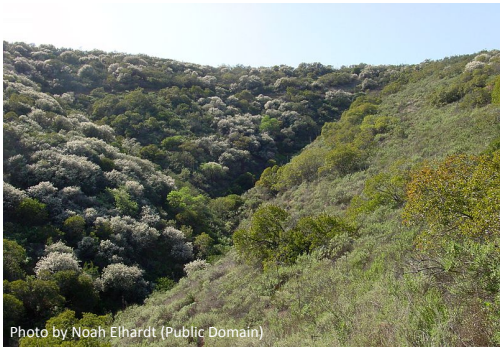
Sage Scrub Habitats

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

Sage scrub habitats feature an open, drought-deciduous shrub canopy and an herbaceous understory of annual and perennial grasses and forbs. Typically in foothills and valleys, but found up to 900 m (2952 ft), sage scrub is classified into three different groupings. Coastal sage scrub occurs from Santa Barbara to northwestern Baja California. Inland sage scrub occurs in western Riverside and San Bernardino Counties, northeastern San Diego County, and northern Los Angeles County. Maritime succulent sage scrub occurs in select areas of coastal southern California (e.g., Cabrillo National Monument), with core distribution in Baja California.

Habitat Vulnerability

Sensitivity & Exposure

Increasing temperatures may affect germination and abundance of some species, while cold sensitivity limits the distribution of others. A majority of sage scrub vegetation exhibits plasticity in response to drought and precipitation variability, but altered precipitation timing, soil moisture, and drought severity/timing may affect composition, distribution, and survival. Increasing fire frequencies may facilitate shifts to exotic annual grassland, a process exacerbated by increased nitrogen deposition. Invasive species compete for resources, alter ecosystem processes, and limit sage scrub regeneration, while land use conversion destroys and fragments habitat. Many sage scrub species are projected to experience a >50% decline in suitable habitat in southern California by mid-century.

Moderate Vulnerability

Drivers of Sage Scrub Habitats

- Climate sensitivities: Air temperature, precipitation, soil moisture, extreme high and low temperature events
- Disturbance regimes: Wildfire, biotic disturbance
- Non-climate sensitivities: Invasive & problematic species, pollution & poisons, land use conversion

Projected Climate and Climate-Driven Changes	Potential Impacts on Sage Scrub Habitats
Variable precipitation, reduced soil moisture, increased drought *Variable annual precipitation; increased climatic water deficit; increased drought frequency and length*	• Altered distribution, species composition, survival, recruitment, germination, productivity, and phenology; potential conversion to more xeric shrub communities and/or non-native annual grassland • Less frequent/larger rainfall events: sage scrub may gain competitive advantage over chaparral and invasive grasses
Increased temperatures and heat waves *+2.5 to +9°C by 2100; increased heat wave frequency and length*	• Altered distribution and species composition • Decreased germination success for some species • Altered susceptibility to exotic invasion
Altered fire regimes *Increased fire size, frequency, and severity*	• Native species declines via resprout mortality and reduced seedbank • Increased exotic species establishment and abundance, potentially exacerbating shifting fire regimes and leading to habitat conversion

Adaptive Capacity

Factors that enhance adaptive capacity:

+ Fairly high plasticity in response to drought and precipitation variability
+ Typically recovers quickly post-disturbance
+ Moderate-high species and functional group diversity; has many rare and imperiled species
+ Provides variety of ecosystem services: biodiversity, recreation, and carbon sequestration

Factors that undermine adaptive capacity:

- 70-90% of historical habitat area has been lost
- Landscape barriers, continued development pressure, and existing habitat fragmentation inhibit seed dispersal, gene flow, and migration
- Short dispersal distances (<5 m) may undermine ability of habitat to track shifts in climate
- Non-climate stressors undermine resilience

Adaptation Strategies for Sage Scrub 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	Restore disturbed areas with native species to limit erosion and prevent establishment of non-native species	• Remove non-native species as soon as they are detected • Immediately plant/seed with native species after disturbance • Water plants to ensure establishment • Exclude off-highway vehicles (OHVs) from restored sites
	Practice rapid, effective fire suppression to minimize fire frequency and restore appropriate fire return intervals	• Conduct patrols during high wind events for early detection of fire • Practice effective types of fuels management in strategic locations (around at-risk human communities or key resources)
Promote Resilience	Restore/manage habitat to reflect future climate conditions while still benefitting native species and mirroring current ecological function	• During restoration, prioritize resilient species or species expected to do well under future climate conditions; possibly incorporate species not currently on site (assisted migration) • Focus habitat restoration activities on sites that are less likely to experience very warm or dry conditions
	Limit recreational use to decrease disturbance and risk of wildfire	• Centralize recreation impacts to easy-access areas • Improve public education and interpretive signage to increase awareness of impacts, and increase regulation/enforcement
Facilitate Transition	Identify vulnerable species and natural resources to inform protection efforts	• Conduct spatial analysis to identify vulnerable species, incorporating levels of biodiversity, climate and non-climate threats, and functional diversity
Increase Knowledge	Determine risk of type-conversion to exotic annual grassland	• Model historical and future climate change, including fire risk and impact on likelihood and rate of type-conversion and invasive species establishment
Engage Collaboration	Coordinate with other groups to reduce wildfire risk	• Engage land use planners to reduce leapfrog development

*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.