Chaparral

Climate Change Vulnerability and Adaptation Strategies for the Santa Cruz Mountain Region

Habitat Description

Chaparral habitats are dominated by sclerophyllous ("hard-leaved") evergreen shrubs and small trees that are well-adapted to fire and drought. Dominant chaparral species are typically categorized by mode of post-fire regeneration: *obligate seeders* require fire for germination from stored seedbanks, while *obligate resprouters* have seeds that are easily killed by fire, so they resprout following fire and recruit from seed during fire-free intervals. *Facultative seeders* utilize both vegetative resprouting and seed germination following fire-induced topkill, and can also recruit from seed in the absence of fire. Within the Santa Cruz Mountains region, characteristic species include chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos* spp.), ceanothus (*Ceanothus* spp.), gooseberries/currants (*Ribes* spp.), buckthorn (*Rhamnus* spp.), hollyleaf cherry (*Prunus ilicifolia*), toyon (*Heteromeles arbutifolia*), and knobcone pine (*Pinus attenuata*).

Habitat Vulnerability

Moderate Vulnerability

High Confidence

Sensitivity & Exposure

Moderate Impact

High Confidence

Projected Changes	Trend
Precipitation	▲▼
Soil moisture	▼
Drought	▲
Wildfire	▲

Potential impacts:

- Altered patterns of chaparral recruitment and community composition, with greater impacts likely in obligate-seeding and obligate-resprouting species
- Increased shrub dieback and mortality due to drought, particularly where invasive grasses increase competition for soil moisture
- Reduced biodiversity, shifts in species composition, and habitat loss due to increases in fire frequency that kill sprouts and seedlings before they reproduce

Non-climate stressors may interact with climate stressors and disturbance regimes:

- *Residential/commercial development* increases loss and fragmentation of habitat, limits species migration and dispersal in response to climate change, and increases the risk of human ignitions
- *Roads, highways, and trails* increase nitrogen deposition, fragment habitats, spread invasive plants, and increase the risk of fire ignitions
- *Invasive species* alter understory composition, displacing native species and increasing fire risk
- *Fire suppression and fuel reduction activities* alter habitat structure/composition and increase risk of severe fires

Chaparral habitats are most sensitive to factors that alter the timing and amount of available water, which affects survival and recruitment of both native and non-native plant species. Climate change is expected to impact shrub functional groups (e.g., obligate seeders, obligate resprouters, facultative seeders) differently, with facultative seeders potentially increasing in dominance.

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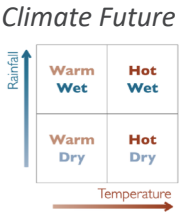
Modeled Changes in Vegetation Distribution

Dramatic Decline | Moderate Decline | Relative Stability | Increase

	San Francisco	Santa Clara Valley	Santa Cruz Mtns. North	Santa Cruz	Sierra Azul
Chamise chaparral					
Mixed chaparral					
Mixed montane chaparral					

While chamise chaparral is projected to increase in all areas of the study region and under all future climate scenarios, other chaparral associations show more mixed responses. Both mixed chaparral and mixed montane chaparral are likely to undergo declines in many areas, particularly under hotter scenarios.

Climate Future

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Adaptive Capacity

Moderate Adaptive Capacity   *Moderate Confidence*

Intrinsic factors (i.e., inherent characteristics) that enhance or undermine adaptive capacity:

- ▲ Widely-distributed within the region
- ▲ High species diversity and high rates of speciation in *Ceanothus* and *Arctostaphylos*
- ▲ Provides critical wildlife habitat
- ▲ Serpentine soils dominated by species with stress-tolerant functional traits
- ▲ Well-adapted to drought and wildfire
- ▲ Variety of regeneration strategies
- ▼ Serpentine chaparral occurs in small, spatially-isolated patches
- ▼ Significant habitat loss/fragmentation and degradation due to land-use conversion
- ▼ Slow growth rate and limited seed dispersal distances
- ▼ Reduced resistance/recovery on sites where invasive species have become established

Extrinsic factors (i.e., management potential) that enhance or undermine adaptive capacity:

- ▲ Provides many critical ecosystem services (e.g., flood/erosion control, carbon sequestration, wildlife habitat)
- ▼ Low public value compared to most other vegetation types, and perceived as a fire risk for adjacent human communities

Historical habitat loss and fragmentation have reduced the ability of chaparral species to migrate in response to climate change, and significantly contribute to the spread of invasive species and increased risk of human ignitions that are associated with post-fire type conversion.

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Adaptation Strategies for Chaparral

Management activities focused on reducing vulnerability to climate change are likely to emphasize minimizing the impacts of altered fire regimes and associated risk of type conversion. For example, limiting development adjacent to chaparral could reduce the risk of anthropogenic ignitions and limit the need to manage chaparral for fuel reduction objectives. Prescribed fire may be used to restore natural fire regimes and maintain ecosystem benefits for wildlife, though site-specific factors must be considered to prevent detrimental impacts on chaparral recruitment, recovery, and vulnerability to invasive species as climate stressors continue to increase.

ADAPTATION APPROACH	ADAPTATION STRATEGIES
Resistance strategies: Maintain current conditions by limiting change *Near-term approach*	• Limit human activity and traffic in fire-prone areas to prevent ignitions • Incorporate fire risk into land use planning (e.g., plan for defensible space, focus on the wildland-urban interface) • Use low-intensity prescribed fire to create a buffer zone around sensitive areas • Restore disturbed areas with native species to limit erosion and prevent establishment of non-native species
Resilience strategies: Accommodate some change while enabling a return to prior conditions *Near- to mid-term approach*	• Focus habitat restoration activities on sites that are less likely to experience very warm or dry conditions* • Reseed/replant disturbed sites with species expected to do well under future climate conditions* • Protect land in priority connectivity/corridor areas via acquisition, realty actions, or land trades*
Response strategies: Intentionally facilitate or direct change to adaptively respond to new conditions *Long-term approach*	• Consider assisted migration of serpentine species to new locations that are expected to remain or become suitable under future climate conditions*
Knowledge strategies: Gather information about climate changes, impacts, and/or management effectiveness *Near- to long-term approach*	• Increase research on and monitoring of the effects of prescribed fire timing and intensity on invasive species* • Map and characterize connectivity between natural areas for plant and animal migration* • Increase monitoring of known or potential invasive species to ensure early detection*
Collaboration strategies: Coordinate management efforts and/or capacity across boundaries *Near- to long-term approach*	• Educate fire agencies and communities about Best Management Practices for fuels treatments* • Expand public education campaigns focused on the risk of roadside ignitions and the importance of defensible space • Create outreach campaigns designed to increase recognition of chaparral as an important California ecosystem* • Partner with local tribes to share resources and expand the use of cultural burning and managed wildfire*

** Future management strategies (not currently occurring)*

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Further information and citations can be found in the source reports of the Santa Cruz Mountains Climate Adaptation Project, available online at http://ecoadapt.org/programs/awareness-to-action/santa-cruz-mountains.