

Regulatory Protection and Conservation

PATRICK A. JANTZ, BERNHARD F. L. PREUSSER,
JESSE K. FUJIKAWA, JOSEPH A. KUHN,
CHRISTOPHER J. BERSBACH, JONATHAN L. GELBARD,
AND FRANK W. DAVIS

In this chapter the current environmental policy setting for conserving and managing grassland ecosystems in California is reviewed. Grassland ecosystems are perhaps the most human-altered terrestrial ecosystem nationally, and in California, but they have been relatively overlooked in terms of conservation policy, especially in the western United States (Connor et al. 2001). In spite of the ecological, economic, and scenic value that grassland ecosystems provide, large expanses of habitat are still being degraded, fragmented, and converted to agriculture and subdivisions because of inadequate protection (Holland and Keil 1995; Stromberg and Griffin 1996; Harper et al. 1998; Gelbard 2003). Only 4% of extant California grasslands are in formally designated reserves (Davis et al. 1998). Finally, because more than 80% of California grasslands are privately owned, land use and land management policy resides primarily at the county and local levels. This review covers the spectrum of current policies that could affect future ecological trends in California grasslands.

Based on recent statewide mapping efforts, grasslands cover nearly 11 million acres of California, or almost 11% of the state (Davis et al. 1998; CDF-FRAP 2002) (Figure 23.1). More than 99% of mapped grassland, which excludes vegetation with more than 10% tree or shrub cover, is classified as annual grassland, with the balance consisting of perennial grassland. This data underestimates the amount of perennial grasslands, which often occur in small patches below the resolution of statewide maps. Oak woodland and savanna ecosystems, which comprise another 5–6% of the state, also encompass extensive grassland habitat, but the presence of the tree stratum places these ecosystems into a different sociopolitical and ecological context because of the special conservation attention afforded oaks as well as their pronounced influence on wildlife and plant community assemblages (Giusti et al. 2004). For these reasons, oak woodland types are excluded from this analysis, whose focus is on

Mediterranean-climate grasslands, excluding desert and Great Basin grasslands of eastern California that fall outside of the California floristic province (but see Keeler-Wolf et al., Chapter 3). It is not possible with existing statewide data to discriminate among different grassland community types or to distinguish between grasslands dominated by native versus exotic species, so for mapping purposes all grasslands in the study region are treated as “California grasslands.” However, many federal, state, and county policies do differentiate between native and exotic grasses. Therefore, when possible and appropriate, the discussion is broken down along the lines set by the policies in question.

First, the hierarchy of federal-to-local land use policies that potentially affect the use and management of California grassland are summarized, focusing in particular on how these policies are currently being applied to grasslands and grassland associated species. Next, existing and emerging conservation incentives for private grassland managers are examined as a complement to regulatory approaches. Policies and incentives based on the protection they afford to the biological integrity of grassland ecosystems are evaluated. In conclusion, recommendations for future policy needs and opportunities are offered.

Federal, State, and Local Regulation of California Grasslands

Federal, state, and local governments have regulatory authority impacting the protection of California grasslands. Table 23.1 lists some of the key federal, state, and local laws and policies influencing the protection of California grasslands. The laws and policies are organized roughly in descending order of magnitude of protection, as determined by a combination of the strength of protection afforded to grasslands and the approximate grassland area protected. As discussed subsequently, federal, state and local governments

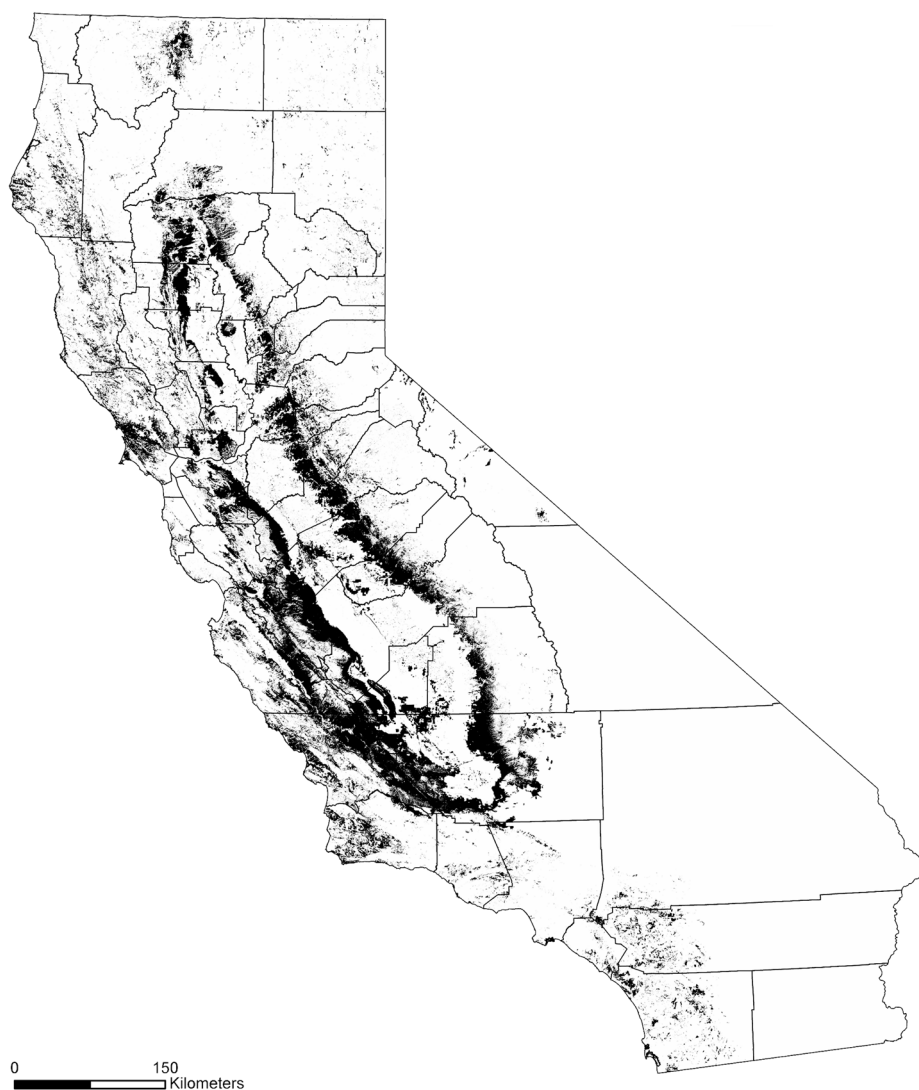


FIGURE 23.1. Grassland distribution in California. Courtesy of Jesse Fukikawa.

also impact protection of California grasslands through ownership and/or management of land.

Federal Authority

FEDERAL OWNERSHIP AND MANAGEMENT OF GRASSLANDS

Roughly 9% of California grassland is owned and managed by the federal government: 2.1% by the Department of Defense (DoD) and 7.1% by other federal agencies (Table 23.2). Examples of extensive grassland areas under federal management include the Carrizo Plain National Monument (Bureau of Land Management [BLM], San Luis Obispo County), the Panoche and Tumey Hills (BLM, Fresno County), and Beale Air Force Base (Yuba County). Management of livestock grazing and off-road vehicle use remain contentious issues on

many non-DoD federal lands. Many of the areas mapped as perennial grasslands occur on DoD lands, in particular Camp Pendleton.

FEDERAL ENDANGERED SPECIES ACT

The U.S. Endangered Species Act (ESA) plays an especially prominent role in California grassland conservation and management. Section 7 of the ESA requires federal agencies that authorize, fund, or carry out activities that affect federally listed threatened or endangered species or designated critical habitat to consult with the Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) to ensure “that actions authorized, funded or carried out by them do not jeopardize the continued existence” of listed species (Goble et al. 2005). Section 9 prohibits any person

TABLE 23.1
Listing of Federal, State and County Policies/Regulations That Affect Grasslands and Grassland-Associated Species

<i>Mechanism</i>	<i>Features</i>	<i>Extent</i>	<i>Example</i>
Grassland species protected by both ESA and CESA Protection provided by both state and federal statutes.	Prohibits take or destruction of critical habitat.	8 vertebrates, 36 plants	San Joaquin kit fox, Stevens kangaroo rat
Grassland species protected by ESA Protection provided only by federal statute.	Prohibits indirect or direct "take" for listed species. HCPs offer exemptions to this rule. Does not prohibit "take" of plant species on private ly owned land.	10 vertebrates, 14 invertebrates, 51 plants. 3.9 million acres in approved HCPs/NCCPs, 7.8 million acres in planned HCPs/NCCPs.* It was not possible to differentiate between HCP and NCCP acreage.	There are five grassland associated species listed under ESA and not CESA: San Clemente loggerhead shrike (<i>Lanius ludovicianus nelsoni</i>), California red-legged frog (<i>Rana aurora draytonii</i>), California tiger salamander (<i>Ambystoma californiense</i>), riparian woodrat (<i>Neotoma fuscipes riparia</i>), Buena Vista Lake shrew (<i>Sorex ornatus relictus</i>)
Grassland species protected by CWA Protection provided only by federal statute.	Section 404 restricts discharge of fill material into the "waters of the United States" without a permit.	All federal jurisdictional wetland and vernal pool habitat throughout California	A 1000-acre complex of vernal pools at the University of California, Merced site. These vernal pools fall within federal jurisdiction due to swale connection to the San Joaquin River.
Grassland species protected by CESA Protection provided only by state statute.	Prohibits indirect or direct "take" for listed speices. NCCPs offer exemptions to this rule.	13 vertebrates, 45 plants	There are four grassland associated species listed under CESA and not ESA: San Joaquin antelope squirrel (<i>Ammospermophilus nelsoni</i>), Swainson's hawk (<i>Buteo swainsoni</i>), bank swallow (<i>Riparia riparia</i>), and Belding's savannah sparrow (<i>Passerculus sandwichensis beldingi</i>).
CEQA Requires mitigation for projects that negatively affect the environment.	Evaluated on a case-by-case basis; not preventative.	Unknown	A building project at the University of California, San Diego, was required to mitigate for impacts to native grassland habitat.
Easements Usually for open space or agricultural preservation. Sometimes explicitly for grassland habitat incl. native perennials.	Incompatible land use in easement areas can decrease the conservation value of these areas.	Unknown	The Nature Conservancy has at least two projects that protect grasslands: the Mount Hamilton Project east of San Jose and the Merced Grassland, conserving 81,000 and 5,000 acres respectively.

