

and habitat values can assist planners, agencies and officials seeking to minimize values lost.

This analysis used one approach to characterize the threat level to regional ecosystems, through examining impacts of projected development to wildlife habitats. Not included in this approach were other important factors, including the parcel size of the habitat and its distance and connectivity to others of its kind in the neighborhood. The analytical complexity required for such an approach exceeded the scope of this report. However, the Areas of Conservation Emphasis (ACE) program of the Department of Fish and Game is slated to include these factors in its future spatial analysis results.

Forests and Rangelands

The Forest and Range 2003 Assessment provided a summary of past and current effects of development pressures on forests and rangelands in the state. The current analysis looked at statewide prospects for these lands in terms of future development. An area of predominantly forest and rangeland that stands out as showing an abundance of high and medium priority landscapes is the west slope of the northern Sierra bioregion (Figure 1.1.6).

Heavy development pressure due to access to major highways (e.g., I-80, US 50) and urbanized areas of greater Sacramento have compromised ecosystem values on these lands. These results are generally consistent with those reported in the previous assessment of California forests and rangelands (CAL FIRE, 2003).

Tools

Tools are described in the current status and trends section of this chapter.

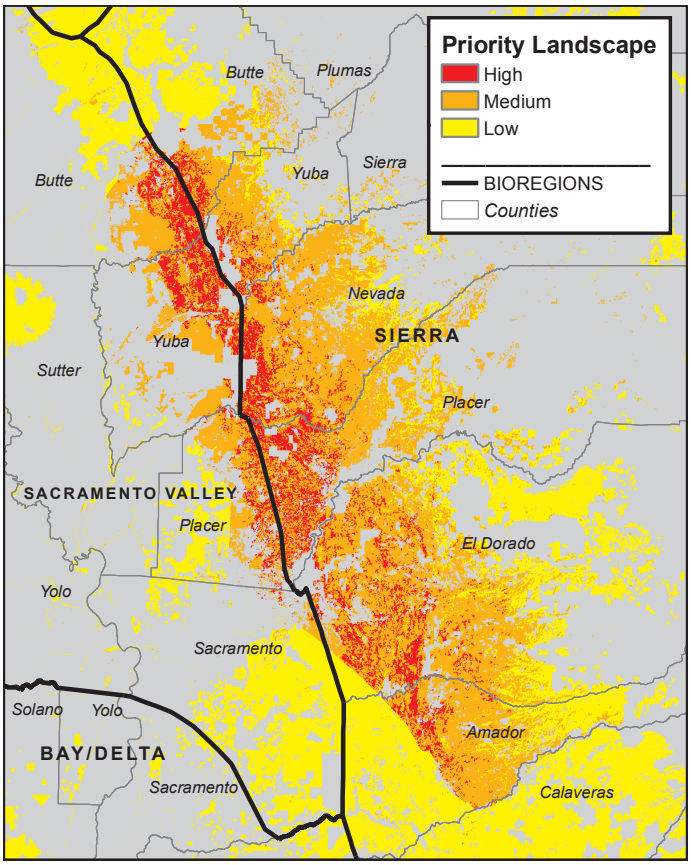


Figure 1.1.6.
Priority landscape in the northern Sierra bioregion, of predominantly working forest and rangeland use.
Data Sources: Commission on Local Governance for the 21st Century (2000); California Tree Seed Zones, Buck, et al. (1970); Statewide Land Use / Land Cover Mosaic, FRAP (2006); ICLUS, U.S. Environmental Protection Agency (2009)