Southern California Alluvial Scrub Habitats

Climate Change Adaptation Actions Summary

An Important Note About this Document: *This document represents an initial effort to identify adaptation actions for alluvial scrub habitats in southern California based on stakeholder input and existing information. Specifically, the information presented below comprises stakeholder input during a two-day adaptation workshop, peer-review comments and revisions, and relevant examples from the literature or other similar efforts. The aim of this document is to expand understanding of possible adaptation actions for southern California alluvial scrub habitats in response to climate change.*

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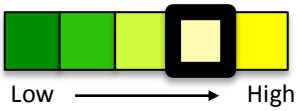
Alluvial Scrub Habitat Vulnerability

Moderate-High Vulnerability



The relative vulnerability of alluvial scrub habitats in southern California was evaluated to be moderate-high by habitat experts due to moderate-high sensitivity to climate and non-climate stressors, high exposure to projected future climate changes, and low-moderate adaptive capacity. Alluvial scrub habitats are critically sensitive to climate drivers that alter hydrologic, flooding, and scouring regimes and/or that alter moisture availability, as these factors affect habitat distribution, composition, and survival. Other climate drivers (e.g., temperature, wildfire) are likely to affect habitat composition. Alluvial scrub habitats are also very sensitive to non-climatic drivers that exacerbate climate-driven changes. For example, dams and water diversions compound hydrological shifts, and invasive species can directly compete with alluvial scrub vegetation for increasingly limited resources. Large portions of alluvial scrub habitat have been lost as a result of human activity, resulting in isolated contemporary habitat along unaltered streams and alluvial outwashes. A variety of landscape barriers, in addition to the soil requirements of component vegetation, may limit dispersal opportunities in response to climatic stressors. However, alluvial scrub communities are disturbance-adapted and feature moderate diversity, which may enhance their resilience in the face of climate change. Alluvial scrub habitats provide several ecosystem services including biodiversity and flood and erosion protection.

Adaptation Strategies and Actions

Table 1 presents a summary of possible adaptation strategies and actions for alluvial scrub habitats, and consists of stakeholder input during an adaptation workshop as well as additional options from the literature or other similar efforts. Stakeholders identified ways in which current management actions could be modified to reduce habitat vulnerabilities as well as future management actions that are not currently implemented but could be considered for future implementation.

Adaptation strategies and actions are grouped according to one of five categories:

1. **Enhance Resistance**. These strategies can help to prevent the effects of climate change from reaching or affecting a resource.
2. **Promote Resilience**. These strategies can help a resource withstand the impacts of climate change by avoiding the effects of or recovering from changes.
3. **Facilitate Transition (or Response)**. These strategies intentionally accommodate change and/or enable resources to adaptively respond to changing and new conditions.
4. **Increase Knowledge**. These strategies are aimed at gathering more information about climatic changes, impacts, or the effectiveness of management actions in addressing climate change.

5. **Engage Coordination**. These strategies may help coordinate efforts and/or capacity across landscapes and agencies.

Table 1. Summary of possible adaptation options for alluvial scrub habitats.

Adaptation Category	Adaptation Strategy	Specific Adaptation Actions
Enhance resistance	Restore native species to disturbed areas	• Restore habitat with native species that are tolerant of disturbed conditions[1] • Build a reserve of seeds and plants that are tolerant of disturbed conditions[2]
	Restore fluvial processes to streams that support alluvial scrub vegetation	• Remove dikes, mining operations, and recharge basins that obstruct the migration ability of streams and sediment deposition areas[1] • Require undeveloped buffers along streams[2] • Raise roads out of washes[1]
Promote resilience	Maintain and/or restore the natural and historical characteristics of a watershed	• Designate critical habitat where the most sensitive species are found, and in areas where the home ranges of several species overlap[2]
	Improve ability to confidently source plants for alluvial scrub restoration	• Conduct a common garden experiment which includes plants from across the species' range in order to understand the level of adaptive variation within the population[1]
Facilitate transition	Identify and protect refugia	• Protect areas that may be buffered from the effects of climate change, including microhabitats that may provide cooler temperatures or maintain higher soil moisture during periods of drought[2]
	Improve habitat restoration tools to support the ability of plants and animals to respond to changing climate conditions	• Develop habitat restoration techniques that will be successful under future climate conditions[2] • Use species distribution modeling to improve understanding and acceptance of facilitated migration for plant species[2]
Increase knowledge	Maintain the natural and historical characteristics of a watershed	• Research historical ranges of flora and fauna[2] • Compile information on species ecology, range, and genetics to create detailed profiles[1]
	Map species distributions to understand potential habitat loss or gain and improve restoration	• Use joint species distribution modeling to look at multiple species within a habitat or community simultaneously, incorporating multiple threats[1] • Survey the vegetation and environment to aid in the design of a plant palette with species suited for various positions within an alluvial fan or watercourse, then update survey as habitat suitability changes under future climate conditions[1]

[1] Denotes adaptation actions identified by workshop participants.
[2] Actions were sourced from the Climate Adaptation Project for the Sierra Nevada and/or the Northern Rockies Adaptation Partnership.