(Continued)

TABLE 23.1 (CONTINUED)
Listing of Federal, State and County Policies/Regulations That Affect Grasslands and Grassland-Associated Species

<i>Mechanism</i>	<i>Features</i>	<i>Extent</i>	<i>Example</i>
Williamson Act Subset of agriculturally zoned areas. Land required to remain in agricultural for ten-year contracts, preventing development for a limited time.	Conservation value compromised by intensive land uses.	Covers roughly 9.9 million acres of nonprime farmland as of 2003. Within counties with available sapital data, an average of 60% of all grasslands were in nonprime contracts from 2000–2004 .	Humboldt County adopted Williamson Act guidelines in 1969 and issued a guideline update in 2002. Most of the grazing lands in the county are enrolled in the program.
General Plan ^a Counties can emphasize grasslands as communities of concern in their planning documents.	Recognition of the biological importance of grasslands in general plans can set the stage for increased grassland conservation. General plans policies are often weakly worded.	Each county must produce a general plan with mandated elements such as land use, conservation, and open space. Recognition of grassland communities varies greatly between counties.	Sacramento County recognizes native grasses as a significant biological resource in the conservation element of their general plan.
Agricultural zoning ^a Lower density zoning that can constrain the extent of development.	Incompatible land uses can limit conservation value. Desire to preserve prime farmland can funnel development to nonprime rangeland/grassland.	Affects the largest area of grassland with 50% zoned statewide (varies by county).	Humboldt County general plan Policy 2523 in the general plan states that agricultural lands “shall be preserved” and lists several actions to fulfill this policy. However, policy 2523 1.D. directs development to “uneconomical or marginally viable agricultural lands” when development must occur.
Open space zoning ^a Lower density zoning that can constrain the extent of development.	Provides weak controls on development. A small amount of this land is strongly protected (conservation easements, etc.). This designation allows incompatible land uses such as motorized sports, golf courses, etc.	Affects the second-largest area of grassland with 20% zoned statewide (varies by county).	Fresno County OS-D.5 states “The County shall strive to identify and conserve upland habitat areas adjacent to wetland and riparian areas that are critical to the feeding, hibernation or nesting of wildlife species associated with these wetland and riparian areas.”

^a General plan policies are often implemented through zoning ordinances such as those described in the text of the chapter. Although there are many zoning types, the majority of grassland is zoned as either agriculture or open space and are the categories focused on.

TABLE 23.2
Area of Federal and State Owned Lands by Grassland Type

<i>Ownership type</i>	<i>Grassland area (acres)</i>	<i>Percent of total grasslands in california</i>
Private	9,462,200	88.08%
Federal	759,427	7.07%
Military	227,305	2.12%
State	131,517	1.22%
Other	162,819	1.52%

NOTE: GIS analysis done using layers from CDF-FRAP (2002) and GAP analysis.

from “taking” (e.g., killing or harming) endangered animal (but not plant) species, thereby extending the Act’s protection to projects with no federal government involvement, including projects on privately owned land. By contrast, for plant species, Section 9 prohibits removal or malicious destruction only on federal lands. Generally, the ESA affords less direct protection of plant, as compared to animal, species. However, protection of endangered animal species often carries protection of endangered plant species along with it, as discussed in the following paragraphs. Section 9 also prohibits any person from engaging in commerce of endangered species.

Section 10 provides exemptions, permits, and exceptions to Section 9’s regulations, including allowance for “incidental” takes as long as such takes do not jeopardize the continued

existence of the species. Under Section 10, the Secretary of Interior can issue an incidental take permit to an applicant in conjunction with the development of a habitat conservation plan (HCP), so long as the applicant’s proposed project (resulting in a take) does not “appreciably reduce the likelihood of the survival and recovery of the species in the wild” (ESA sec. 10(a)(2)(B)). The HCP process has been used extensively in California to mitigate incidental take of endangered species, including grassland-dependent animal species, and has thereby directly affected grassland conservation in many areas of the state. For development to proceed within the established HCP area, HCPs require minimization of impact and mitigation of remaining impact to the maximum extent practicable. Such mitigation can be handled through privately owned mitigation or conservation banks, which protect and/or restore similar habitat in another location and sell credits that allow for the development of otherwise protected habitat.

Currently 75 grassland-associated¹ species, including 10 vertebrates, 14 invertebrates, and 51 plants, are listed as threatened or endangered under the ESA (Appendix 23.1). On a county basis, the number of listed species associated with grassland habitat ranges from 0–18 (Figure 23.2a). Unfortunately, the total habitat area affected by the listed species has not been determined on a consistent basis.

1. Grassland-associated species were determined by referencing the California Department of Fish and Game wildlife habitat relationship (WHR) database for vertebrates, the Calflora database for plants, and life history descriptions for invertebrates.

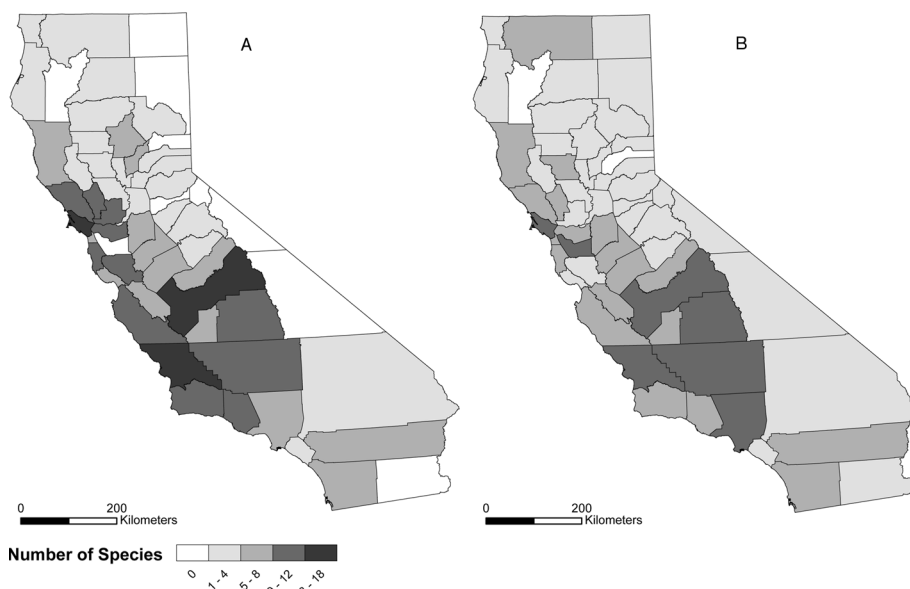


FIGURE 23.2. Number of federal (A) and state (B) listed endangered or threatened grassland associated species by county.

Approved and proposed HCPs for grassland-dependent species range in size from small plans covering a single species, such as the Wildcat Line LP HCP in Monterey County, which only covers Smith's blue butterfly in a planning area of 11.5 acres, to large subcounty plans such as the East Contra Costa County HCP/NCCP,² protecting multiple species and covering at least 23,500 acres, about 19,000 acres of which is grasslands. HCP/NCCPs may also cover both listed and non-listed species. An example of the latter is Solano County's HCP/NCCP, which covers 25 listed species, eight of which are grassland associated, as well as 51 non-listed species (Solano County Water Agency, <http://www.scwa2.com/hcp.html>).

Although numerous grassland-associated species have been included in HCPs, there are a few species that appear more often than others, including San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia silus*), and California red-legged frog (*Rana aurora draytonii*). Some species such as the San Joaquin kit fox and the California condor (*Gymnogyps californianus*) serve as "umbrella species" because of their large area requirements. For example, the kit fox figures prominently in the design of HCPs, multispecies HCPs and NCCP reserves and habitat corridors in East Contra Costa, Santa Clara, western Stanislaus, San Joaquin, and Kern Counties.

Increasingly, plans are designed to meet the requirements of both the HCP and NCCP planning processes. Of the 97 approved HCPs and NCCPs in California listed on the USFWS and California Department of Fish and Game (CDFG) websites, 42 of them affect grassland species (Table 23.3). These plans cover nearly four million acres, and plans covering more than seven million additional acres are currently being developed. It should be noted that these are the total planning areas of the HCP/NCCPs and include areas that are not part of habitat reserves.

