Grassland Habitats

Climate Change Vulnerability, Adaptation Strategies, and Management Implications in Southern California National Forests

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Habitat Description

Southern California hosts valley/south coastal grasslands, warm desert grasslands, and coastal prairie grasslands. Coastal prairie grasslands extend northward from the Channel Islands, warm desert grasslands are in interior regions, and valley/south coastal grasslands extend south along the coastline from Santa Barbara. Grasslands in southern California are typically dominated by high non-native annual cover, but still support a diversity of native annual and perennial species at low abundances.

Habitat Vulnerability

Sensitivity & Exposure

Changes in moisture availability and timing are likely to interact with temperature to affect grassland composition, productivity, survival, and distribution. These factors also influence the proliferation and abundance of non-native annual grasses. Wildfire and herbivory can elevate biodiversity and/or have negative impacts on perennial grasses and other grassland components depending on timing, frequency, intensity, and local conditions. Non-climate stressors (overgrazing, invasive species, land use conversion) affect grassland continuity and alter native grass survival, productivity, and recruitment.

Moderate Vulnerability

Drivers of Grassland Habitats

- Climate sensitivities: Precipitation, soil moisture, drought, air temperature
- Disturbance regimes: Wildfire
- Non-climate sensitivities: Overgrazing, invasive & problematic species, land use conversion

Projected Climate and Climate-Driven Changes	Potential Impacts on Grassland Habitats
Altered precipitation & soil moisture *Variable annual precipitation volume and timing; increased climatic water deficit*	• Altered productivity, seed survival, germination, species composition, and distribution • Above-average rainfall and persistent wet conditions in fall/spring may favor annuals, while slightly drier conditions and precipitation variability may favor perennials • Shifts in precipitation timing may increase invasive species establishment or dominance • Longer wet seasons and/or a later start to the wet season may affect soil respiration
Increasing drought *Longer, more severe droughts*	• Multi-year/severe droughts: reduced cover and size of native grasses, increased seedling and young plant mortality • Altered plant physiology
Increasing temperatures *+2.5 to +9°C by 2100*	• Accelerated phenology: accelerated senescence/flowering, altered dormancy timing • Altered productivity, species composition, and distribution, including increased annual grass growth/productivity (particularly with higher average winter temperature)
Altered fire regimes *Increased fire size, frequency, and severity*	• Mortality of established perennial bunchgrasses • Altered species composition: response will depend on timing and moisture availability • Increased annual grassland extent via type conversion from shrub systems

Adaptive Capacity

Factors that enhance adaptive capacity:

+ Highly variable response to stressors/disturbance: functional groups may change because annual species have higher and more persistent seedbanks
+ Moderately-high species, functional group, and physical/ topographic diversity
+ Provides variety of ecosystem services: biodiversity, grazing, recreation, and carbon sequestration

Factors that undermine adaptive capacity:

- Significantly altered composition: perennial species represent only small percentage of cover and all grasslands face severe invasion risk
- Facing significant fragmentation and habitat loss
- Perennial species feature low recruitment and functional group diversity, and have small populations

Adaptation Strategies for Grassland Habitats


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What kinds of adaptation options are there?

Enhance Resistance ➔ Prevent climate change from affecting a resource

Promote Resilience ➔ Help resources weather climate change impacts by avoiding the effects of or recovering from changes

Facilitate Transition ➔ Accommodate change and/or enable resources to adaptively respond to variable conditions

Increase Knowledge ➔ Gather information about climate impacts and/or management effectiveness in addressing climate change challenges

Engage Collaboration ➔ Coordinate efforts and capacity across landscapes and agencies

Adaptation Category	Adaptation Strategy	Specific Management Actions
Enhance Resistance	Limit the impacts of urbanization on grasslands and oak woodlands	• Facilitate and build capacity in communities to protect/enhance/ restore grasslands and oak woodlands
	Increase proactive management to prevent weeds	• Apply early detection rapid response, inventory and mapping • Include invasive species prevention strategies in all projects • Ensure weed-free policies are included in planning documents
	Manage non-native grasses to increase native grass diversity/cover and reduce fire risk and competition for soil moisture	• Tailor ground management techniques (fire, grazing, mowing) according to local conditions and goals • Manage invasive species in priority areas • Implement seasonal grazing and/or reduce grazing practices that encourage spread of non-native species
Promote Resilience	Increase native cover and diversity to enhance habitat resiliency and quality	• Seed with native species • Practice seasonal grazing (to remove non-natives/manage thatch) • Identify and promote early-successional natives that may be able to compete with non-natives • Plant potential microsites with mix of species
Facilitate Transition	Identify and protect refugia for priority conservation and restoration areas	• Identify areas where relict plants could be established • Designate conservation easements • Control and/or remove non-native species in identified refugia to reduce competition for declining water resources in the future
Increase Knowledge	Increase knowledge base to enhance restoration success	• Identify regional drought-adapted ecotypes to enhance/restore mesic areas
Engage Collaboration	Work across jurisdictions	• Coordinate invasive species management, funding and support between agencies

*Actions presented are those evaluated as having higher effectiveness and/or feasibility.

Management Implications

This information can be used in a variety of ways:

- ✔ Forest Plan Revisions
- ✔ U.S. Forest Service Climate Change Performance Scorecard: Element 6 - "Assessing Vulnerability" and Element 7 - "Adaptation Actions"
- ✔ Bureau of Land Management Resource Management Plan Revisions

Resilient management requires implementing a variety of adaptation options

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Further information and citations can be found in source reports, *Climate Change Vulnerability Assessment for Focal Habitats of Southern California* and *Climate Change Adaptation Strategies for Focal Habitats of Southern California*, available online at the EcoAdapt Library: http://ecoadapt.org/library.