Adaptation Category	Adaptation Strategy	Specific Adaptation Actions
Engage coordination	Work across jurisdictions	• Coordinate invasive species management, funding, and support between agencies[2] • Communicate about projects and coordinate on-the-ground activities[2] • Align budgets and program work priorities with adjacent lands[2]

Table 2 identifies the key alluvial scrub habitat vulnerabilities that may be reduced and/or addressed by various adaptation actions. These linkages are based on expert opinion.

Linking vulnerabilities to adaptation options can help managers decide which actions to implement and aid prioritization based on multiple factors (e.g., habitat type, observed or projected changes, ecosystem service). However, when selecting adaptation actions for implementation, it is also important to consider secondary effects on other resources, both positive and negative. For example, trail or road decommissioning may benefit aquatic systems by limiting erosion impacts but could also remove important access points to fire-prone areas. For more information about alluvial scrub adaptation strategies and actions developed by participants during the workshop, including where and how to implement adaptation actions, implementation timeframe, collaborations and capacity required, and secondary effects on other resources (both positive and negative), please see the report *Climate Change Adaptation Strategies for Focal Habitats of Southern California*.

Table 2. Key vulnerabilities of alluvial scrub habitats linked to specific adaptation actions and management activities; implementation of adaptation actions (central column) may help to directly reduce and/or address the impacts of identified climate and non-climate stressors and disturbance regimes (right columns). Actions highlighted in **red** represent adaptation strategies that enhance resistance, those highlighted in **orange** promote resilience, and those highlighted in **green** facilitate transition. Adaptation actions aimed at increasing knowledge and engaging coordination are not included in this table as they address vulnerability indirectly. Adaptation actions listed in this table include those identified by participants, in the scientific literature, and in other similar efforts.

Management Activity	Adaptation Actions	↑ Air temperature	Altered precipitation (timing & amount), ↓ Soil moisture	↑ Flooding & soil erosion	Altered wildfire regimes	Invasive & problematic species
		Climate Stressors		Disturbance Regimes		Non-Climate Stressors
Habitat Management & Restoration Activities	Restore habitat with native species that are tolerant of disturbed conditions		✔	✔	✔	
	Build a reserve of seeds and plants that are tolerant of disturbed conditions		✔	✔	✔	
	Use species distribution modeling to improve understanding and acceptance of facilitated migration for plant species	✔	✔			
	Designate critical habitat where the most sensitive species are found, and in areas where the home ranges of several species overlap		✔	✔	✔	✔
	Conduct a common garden experiment which includes plants from across the species' range in order to understand the level of adaptive variation within the population	✔	✔			
	Use species distribution modeling to improve understanding and acceptance of facilitated migration for plant species	✔	✔			
	Protect areas that may be buffered from the effects of climate change, including microhabitats that may provide cooler temperatures or maintain higher soil moisture during periods of drought	✔	✔			
	Develop habitat restoration techniques that will be successful under future climate conditions	✔	✔	✔	✔	✔
Watershed Improvement	Require undeveloped buffers along streams			✔		
	Raise roads out of washes			✔		
	Remove dikes, mining operations, and recharge basins that obstruct the migration ability of streams and sediment deposition areas			✔		

In addition to directly reducing some vulnerabilities (Table 2), some adaptation actions may indirectly address other vulnerabilities. For example, raising roads out of washes may reduce invasive species introductions. Similarly, restoring habitats with species that are tolerant of disturbed conditions can also indirectly reduce vulnerability to increased air temperatures if disturbance-adapted plants with higher heat thresholds are utilized for restoration plantings.

Two other important considerations when selecting adaptation actions for implementation include feasibility (action capable of being implemented) and effectiveness (action reduces vulnerability). An adaptation action with high feasibility has no obvious barriers and a high likelihood of implementation whereas an action with low feasibility has obvious and/or significant barriers to implementation that may be difficult to overcome. An adaptation action with high effectiveness is very likely to reduce associated vulnerabilities (listed in Table 2) and may benefit additional management goals or resources whereas an action with low effectiveness is unlikely to reduce vulnerability and may have negative impacts on other resources.

Figure 1 plots adaptation actions listed in Table 1 according to feasibility and effectiveness. This figure can help managers prioritize actions for implementation (e.g., actions with high feasibility and high effectiveness), better target management efforts toward specific challenges (e.g., actions with low or moderate feasibility but high effectiveness), and/or evaluate whether to proceed with implementation (e.g., actions with high feasibility but low effectiveness). For the latter two purposes, managers may consider the following questions:

- **Low or Moderate Feasibility/High Effectiveness Actions**: What steps can be taken to increase the likelihood of this action being implemented in the future?
    - *Example*: Would improving public outreach and education or enhancing public/private collaboration facilitate the removal of dikes or recharge basins with the goal of restoring fluvial processes?
- **High Feasibility/Low or Moderate Effectiveness Actions**: Does this action still make sense given projected climate changes and impacts?
    - *Example*: If conditions are projected to become drier, should grazing continue in areas with drought-sensitive vegetation?