Inclusion in an HCP/NCCP does not necessarily ensure strong protections for grasslands or grassland species. In the case of the San Diego Multiple Species Conservation Program (MSCP), for example, grasslands are just one of 26 natural vegetation communities in the plan area. In this case, grasslands were clearly not the main focus of the plan, which was especially concerned with the coastal sage scrub ecosystem. According to San Diego's land development codes within the San Diego MSCP area, native grasslands are classified as Tier I habitat and non-native grasslands as a Tier III habitat type (more mitigation is required for Tier I habitat than for Tier III habitat). This is expected to lead to higher levels of preservation for native grasslands than for non-native grasslands.

FEDERAL CLEAN WATER ACT

Section 404 of the federal Clean Water Act, which regulates fill of wetlands, also provides protection for California grasslands.

2. Natural Community Conservation Plans (NCCPs), provided for under the California Endangered Species Act, allow for voluntary cooperation of landowners and agencies in developing efforts to protect listed and nonlisted species.

Section 404 is administered by the Army Corps of Engineers. Wetlands and vernal pool wetlands in particular can occur in or near grassland habitat, potentially increasing protection of grasslands. Federal jurisdiction over isolated wetlands and ponds was diminished following the Supreme Court's 2001 *SWANCC v. Army Corps of Engineers* decision. However, many of California's vernal pools, for example those at the University of California's new Merced campus, are still considered "waters of the United States" and thus come under federal authority and section 404 processes, because of surface connections through swales. Isolated wetlands not connected to waters of the United States are under jurisdiction of the state, which may delegate responsibility to local regulatory bodies.

Although it specifically addresses wetlands, Section 404 of the CWA can affect grassland conservation to the extent that grassland adjacent to a federal jurisdictional wetland is less likely to be developed, as a result of the 404 permitting process restricting dredging or fill of wetlands. Most of California's vernal pools occur in grasslands, and CWA as well as ESA (and to a lesser extent the U.S. Migratory Bird Treaty Act) protections have led to some conservation of vernal pool/grassland complexes in areas such as western Merced County. Perhaps more important has been the application of Federal Clean Water State Revolving Funds to protect grassland/vernal pool complexes. For example, agencies, land trusts, and conservancies have collaborated to protect more than 40,000 acres of vernal pool landscapes in the Central Valley (See reports by the U.S. Environmental Protection Agency, http://www.epa.gov/owow/wetlands/pdf/state_rev_fund.pdf).

If a vernal pool or wetland is not deemed "waters of the United States," the permitting process is conducted variously by the counties. The extent of wetland buffer zones also varies depending on wetland type, the specific jurisdiction, or county (National Academy of Sciences 2001). Often the wording of the policy specifies a distance within which removing, filling, dredging, or altering certain resource areas, such as vernal pools, is prohibited. By virtue of its presence in the landscape, vernal pool habitat has the potential to conserve large areas of grasslands, either through federal 404 or county level jurisdictional permitting processes.

FEDERAL CONSERVATION RESERVE PROGRAM

The Conservation Reserve Program (CRP) is a voluntary program to remove sensitive and erodible cropland and pasture from agricultural production. Farmers enroll their land for 10 or 15 years in exchange for rental payments to compensate for lost revenue. The enrolled acreage is planted with natural, although not necessarily native, cover to reduce erosion and provide wildlife habitat. According to the USDA Farm Service Agency, as of 2005, 144,438 acres of land in California were in CRP contracts (http://www.fsa.usda.gov/Internet/FSA_File/fy2005.pdf). Of these, 126,760 acres were in either grass or legume cover. Because its influence is minor, no further discussion of the CRP is included in this review.

TABLE 23.3
HCPs and NCCPs Affecting Grassland Species

<i>County</i>	<i>Number of HCPs/NCCPs</i>	<i>Area covered (acres)</i>	<i>Number of planned HCPs/NCCPs</i>	<i>Area planned (acres)</i>
Multiple Locations ^a	1	2,937	0	0
Alameda	1	32.3	0	0
Contra Costa	0	0	1	175,435
Fresno	2	104.12	1	10
Kern	8	286,790.5	1	1,900,000
Kern/Tulare/ Kings	1	19,900	0	0
Los Angeles	1	14	1	8,661
Merced	0	0	2	250,630
Monterey	1	11.5	0	0
Orange	1	208,000	1	91,000
Placer	0	0	1	273,983
Riverside	10	1,853,644.5	1	11,785
Sacramento	0	0	1	340,000
Sacramento/ Sutter	1	53,342	0	0
San Benito	0	0	1	888,960 (County-wide Plan)
San Diego	5	608,938.9	3	1,585,938
San Joaquin	2	896,300	0	0
San Mateo	2	3,525.4	0	0
Santa Clara	2	5.02	1	440,318
Santa Cruz	3	168.7	0	0.0
Shasta	0	0	1	160,000
Solano	0	0	1	530,560 (County-wide Plan)
Tulare	1	9.7 Linear Miles	0	0
Yolo	0	0	1	400,000
Yuba/Sutter	0	0	1	200,100
Total ^b	42	3,933,713.94	19	7,257,380.0

NOTE: These HCPs and NCCPs exclude constructed wetlands because we assumed that they would not contain grassland habitat. Data for this table from http://ecos.fws.gov/conserv_plans/servlet/gov.doi.hcp.servlets.PlanReportSelect?region=8&type=HCP and <http://www.dfg.ca.gov/nccp/status.htm>. For plans listed by both the FWS and DFG, FWS area numbers were used. For plans containing multiple subarea plans, all subareas plans were considered to be on HCP/NCCP

^aThis plan covers 25 existing and 4 planned sites in California.

^bTotal Area Covered does not include the Tulare County plan. Some planning areas overlap, so these numbers may be overestimates. Planning areas include both reserve and non-reserve areas covered by these plans.

State Authority

STATE OWNERSHIP AND MANAGEMENT OF GRASSLANDS

The state of California owns and manages roughly 1.2% of California's annual grasslands (Table 23.2) (Davis et al. 1998). Noteworthy examples include the annual grasslands of the Department of Fish and Game's Carrizo Plain Ecological Reserve and coastal grasslands at Montana de Oro State Park (San Luis Obispo County), and Wilder Ranch State Park (Santa Cruz County).

The University of California's Natural Reserve System manages several significant grassland areas for research, education, and conservation, notably the Jepson Prairie Reserve (Solano County), McLaughlin Natural Reserve (Napa, Lake, and Yolo Counties), and Sedgwick Reserve (Santa Barbara County). The Jepson Prairie Reserve includes extensive native grassland and vernal pool complexes, while McLaughlin and Sedgwick include extensive areas of serpentine grassland.

STATE LEGISLATION

The State of California has enacted several pieces of legislation impacting California grasslands. Many of California's environmental laws mirror their federal counterparts, and some are more protective than federal law. State law also frequently shapes county-level legislation and mandates county-level management responsibilities. Some of these are discussed in more detail in the following paragraphs.

CALIFORNIA ENDANGERED SPECIES ACT

The California Endangered Species Act (CESA) mirrors the federal ESA in many ways. Notably, however, CESA extends protection of listed plant species onto privately owned lands (ESA sec. 9(a)(2) and CESA sec. 2062, sec. 2068). Natural Community Conservation Plans (NCCPs) serve the same function under CESA that HCPs serve under the ESA, the main differences being that permitting is through the CDFG, rather than the USFWS, and that the NCCP process requires independent scientific review.

Currently 58 grassland-associated species are listed under CESA. Of these species, 13 are vertebrates and 45 are plants (Appendix 23.1). Grassland-associated insects are not eligible for listing under CESA (Appendix 23.1) (<http://ag.ca.gov/opinions/pdfs/98-105.htm>).

As with the federal ESA, the amount of protection afforded to grassland habitat by CESA varies by county based on the number of listed species present; more species or species requiring large home ranges can lead to larger amounts of protected grassland habitat. The number of state listed species present in any given county ranges from 0–11 (Figure 23.2b). The extent of habitat for these species within each county has not been consistently estimated.

The effects of NCCPs on grasslands are similar to the effects of HCPs. As was discussed in the federal ESA section, there is

considerable overlap between HCPs and NCCPs, and there are many similarities between the two types of plans. Both require minimization of impact and limit "take" to levels that will not endanger the survival of the species. Both also require that adequate funding for implementation of the plan be guaranteed before the plan is approved.

Although HCPs and NCCPs are generally similar, there are a few differences. In particular, HCPs under ESA require mitigation of impacts to the maximum extent practicable, while NCCPs require mitigation to be roughly proportional to the take.

OTHER STATE LAWS IMPACTING GRASSLANDS

Additional state laws impacting the protection of California grasslands include the California Environmental Quality Act (CEQA), the Williamson Act, the Coastal Act, and the Government Code. These statutes are discussed in the following paragraphs in the section concerning county government authority since county governments frequently implement these laws.

County Authority

COUNTY OWNERSHIP AND MANAGEMENT OF GRASSLANDS

County parks, water districts, and open space districts account for less than 1% of the state's lands, although some parks and utility districts protect significant native grasslands. Examples include the East Bay Regional Park District's Point Pinole Park (Contra Costa County), Redwood Regional Park (Alameda County), the East Bay Municipal Utility District's Siesta Valley watershed management area, and the Ramona Grassland Preserve (San Diego County).

COUNTY GENERAL PLANS AND POLICY DOCUMENTS

Counties have authority to create policies and ordinances that determine how land can be used and what conditions can be placed on use. County land use goals and policies are specified in general plan documents, which the state requires counties to create and maintain. General plans include both mandatory and optional elements. The mandatory elements are land use, circulation, housing, open space, conservation, safety, and noise. The land use, open space, and conservation elements have special relevance to conservation of grasslands. Examples of optional elements with potential to impact grasslands include the agriculture, scenic highways, and biological resources elements.

General plans are binding documents but may be amended to accommodate changing county needs. The goals and policies of the general plan are implemented by county zoning ordinances. These ordinances specify the actions in which land owners may engage and the use to which land may be put. For example, they specify allowable densities for different land use types in the county.

In order to assess the level of protection afforded grasslands at the county level, readily available³ county policy

documents in 21 counties were surveyed. These 21 counties account for 76% of the total grassland area in California (Appendix 23-2). Privately owned grassland in many of these counties comprises more than 90% of total grassland area within each county (Appendix 23.3). General plans and zoning ordinances and conducted phone and email interviews with county planning departments were reviewed. Sixteen of the counties had readily accessible general plans. As discussed in the following paragraphs, the number of counties that included conservation, open space or land use elements, as well as other optional elements that recognize grassland resources were quantified.

Conservation Element

California Government Code Section 65302(d) requires that a conservation element (some legal guidelines regarding conservation) be present in all county general plans. This element provides guidance for the conservation, development, and utilization of natural resources within the county. Counties frequently combine this element with the open space element of their general plan.

The county conservation element often identifies specific habitats of concern such as wetlands, rare plant community types, and habitat for sensitive species. Fourteen of the counties examined had readily available conservation elements, of which six were combined conservation/open space elements. Of these, five of the conservation elements and five of the combined elements recognized grasslands and/or native grasslands. The Kern County general plan combines land use, conservation, and open space elements and contains no recognition of grassland ecosystems (Appendix 23-4).

When grasslands are mentioned in the conservation element of the general plan, it is often in context of preserving significant natural areas. For example, in Madera County's combined natural resources and agricultural element Policy 5.E.3, grassland could be included in "natural areas of outstanding vegetation." In practice Madera County's policy is implemented by maintaining a list of significant species, including species listed under CESA, species included in the California Native Plant Society's Inventory of Rare and Endangered Plants, and Department of Fish and Game species of special concern. The list is kept current to fulfill the requirements of federal and state endangered species laws and to guide the county's efforts in conserving important natural areas.

Instead of providing additional protections, conservation elements generally defer to federal and state regulations. However, some counties appear to be moving toward more proactive grassland conservation. The 2004 Monterey County general plan update, for example, contains language that would give special protection to native perennial grass habitat within the county. If the draft plan is approved, coastal terrace prairie/valley needlegrass grassland will be defined as an

environmentally sensitive area, which "shall be protected against any significant disruption of habitat values" according to policy CZ-5.2 (Monterey County General Plan, Draft, Environmental Resources Management, Coastal Zone Goal 5).

Open Space Element

California Government Code Section 65302(e) requires each county to provide a plan for comprehensive and long-range preservation and conservation of open space land within its jurisdiction. This element is frequently combined with the conservation element in the general plan. Grasslands can in principle be protected by open space land use restrictions. However, open space land can be managed for varied uses ranging from natural resource production to outdoor recreation or the promotion of public health and safety.

TABLE 23.4
Area of Grassland in General Plan Zones

<i>Zoning</i>	<i>Grassland area (acres)</i>	<i>Percent</i>
Agriculture	7,831,093	53.25%
Open Space	2,991,640	20.34%
Very Low Density Residential	1,888,981	12.84%
Low Density Residential	1,316,524	8.95%
Other	14,467,465	4.62%

All of the plans examined contained either open space elements or combined elements that included open space information and policy goals. Grasslands and/or native grasslands specifically were recognized in four open space elements, as well as the five combined elements discussed already (Appendix 23.4). For example, Fresno County's policy, Fresno County, General Plan, Open Space and Conservation Element (http://www.co.fresno.ca.us/4510/4360/General_Plan/Gp_Final_policy_doc/Open_Space_Element_rj.pdf) stipulates that "the County shall require that development on hillsides be limited to maintain valuable natural vegetation, especially forests and open grasslands, and to control erosion." Sonoma County's Open Space Element 3.1 designates critical habitat areas that "require special protection because they are highly sensitive to change and could be adversely affected by development," including vernal pools, native bunch grasses, and oak savannahs.

Currently approximately 3 million acres of grassland—3% of the state land area and 20% of all California grasslands—are in open space designation (Table 23.4). The ecological significance of this designation is difficult to ascribe given the wide range of management goals for these areas. In the longer term, as in the conservation element, open space affords little protection in excess of what federal and state regulations supply.

3. "Readily available" documents consisted of those available on county Web sites and those that could be acquired by mail within the time frame of this analysis.

Land Use Element

California Code section 65302(a) requires a general plan land use element that “designates the general location and intensity of housing, business, industry, open space, education, public buildings and grounds, waste disposal facilities, and other land uses.” Of the 16 general plans examined, 15 had land use elements and one had a combined land use, open space, and conservation element. Grasslands were recognized in four of the available land use elements, usually associated with agricultural and historical land uses within county boundaries. No land use elements included recognition of native grasslands (Appendix 23.4). In the Paradise Urban Reserve area of Butte County, for example, native grasslands are recognized as part of the heritage and aesthetic environment of local communities.

More broadly, the land use element provides guidance for zoning densities for particular land uses, as will be discussed at greater length subsequently.

Optional Elements: Agriculture Element

Twenty-six counties have adopted agriculture elements in their general plans, including 11 of the 22 counties investigated. Agriculture elements are primarily designed to protect and promote agriculture and use a variety of approaches to accomplish these goals. These approaches include technical assistance to farmers, establishing agricultural support zones to ensure the economic viability of agricultural operations, promoting agricultural products, and striving to minimize the conflict between residential and agricultural areas.

Because a large percentage of California’s grasslands are found in agriculturally zoned grazing lands (Table 23.4), agriculture elements can have significant effects on grassland ecosystems. Land use restrictions for preservation of agricultural lands can keep residential development from encroaching on grasslands. On the other hand, policies that promote retention of prime farmland over less valuable rangelands may direct development onto grasslands.

Few agriculture elements directly address grassland or native ecosystems, and none mentions grasslands or native ecosystems in agriculture element policies. Merced County mentions “native pasture” when describing trends in land conversion. Stanislaus County mentions “native ecological systems” and “grasslands” (in Appendix C and Appendix A of its general plan, respectively).

Coastal Element

Under the California Coastal Act Section 30108.55, local governments are permitted to prepare coastal plans in order to protect, maintain, and enhance coastal zone resources, plan for public recreation in the coastal zone, and coordinate between local and state initiatives that affect the coastal zone. CDFG-listed sensitive grassland types, including coastal terrace prairie, are recognized as Environmentally Sensitive Habitat Areas (ESHA), and as such are provided with some protection.

Grasslands are occasionally mentioned in county coastal plans. The Mendocino County coastal element, for example, acknowledges the presence of grassland habitat within the coastal zone but does not recognize native grassland as a habitat of special consequence or afford any special protections to coastal grassland systems. Alternatively, the Santa Barbara County coastal element lists specific coastal management areas in which native grassland species are known to exist.

Other Optional Elements

Optional elements that may affect grassland ecosystems include resource conservation, scenic highways, growth management, parks and recreation, and biology elements. Counties that have scenic highway elements include Butte, Madera, Mariposa, Mendocino, Sacramento, San Benito, Shasta, and Tehama. The contents of this element are often paralleled in the mandatory elements of other counties, especially the open space element. Scenic highway policies often overlap with grassland systems but generally only limit zoning density in included regions rather than forestalling development entirely. None of the counties examined had a growth management or parks and recreation element that afforded any special recognition to grassland or native ecosystems. None of the counties that we examined had biological elements in their general plans.

ZONING

Zoning ordinances are a reflection of the goals and policies found in general plan elements. Thus, the lack of specific attention to grasslands in the general plans is mirrored in zoning ordinances. As with general plans, zoning ordinances can be changed, and variances are often granted, which can reduce the efficacy of zoning as a tool for grassland conservation. The zoning types most likely to indirectly preserve grassland habitats are those that promote large lot size or low housing densities such as open space, agriculture, and very low-density residential. In current general plans, more than 80% of grasslands fall in one of these three categories, with 54% of grasslands presently zoned for agricultural use, and 20% zoned for open space (Table 23.4).

COUNTY IMPLEMENTATION OF THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Counties must comply with CEQA, which requires them to prepare reports examining the significant environmental impacts of proposed development projects before approving such projects. CEQA allows counties to set thresholds when determining what a significant environmental impact is. Furthermore, counties can create resource protection ordinances with specific thresholds that can be used as the thresholds of significance in CEQA. Generally, significant environmental impacts, as defined under CEQA or the county’s implementing rules, must either be avoided or mitigated.

The two areas of CEQA review of particular relevance to the protection of California grasslands are the agricultural and biological reviews. Agricultural impacts are generally considered significant if they conflict with Williamson Act contracts (see following paragraphs) or could result in the conversion of farmland to nonagricultural use. Because large areas of grassland are either under Williamson Act contracts, included in agricultural zones, or adjacent to agricultural areas, CEQA review has the potential to influence large areas of grassland.