Alternatively, there may be some actions that do not reduce vulnerability directly but could provide important information, tools, or support to address vulnerability down the line. For example, actions aimed at increasing knowledge through monitoring or modeling could provide key information for future restoration activities (e.g., creating detailed species genetic profiles to select genetically and ecologically suitable plant species for future conditions). Managers may want to weigh the costs and benefits of implementing actions with the timeframe required to reduce vulnerability directly. Additionally, actions focused on coordination and collaboration may not directly address vulnerabilities, but these remain important steps toward better planning and management.

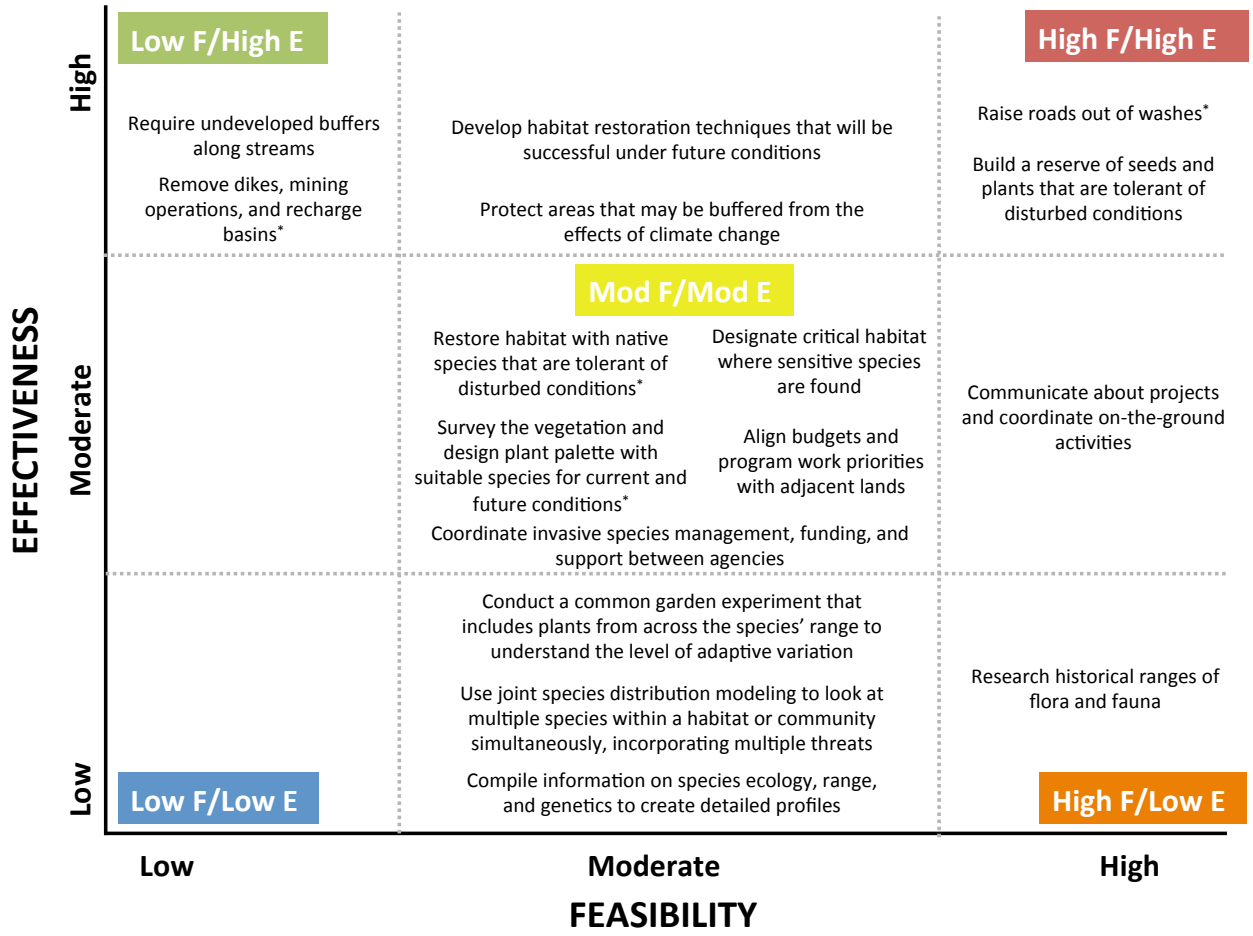


Figure 1. Alluvial scrub adaptation actions plotted according to implementation feasibility (action capable of being implemented) and effectiveness (action reduces vulnerability). Those actions having high feasibility and effectiveness appear in the upper right corner and low feasibility and effectiveness in the bottom left corner. An asterisk (*) denotes adaptation actions evaluated for feasibility and effectiveness by workshop participants, although in some cases the ranking was shifted based on expert opinion. All other adaptation action evaluations are based on expert opinion.

Recommended Citation

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This document is available online at the EcoAdapt website (http://ecoadapt.org/programs/adaptation-consultations/socal).