Biological impacts in grasslands are generally considered significant if they threaten sensitive species or habitat types, including: (1) candidate, sensitive, or special status species identified in regional or local plans or by the CDFG or USFWS; (2) sensitive communities identified in regional or local plans or by the CDFG or USFWS; (3) areas covered by CWA Section 404; (4) wildlife corridors; or (5) areas covered by habitat conservation plans. In addition, counties may use other criteria, such as listing by the California Native Plant Society (CNPS), to determine whether the biological impacts of a project would be significant.

Annual grasslands are generally not considered sensitive communities; thus, impacts to them do not generally meet the significance threshold for which CEQA mandates mitigation or avoidance. However, if individual species of concern, such as endangered animals or plants, are associated with grasslands, then CEQA's mandates may apply. Certain native grassland communities, such as valley needlegrass, have been identified as rare by the CDFG and thus impacts to these communities may be significant and require mitigation or avoidance. For such communities, thresholds of significance, which are applied on a case by case basis, will determine whether project impacts are significant enough to require mitigation or avoidance.

In the absence of explicit guidelines, counties rely on the judgment of county agencies or hired consultants to determine whether a project's impacts to biological resources would be significant. Inventorying and listing of significant grassland communities by county agencies, in combination with scientifically based thresholds of significance, would increase the likelihood that impacts to such communities would be avoided or mitigated. For example, the County of Santa Barbara Environmental Thresholds and Guidelines Manual states that impacts to "small acreages" of non-native (annual) grassland are not considered significant if "wildlife values are low." Santa Barbara defines native grasslands as containing at least 10% native grass cover. This specific guideline is used with the general CEQA guidelines to determine whether impacts to native grassland communities in the county are significant.

Counties could also define a significance threshold concerning cumulative impacts to grassland communities, which could help mitigate the piecemeal development of annual grasslands. For example, a county could define some proportion of its total grassland area that it desired to retain. The impact of an individual project could then be evaluated

relative to this threshold. This would help to set an upper limit on the amount of grassland developed in the county.

THE WILLIAMSON ACT

The Williamson Act empowers California county governments to offer contracts to private landowners to preserve land for agricultural and open space use in exchange for a reduced property tax assessment. Williamson Act contracts limit contracted parcels of land to agricultural uses for ten years, after which time the contract is automatically renewed unless the landowner files for non-renewal at least nine years prior to the contract's expiration. The Williamson Act also provides for the establishment of Farmland Security Zones (FSZs), which put land under contract for twenty years in return for greater property tax reduction.

TABLE 23.5
Grassland Area Currently under Williamson Act Contracts

<i>County</i>	<i>Annual grasslands in Williamson Act (acres)</i>	<i>Percent annual grassland in Williamson Act</i>
Glenn	215,671	99.9%
San Benito	345,930	77.9%
Tehama	371,992	74.5%
Madera	192,720	72.6%
Santa Barbara	181,845	64.4%
Fresno	287,035	54.3%
Humboldt	90,302	40.9%
Sacramento	64,954	32.3%

Currently all California counties except Del Norte, San Francisco, Inyo, and Yuba offer Williamson Act contracts. Of the nearly 27 million acres of agricultural land in California in 2002, slightly more than 5 million acres were classified as prime farmland. Close to another 7 million acres were classified as important farmland of other types. The balance, roughly 14 million acres, was classified as nonprime farmland, which is primarily grazing land, which does not require high-quality soil types. Nearly 11 million is held under Williamson Act contracts as nonprime farmland. In the eight counties for which GIS data are available online (Fresno, Glenn, Humboldt, Madera, Sacramento, San Benito, Santa Barbara, Tehama), an average of 64.6% of the total grassland area is held under Williamson Act contracts (Table 23.5).

In recent years the acreage held under Williamson Act contracts has remained relatively stable. In the period from 1990–2003, the California Division of Land Resource Protection reports that acreage increased only slightly, from approximately 15.97 million acres in 1990 to 16.56 acres in 2003, but

these numbers do not reflect changes to the spatial layout of holdings (http://conservation.ca.us.gov/DLRP/lca/stats_reports/index.htm). Some landowners may choose to file for nonrenewal when the profit of developing land exceeds the tax savings under the Williamson Act, whereas speculators may purchase land far from existing urban centers and place it under contract in order to hold it at a reduced tax rate until development becomes profitable.

Interactions between Federal, State, and County Policy

There are significant interactions among federal, state, and county policies. For example under CEQA, it is up to the counties to set thresholds for determining significant biological impacts. However, often the biological elements that are the foci of CEQA actions are designated as sensitive by the state and/or federal government. Similarly, the Williamson Act is often closely related to the general plan. Some counties specifically encourage entry into Williamson Act contracts in their general plans. Humboldt County Agriculture Element Policy 2523, for example, states that “Agricultural lands shall be conserved and conflicts minimized between agricultural and non-agricultural uses . . . by broadening the utility of agricultural preserves and the Williamson Act Program to accommodate and encourage intensely managed farms” (Humboldt County Community Development Services Department Planning Division 1984). In addition, counties can use their authority under the Williamson Act to encourage preservation of significant open space lands and wildlife habitat by including such areas in Agriculture Preserve delineations, which circumscribe lands eligible for enrollment in the program.

ESA, CESA, and CEQA play somewhat complementary roles in conserving grassland habitats. The ESA has strong prohibitions against indirect take but does not apply those protections to plants, whereas CESA has weaker indirect take provisions but stronger plant protections. ESA and CESA provide protection to listed species, while CEQA applies to species or habitats of concern which have not yet been listed and therefore do not receive protection from the other regulations. More generally, ESA, CESA, and CEQA strictures are forcing counties to reexamine their land planning approaches to take fuller account of wildlife and natural resource issues that have traditionally been the domain of state and federal resource agencies (Scott et al., 2006).

Summary of Public Policies and Regulations

Several important conclusions can be drawn from the preceding analysis of public policies and regulations. First, most grasslands are privately owned, and at least two of every three grassland acres are zoned for agricultural use or open space (Table 23.4) and/or managed under Williamson Contracts. To a large extent the future of these grasslands depends on private land management priorities and approaches. Second, in areas where grasslands are under the greatest pressure of land development—notably in the Bay area, southern San Joaquin Valley, Riverside Basin, and the

South Coast—hundreds of thousands if not millions of acres of grassland are being protected as habitat for endangered species. The future of grasslands in these areas depends largely on the design and ongoing management of habitat reserves, which at best is a contentious and expensive negotiated settlement between the agencies and stakeholders (Davis et al. 2005). Third, in the absence of regulated species, grassland ecosystems, particularly annual grasslands dominated by non-native species, are protected mainly for open space or rangeland values. Such protection will certainly contribute to conserving habitat for many grassland-dependent species, although in the absence of explicit biological management goals and ecological monitoring the extent of conservation remains conjectural. Furthermore, given increasing restrictions on development in prime farmland, oak woodlands, and coastal shrublands, grasslands could receive an increasing share of development in the future.

Additional Tools for Grassland Conservation on Private Lands

Tools outside of government regulation and management that promote sustainable use and restoration of grassland ecosystems are being increasingly applied in California. A compilation of web links to these and other public and private incentive programs, as well as further information on federal, state and local policies previously discussed, is provided in Appendix 23.5, which is posted online at http://www2.bren.ucsb.edu/~ca_grasslands/appendix5.htm.

Socioeconomic Benefits of Grassland Conservation

Many private landowners currently perceive conservation measures as unfairly expensive and a threat their livelihood, freedom, and property rights (Ling 1998; Esseks and Drozd 2002). To help alleviate these concerns, there are several organizations that promote conservation from an agricultural land user's viewpoint, including the California Rangeland Trust and American Farmland Trust. Even those who are interested in conservation actions typically lack the time, money, and technical expertise to implement them (Ingram and Lewandrowski 1999). In addition, they are often unaware of the significant benefits that such actions can bring them, including economic benefits and the incentive programs that are available to help make conservation actions both affordable and money saving (Ingram and Lewandrowski 1999; Phillips 2001; Balmford et al. 2002).

Conservation actions can help landowners avoid economic costs of poor land management, boost profits, and generate new income opportunities (Richards and George 1996; Balmford et al. 2002). For example, overgrazing that causes weed invasions (Hobbs and Humphries 1995) may increase control costs and reduce land value and livestock forage capacity (Sheley and Petroff 1999; Naylor 2000). Weeds cost the State of Montana \$100 million per year, and an invasion reduced the real estate value of one ranch by nearly 60% (Sheley et al. 1998). Costs may also include water

loss. Gerlach (2004) estimated that in the Sacramento River watershed alone, yellow starthistle may cause losses of soil moisture of 15–25% of mean annual precipitation, with the cost of lost water estimated to range from \$16 million to \$75 million (U.S.) per year. Devising a management plan that minimizes invasions can simultaneously reduce these costs, boost profits, and benefit native species and ecosystem processes (Hobbs and Humphries 1995; Mack et al. 2000; Naylor 2000; Phillips 2001).

Conservation actions can also help grassland owners diversify their income. Sustainable management can qualify them to tap into the growing market for sustainably produced products (Kennard 2005). Maintaining healthy fish, wildlife, and wildflower populations improves prospects for landowners seeking to generate income through hunting, fishing, and ecotourism (Esseks and Drozd 2002; Tate 2003), which can greatly exceed income generated through agriculture and ranching (Balmford et al. 2002). It also makes them eligible for incentives that reward good stewardship (McQueen and McMahon 2003).

Concerning development pressures, there is a prevailing thought that as California grows, it is inevitable that more homes must be built. While this is true, county agencies and developers that use subdivision for conservation purposes allow for a higher degree of efficiency in development, minimizing potential for destruction of open tracts of grassland. This holds particularly when alternative scenarios involve large parcel creation. Conservation easement language can also reflect this, specifying that the land be subdivided within a boundary, easing development rights for the remainder of the tract.

Financial incentives for grassland conservation

Numerous incentives are offered by federal, state, local, and private organizations to provide grassland owners, local governments, and NGOs with financial and technical assistance for implementing conservation measures (Appendix 23.5), as briefly summarized in the following paragraphs.

TAX INCENTIVES

Tax incentive programs help landowners reduce state and federal income and other taxes with a credit for part or all of the costs of conservation practices (Appendix 23.5). Perhaps the most common type of program is the conservation easement, which is designed on a case-by-case basis and can provide income, property, and estate tax credits (McQueen and McMahon 2003). Easements reward landowners for conserving grasslands for agricultural and open space purposes by assessing lands at a reduced tax rate that is based on the parcel's agricultural or open space value instead of its higher development value. McLaughlin (2004) estimated federal income tax savings for donating a conservation easement worth \$500,000 to be \$157,500 for a high-income (\$250,000/year) landowner, \$36,450 for a middle-income (\$75,000/year) landowner, and \$9,450 for a low-income (\$35,000/year) landowner.

DIRECT FUNDING

Opportunities include federal, state, local, and private grants, purchases of conservation easements, cost sharing, and reimbursement of conservation-related expenses (Appendix 23.5). Federal programs offered by the Natural Resource Conservation Service (NRCS) through the Farm Bill, for example, provide funding and cost-share opportunities to improve water management and quality, erosion control, wildlife habitat protection, and overall quality of land management by incorporating conservation into ranching and farming operations.

PUBLIC FINANCING

Support among the public for conservation of natural lands and open space has been growing in recent years. In 2005 alone, ballot measures across the country created a total of \$1.7 billion earmarked for conservation (Trust for Public Land 2005). As demand for open space in California grows, public financing for grassland conservation will likely increase in importance.

TECHNICAL ASSISTANCE

Landowners often need assistance with identifying and understanding relevant programs, understanding regulations, applying for permits or programs, or developing conservation, restoration, monitoring, and sustainable management plans. This type of advice is available through personal consultations, extension short courses, and other government and nongovernment sources (Appendix 23.5).

REGULATORY STREAMLINING

Incentives include permitting landowners to conduct otherwise restricted activities, such as hunting and fishing, in exchange for implementing a management plan accepted by a federal or state conservation agency (Appendix 23.5). Examples of such programs include Safe Harbor Agreements (Bean et al. 2001), aimed at granting landowners more flexibility in promoting and protecting endangered species.

ECOSYSTEM SERVICES INCENTIVES

An emerging category of incentives revolves around the stewardship of ecosystem services whose economic value is often comparable to or even greater than the value of goods and services that have a market value, such as production of meat and crops (Daily 1997; Balmford et al. 2002). Ecosystem services provided by grasslands include pollination of crops by insects, soil fertility and stabilization, water filtration and storage, livestock forage, species diversity, carbon storage, and genetic material for improving our food crops (Daily et al. 1997; White et al. 2000). Sala and Paruelo (1997) noted that not recognizing these services has resulted in management systems aimed at maximizing production of marketable goods and services such as meat. As Balmford et al. (2002)

noted, the development of market instruments that capture the social values of relatively undisturbed ecosystems—for instance, through carbon or biodiversity credits or through premium pricing for sustainably produced products—is a crucial step toward sustainability.

EDUCATING GRASSLAND MANAGERS ABOUT THE BENEFITS OF INCENTIVES

In a recent survey of agricultural landowners in California, 45% of respondents were not making an effort to minimize overgrazing, 55% were not making an effort to minimize soil erosion, and two-thirds or more were failing to make an effort to protect or improve wildlife habitats (66%), minimize flow of chemical fertilizers or pesticides into surface waters or groundwaters (69%), prevent or minimize flow of livestock wastes into surface waters or groundwater (75%), or protect or improve wetlands (83%) (Esseks and Drozd 2002). In many cases, this reflects that landowners remain unaware of the conservation options available to them (Bean et al. 2001).

Unfortunately, awareness of incentives is sufficiently low that programs are sometimes defunded on grounds of lack of use (Dawn Afman, U.S. NRCS, personal communication). This suggests that government agencies and NGOs need to develop better strategies to increase public awareness of and support for them (Jacobsen 2003; Farrior 2005). Such strategies will have to appeal to personal concerns and values such as financial health, independence, and ingenuity by framing conservation actions as opportunities (as opposed to threats)

to boost profits and solve time-consuming management problems (e.g., Farrior 2005). Schultz and Zelezney (2003) noted that when targeting the voting public in California as part of a campaign to protect open space, “our children’s future” and quality of life (for our family and future generations) were foremost among reasons people cared about protecting land. Educational messages and materials can be made available through such channels as direct mailings, the Internet, information booths at farmers’ markets, extension short courses, and presentations at meetings of ranching, farming, and outdoor recreation organizations (Richards and George 1996; Jacobsen 2003; Tate 2003).

Concluding Remarks

A large number of policies currently operate to influence the future of privately owned grasslands in California, ranging from relatively strong regulations such as ESA and CESA to weaker but potentially influential guiding policies in county general plans to nonregulatory financial incentives such as tax breaks and financial assistance programs. The association of grasslands with wide-ranging endangered species such as the California condor and San Joaquin kit fox (*Vulpes macrotis mutica*) and locally important species such as the Stephens kangaroo rat (*Dipodomys stephensi*) and Bay checkerspot butterfly (*Euphydryas editha bayensis*) has led to the establishment of large grassland reserves in many areas of the state undergoing large-scale development, with the trend

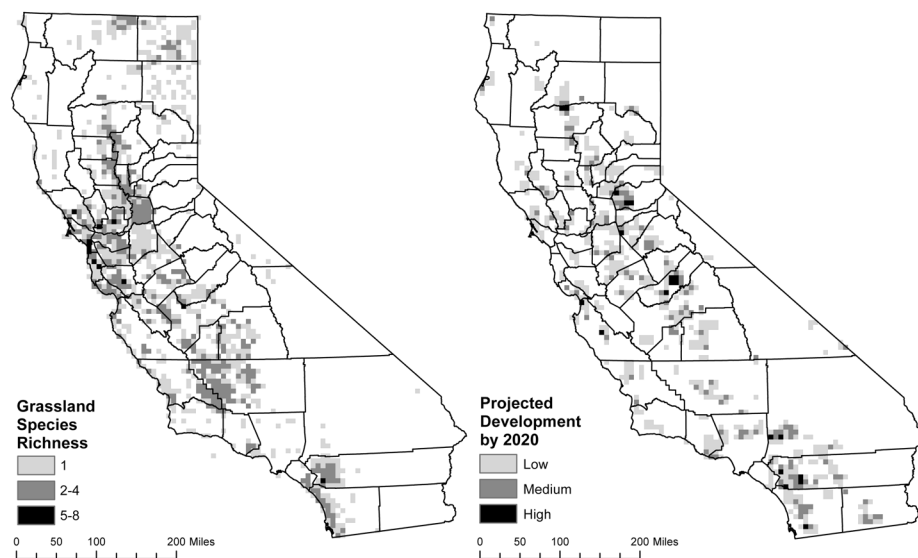


FIGURE 23.3. Comparison of threatened and endangered grassland species distributions with projected development in California. The threatened and endangered species map was derived from California Natural Diversity Database point data and was generalized to 10-kilometer grid cells. Projected development was derived from FRAP data (CDF-FRAP 2002). The original FRAP data combined historical growth patterns with population projections to forecast growth for 5-kilometer grid cells. For each 10-kilometer grid cell in our map, we calculated the area of underlying 5-kilometer cells projected to reach a density of 1 house per 20 acres by the year 2020.

being toward larger, subcounty- or countywide biological conservation programs. Clearly, ESA and CESA are the major drivers of grassland protection in urbanized and urbanizing areas of California.

In more rural areas, the majority of grasslands are presently under agricultural and open space zoning, and a large fraction is managed under Williamson Act contracts. Nevertheless, the future of these grasslands is tenuous, as continued rapid population growth and demand for rural residential development raise the market value of these lands. Counties have authority to protect habitat types that they consider important, but in the absence of legally protected species or community types, few counties currently attribute special significance or conservation value to grassland ecosystems. Comparing the projected location of future development with the current distribution of grassland-associated threatened and endangered species reveals areas, particularly central and southern California, where grasslands are likely to be heavily impacted (Figure 23.3). Counties where rapid growth and sensitive species distributions overlap will be the focus of intense planning efforts but also present an opportunity for implementation of more proactive grassland conservation policies.

The future of California grasslands also depends in part on public policies that tend to operate against grassland conservation. Such policies have not been analyzed here, but it should at least be mentioned that subsidies for agriculture, livestock grazing, water use, and road building and maintenance can promote cropping in marginal areas better suited for rangeland, grazing, and subdivision of rural lands (Myers and Kent 1998; Dale et al. 2000; GAO 2005). Public policies pertaining to road network development and maintenance have a pervasive influence, because roads serve as corridors

for the spread of invasive species, fragment grassland habitats, and degrade roadside environments (Forman et al. 2003; Gelbard and Belnap 2003; Gelbard and Harrison 2003).

Financial incentives are playing an increasingly important role in the protection and management of privately owned grasslands. Public agencies and conservancies such as The Nature Conservancy, the Trust for Public Land, the California Rangeland Trust, and dozens of county and local land trusts have already invested hundreds of millions of public and private dollars to protect grasslands through outright acquisition and conservation easements. Other kinds of incentives can also help improve the effectiveness of conservation partnerships. For example, The Malpais Borderlands Group, a coalition of ranchers, agencies, The Nature Conservancy, and foundations in southern New Mexico and Arizona developed a grass banking approach to protecting and restoring grasslands (Page 1997). By joining the group, ranchers whose lands have become degraded gain access to a grass bank on which to graze their livestock (the 150,000 ha Gray Ranch), providing rest from grazing that allows their grasses to recover. They can also receive native reseeding, technical assistance, and monitoring from management experts. In exchange, they take steps such as (1) donating a conservation easement to protect their land as open space (which reduces their taxes) and (2) allowing natural fires to burn, which helps beat back invasive plants and stimulates the recovery of native grasses. Perhaps such an approach to landscape-scale grassland conservation could be tailored for use in California. For example, grass banking could give ranchers a place to graze during years that their land is treated with fire and reseeding to eradicate weeds and restore native species (Corbin et al. 2004).

APPENDIX 23.1
Listed Threatened and Endangered Grassland-Associated Species

Scientific name	Common name	Status		Scientific name	Common name	Status	
	Plants	State	Federal	Vertebrates	State	Federal	Status
<i>Acanthomintha duttonii</i>	San Mateo thorn-mint	SE	FE	<i>Ambystoma californiense</i>	California tiger salamander		FE
<i>Acanthomintha ilicifolia</i>	San Diego thorn-mint	SE	FT	<i>Amnospermophilus nelsoni</i>	San Joaquin antelope squirrel	ST	
<i>Allium munzii</i>	Munz's onion	ST	FE	<i>Buteo swainsoni</i>	Swainson's hawk	ST	
<i>Amsinckia grandiflora</i>	Large-flowered fiddleneck	SE	FE	<i>Dipodomys ingens</i>	Giant kangaroo rat	SE	FE
<i>Arctostaphylos hookeri</i> ssp. <i>hearthiorum</i>	Hearst's manzanita	SE		<i>Dipodomys nitratooides exilis</i>	Fresno kangaroo rat	SE	FE
<i>Arctostaphylos hookeri</i> ssp. <i>ravenii</i>	Presidio manzanita	SE	FE	<i>Dipodomys stephensi</i>	Stephens kangaroo rat	ST	FE
<i>Astragalus brauntonii</i>	Braunton's milk-vetch		FE	<i>Falco peregrinus anatum</i>	Peregrine falcon	SE	
<i>Astragalus clarianus</i>	Clara Hunt's milk-vetch	ST	FE	<i>Gambelia sila</i>	Blunt-nosed leopard lizard	SE	FE
<i>Blennosperma bakeri</i>	Baker's blennosperma	SE	FE	<i>Grus canadensis tabida</i>	Sandhill crane	ST	
<i>Brodiaea coronaria</i> ssp. <i>rosea</i>	Indian Valley brodiaea	SE		<i>Gymnogyps californianus</i>	California condor	SE	FE
<i>Brodiaea filifolia</i>	Thread-leaved brodiaea	SE	FT	<i>Rana aurora draytonii</i>	California red-legged frog		FT
<i>Brodiaea insignis</i>	Kaweah brodiaea	SE		<i>Reithrodontomys raviventris</i>	Salt-marsh harvest mouse	SE	FE
<i>Brodiaea pallida</i>	Chinesescamp brodiaea	SE	FT	<i>Riparia riparia</i>	Bank swallow	ST	
<i>Calochortus tiburonensis</i>	Tiburon Mariposa lily	ST	FE	<i>Sylvilagus bachmani riparius</i>	Riparian brush rabbit	SE	FE
<i>Castilleja affinis</i> ssp. <i>neglecta</i>	Tiburon Indian paintbrush	ST	FE	<i>Vulpes macrotis mutica</i>	San Joaquin kit fox	ST	FE
<i>Caulanthus californicus</i>	California jewelflower	SE	FE	Invertebrates			
<i>Ceanothus ferrisae</i>	Coyote ceanothus		FE	<i>Branchinecta conservatio</i>	Conservancy fairy shrimp		FE
<i>Chlorogalum purpureum</i> var. <i>purpureum</i>	Purple amole		FT	<i>Branchinecta longiantenna</i>	Longhorn fairy shrimp		FE

<i>Chorizanthe howellii</i>	Howell's spineflower	ST	FE	<i>Branchinecta sandiegoensis</i>	San Diego fairy shrimp	FT
<i>Chorizanthe robusta</i>	Robust spineflower		FE	<i>Branchinecta lynchi</i>	Vernal pool fairy shrimp	FT
<i>Chorizanthe valida</i>	Sonoma spineflower	SE	FE	<i>Cicindela ohlone</i>	Ohlone tiger beetle	FE
<i>Cirsium ciliolatum</i>	Ashland thistle	SE		<i>Elphrus viridis</i>	Delta green ground beetle	FT
<i>Cirsium fontinale</i> var. <i>fontinale</i>	Fountain thistle	SE	FE	<i>Euphilotes enoptes smithi</i>	Smith's blue butterfly	FE
<i>Clarkia franciscana</i>	Presidio clarkia	SE	FE	<i>Euphydryas editha bayensis</i>	Bay checkerspot butterfly	FT
<i>Clarkia imbricata</i>	Vine Hill clarkia	SE	FE	<i>Euphydryas editha quino</i>	Quino checkerspot	FE
<i>Clarkia speciosa</i> ssp. <i>immaculata</i>	Pismo clarkia		FE	<i>Icaricia icarioides missionensis</i>	Mission blue butterfly	FE
<i>Clarkia springvillensis</i>	Springville clarkia	SE	FT	<i>Lepidurus packardii</i>	Vernal pool tadpole shrimp	FE
<i>Cordylanthus palmatus</i>	Palmate-bracted bird's-beak	SE	FE	<i>Speyeria callippe callippe</i>	Callippe silverspot butterfly	FE
<i>Delphinium luteum</i>	Yellow larkspur		FE	<i>Speyeria zerene behrensii</i>	Behren's silverspot butterfly	FE
<i>Dudleya abramsii</i> ssp. <i>parva</i>	Conejo dudleya	SE	FT	<i>Streptocephalus woottoni</i>	Riverside fairy shrimp	FE
<i>Dudleya setchellii</i>	Santa Clara Valley dudleya		FE			
<i>Dudleya stolonifera</i>	Laguna Beach dudleya	ST	FT			
<i>Eriastrum hooveri</i>	Hoover's woollystar		FT			
<i>Eryngium aristulatum</i> var. <i>parishii</i>	San Diego button-celery	SE	FE			
<i>Fritillaria roderickii</i>	Roderick's fritillary	SE				
<i>Fritillaria striata</i>	Striped abobe lily	ST				
<i>Hemizonia conjugens</i>	Otay tarplant	SE	FT			
<i>Hemizonia increscens</i> ssp. <i>villosa</i>	Gaviota tarplant	SE	FE			
<i>Hesperolinon congestum</i>	Marin dwarf flax	ST	FT			
<i>Hesperolinon didymocarpum</i>	Lake County dwarf-flax	SE				
<i>Holocarpha macradenia</i>	Santa Cruz tarplant	SE	FT			
<i>Lasthenia conjugens</i>	Contra Costa goldfields		FE			
<i>Lembertia congdonii</i>	San Joaquin woollythread		FE			
<i>Lilium occidentale</i>	Western lilly	SE	FE			
<i>Limnanthes douglasii</i> ssp. <i>sulphurea</i>	Douglas' meadowfoam	SE				

(Continued)

APPENDIX 23.1 (CONTINUED)
Listed Threatened and Endangered Grassland-Associated Species

Scientific name	Common name		Status		Scientific name	Common name		Status	
	Plants		State	Federal		Vertebrates			State
<i>Limnanthes floccosa</i> ssp. <i>californica</i>	Butte County meadowfoam		SE	FE					
<i>Lupinus milo-bakeri</i>	Milo Baker's lupine		ST						
<i>Opuntia basilaris</i> var. <i>treleasei</i>	Bakersfield cactus		SE	FE					
<i>Parvisedum leiocarpum</i>	Lake County stonecrop		SE	FE					
<i>Pentachaeta bellidiflora</i>	White-rayed pentachaeta		SE	FE					
<i>Pentachaeta lyonii</i>	Lyon's pentachaeta		SE	FE					
<i>Plagiobothrys diffusus</i>	San Francisco popcorn-flower		SE						
<i>Plagiobothrys strictus</i>	Calistoga popcorn-flower		ST	FE					
<i>Pseudobahia bahiifolia</i>	Hartweg's golden sunburst		SE	FE					
<i>Pseudobahia peirsonii</i>	San Joaquin adobe sunburst		SE	FT					
<i>Sidalcea keckii</i>	Keck's checkerbloom			FE					
<i>Streptanthus albidus</i> ssp. <i>albidus</i>	Metcalf Canyon jewel-flower			FE					
<i>Streptanthus niger</i>	Tiburon jewel-flower		SE	FE					
<i>Thlaspi californicum</i>	Kneeland prairie pennycress			FE					
<i>Trifolium amoenum</i>	Showy Indian clover			FE					
<i>Verbena californica</i>	California vervain		ST	FT					

NOTE: FE: Federally listed as Endangered

FT: Federally listed as Threatened

SE: State listed as Endangered

ST: State listed as Threatened

Plant Selection: State and Federal threatened and endangered grassland associated species were selected from the Calflora database. Plants from communities m24 or m25 (Coastal Prairie or Valley Grassland) were selected. From this list, T + E sp. were selected. The regioncode was used to populate a list of T + E sp. by county. State "rare" species were excluded.

Animal Selection: State and Federal threatened and endangered grassland associated species were selected from the Wildlife Habitat Relationship database from the CDFG.

Invertebrate Selection: Federal list of California invertebrates was compared with life history records to determine association with grassland ecosystems.

APPENDIX 23.2
Counties Surveyed and Grassland Areas

<i>County</i>	<i>Acres</i>	<i>Proportion of total grassland area</i>	<i>Cumulative proportion of total grassland area</i>
Kern	1,343,693	12	12
San Luis Obispo	991,126	9	21
Monterey	638,047	6	27
Fresno	529,088	5	32
Tehama	499,305	5	37
Merced	497,017	5	41
San Benito	443,567	4	45
Tulare	340,365	3	49
Stanislaus	319,211	3	52
Santa Barbara	282,500	3	54
Mendocino	277,068	3	57
Madera	263,414	2	59
Sonoma	227,310	2	61
Humboldt	221,038	2	63
Glenn	215,657	2	65
Kings	209,388	2	67
Sacramento	201,053	2	69
Siskiyou	187,571	2	71
San Joaquin	169,555	2	73
Mariposa	165,737	2	74
San Diego	163,106	2	76

APPENDIX 23.3
Ownership and Management Profile of California Grasslands

County	Public reserve		Public non reserve		Private reserve		Private non reserve		Total		
	Acres	% of County	Acres	% of County	Acres	% of County	Acres	% of County	Acres	% Public	
Kern	36,158	1	137,511	3	5,056	0	1,164,968	22	1,343,693	87	13
San Luis Obispo	24,354	1	163,014	8	1,127	0	802,630	38	991,126	81	19
Monterey	5,458	0	72,477	3	726	0	559,385	26	638,047	88	12
Fresno	25,234	1	76,569	2	3,138	0	424,147	11	529,088	81	19
Tehama	24,824	1	19,118	1	20,887	1	434,476	23	499,305	91	9
Merced	38,044	3	5,347	0	7,116	1	446,510	35	497,017	91	9
San Benito	6,299	1	34,520	4	346	0	402,402	45	443,567	91	9
Tulare	17,381	1	9,422	0	2,488	0	311,074	10	340,365	92	8
Stanislaus	2,735	0	205	0	1,688	0	314,583	32	319,211	99	1
Santa Barbara	3,773	0	30,144	2	1,685	0	246,897	15	282,500	88	12
Mendocino	3,595	0	11,977	1	64	0	261,432	12	277,068	94	6
Madera	2,619	0	7,082	1	509	0	253,203	18	263,414	96	4
Sonoma	6,657	1	8,179	1	1,384	0	211,090	21	227,310	93	7
Humboldt	7,443	0	6,227	0	30	0	207,339	9	221,038	94	6
Glenn	4,055	0	5,935	1	539	0	205,128	24	215,657	95	5
Kings	0	0	7,289	1	0	0	202,098	23	209,388	97	3
Sacramento	2,703	0	4,596	1	4,977	1	188,777	30	201,053	96	4
Siskiyou	6,580	0	16,141	0	620	0	164,230	4	187,571	88	12
San Joaquin	1,122	0	237	0	3,902	0	164,294	18	169,555	99	1
Mariposa	2,199	0	7,929	1	0	0	155,609	17	165,737	94	6
San Diego	3,348	0	54,861	2	7	0	104,889	4	163,106	64	36
Solano	3,630	1	3,484	1	1,567	0	148,673	26	157,353	95	5
Contra Costa	6,889	1	11,018	2	15,520	3	121,544	24	154,971	88	12
Alameda	4,094	1	2,422	0	15,674	3	132,512	25	154,702	96	4
Santa Clara	3,393	0	6,200	1	600	0	140,812	17	151,005	94	6
Calaveras	59	0	5,159	1	4,379	1	135,295	20	144,892	96	4
Riverside	8,238	0	16,042	0	3,244	0	112,038	2	139,562	83	17
Butte	8,616	1	1,376	0	1,053	0	127,709	12	138,754	93	7

Marin	27,090	7	5,407	1	988	0	85,852	23	119,337	73	27
Shasta	361	0	1,700	0	5	0	107,787	4	109,853	98	2
Colusa	4,092	1	1,703	0	1,181	0	102,870	14	109,846	95	5
Yolo	521	0	1,539	0	0	0	105,482	16	107,543	98	2
Tuolumne	4,174	0	12,760	1	0	0	86,159	6	103,093	84	16
Placer	489	0	1,228	0	0	0	99,606	10	101,323	98	2
Yuba	2,928	1	20,588	5	37	0	58,224	14	81,778	71	29
Amador	153	0	1,250	0	0	0	76,986	20	78,390	98	2
El Dorado	3,791	0	1,070	0	0	0	71,004	6	75,865	94	6
Los Angeles	4,225	0	3,272	0	32	0	59,586	2	67,115	89	11
Ventura	6,128	1	3,141	0	67	0	55,528	5	64,864	86	14
Napa	588	0	2,006	0	35	0	59,942	12	62,571	96	4
Lake	2,301	0	4,967	1	62	0	43,905	5	51,234	86	14
Trinity	2,676	0	4,416	0	15	0	36,529	2	43,635	84	16
San Bernardino	5,112	0	2,147	0	0	0	34,302	0	41,562	83	17
Plumas	598	0	19,323	1	35	0	20,939	1	40,895	51	49
Mono	12,113	1	22,306	1	0	0	4,957	0	39,375	13	87
Sutter	657	0	242	0	72	0	38,303	10	39,274	98	2
Lassen	1,856	0	14,164	0	35	0	19,694	1	35,748	55	45
Orange	2,424	0	1,836	0	432	0	28,819	6	33,512	87	13
Nevada	875	0	1,712	0	2	0	28,370	5	30,959	92	8
Modoc	1,050	0	11,500	0	2	0	14,060	1	26,613	53	47
San Mateo	655	0	991	0	2,538	1	18,967	5	23,151	93	7
Santa Cruz	1,665	1	57	0	22	0	12,249	4	13,993	88	12
Alpine	2,162	0	6,682	1	0	0	2,019	0	10,863	19	81
Sierra	430	0	4,114	1	5	0	3,810	1	8,359	46	54
Del Norte	420	0	919	0	72	0	2,656	0	4,067	67	33
San Francisco	10	0	42	0	0	0	185	0	237	78	22
Inyo	0	0	12	0	0	0	0	0	12	0	100
Imperial	0	0	0	0	0	0	0	0	0	0	0
Total	349,046		875,577		103,962		9,422,536		10,751,121		
Percent of Total Grassland Area	3.25		8.14		0.97		87.64		100		

APPENDIX 23.4
General Plan Element Profile

Rank by grassland area	County	Year	Mandatory elements			Optional elements			
			Land use	Conservation	Open space	Agriculture	Coastal	Scenic highways	Resource conservation
1	Kern	2004		0 ^a		DNE	DNE	DNE	DNE
2	San Luis Obispo ^b	1974–1998	1,2	NA	1,3	1,3	NA	DNE	DNE
4	Fresno	2000	0	3 ^a		DNE	DNE	NA	NA
6	Merced	1990–2002	1	1 ^a		1,2	DNE	DNE	DNE
7	San Benito	1980–1998	0	NA	2	DNE	DNE	NA	DNE
8	Tulare ^c	1972–1981	0	1 ^a		DNE	DNE	0	DNE
9	Stanislaus	1992–1994	0	3 ^a		1	DNE	DNE	DNE
10	Santa Barbara	1975–2004	0	1,3	1	0	3	NA	0
11	Mendocino	1981	1	2 ^a		DNE	1	1	DNE
12	Madera	1995	0	1,2	2	DNE	DNE	NA	NA
13	Sonoma	1989	0	1	3	0	DNE	DNE	DNE
14	Humboldt	1982–1984	0	0	0	0	0	DNE	1
16	Kings	1996–2004	0	2	0	DNE	DNE	DNE	DNE
17	Sacramento	1974–1993	0	3	1	0	DNE	NA	DNE
20	Mariposa	2003	1	1 ^a		1	DNE	0	0
21	San Diego	2000	2	3	0	DNE	NA	1	DNE

NOTE: Information on whether counties recognize grassland ecosystems, recognize native ecosystems, or recognize native grassland ecosystems was drawn from current and available county general plans (16 total, excluding Monterey, Tehama, Glenn, Siskiyou, and San Joaquin).

0 = No recognition of grasslands or native ecosystems, 1 = specific recognition of grassland ecosystems, 2 = specific recognition of native ecosystems, 3 = specific recognition of native grasslands, NA = element not readily available for this county, DNE = element does not exist

^a Several counties combine mandatory elements. For these counties the columns have been merged.

^b Only Part 4 of the land use element for San Luis Obispo County was examined

^c The land use element for Tulare County was unavailable. This information is from a 1991 general plan policy summary of policies from 1964 to 1998.