Santa Cruz Mountains Climate Adaptation Project

Climate Change Vulnerability Assessment Workshop

October 15, 2019
Los Altos, CA

EcoAdapt™
Meeting the challenges of climate change

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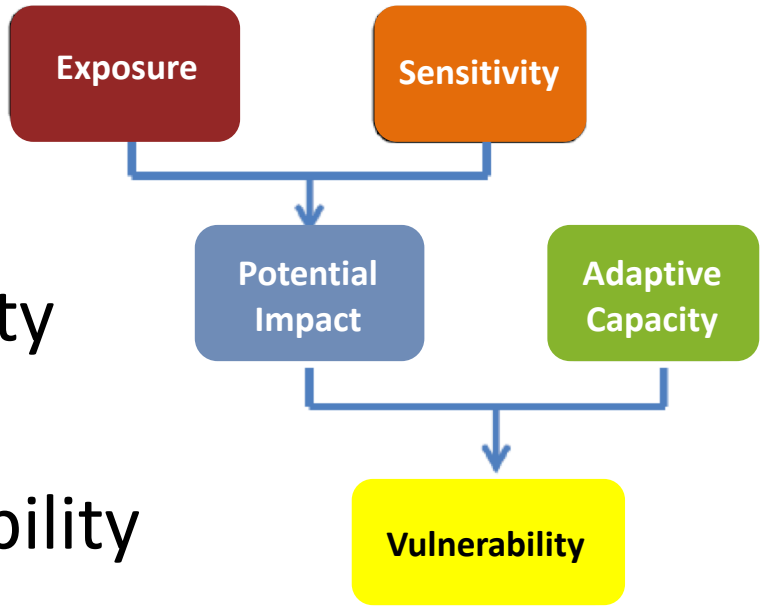
Next Steps

Vulnerability Assessment

- ❑ EcoAdapt evaluates projected future climate exposure
- ❑ Literature review and synthesis
- ❑ Peer review of draft vulnerability findings
- ❑ Revise and create final vulnerability products



Next Steps

Adaptation Planning

Two adaptation workshops:

Generate adaptation strategies and specific actions to reduce vulnerabilities of habitats and species

- Where, when, and how those actions can be applied
- Implementation feasibility and effectiveness
- Co-benefits and tradeoffs

Feb/Mar 2020

Identify Adaptation Strategies & Actions

Goal: Develop adaptation strategies and actions to reduce vulnerabilities or increase resilience of habitats and species

Network Adaptation Workshop

- Review vulnerability assessment results and spatial analysis
- Use scenario planning approach to identify current and new management strategies in response to different scenarios
- Modeled after TBC3's Climate Ready Vegetation Management in the Bay Area Workshop

Table 3.1. Proposed management tools identified by break-out group under Scenario A (massive drought-induced oak-dieback). Grey text are additional comments from the joint discussion.

	BIODIVERSITY	WATER	FIRE	HUMANS
Current tools to keep	Erradication of high-priority invasives especially those having impact on biodiversity, but also those that are manageable			
	Downscale climate models			
	Working with the restoration palette you have and allow for expansion as well e.g. removing invasive species in certain areas to allow further establishment of already-existing natives			
	Using traditional knowledge		Low fire (prescribed burns)	
New tools to consider	Larger scale programs to manage matrix (increase habitat connectivity and heterogeneity) e.g. working across reserves and developing comprehensive broad-scale management programs			
	Early detection and rapid response through education of volunteers		Experiment and research with new tools, e.g. burning grass around oaks to get more water thus reducing water stress on oaks	Revise semantics e.g. terms like 'invasive' – from different county? different country/continent?
	Management heterogeneity (use multiple strategies)			Become better story-tellers of how we tell what changes are occurring
	Expand plant palette and work with those you have			Educating public to value new communities and accept change
	Find ways to enhance new niches			

Identify Adaptation Strategies & Actions

Goal: Develop adaptation strategies and actions to reduce vulnerabilities or increase resilience of habitats and species

Midpen Adaptation Workshop

- Evaluate whether and how **existing** projects or management actions may be vulnerable to climate change, and identify ways to modify actions to reduce vulnerabilities and/or increase resilience

Current Project Example: Reseed/planting of damaged chaparral habitats

Modifications:

- Increase species diversity and choose species that represent future ranges

Identify Adaptation Strategies & Actions

Goal: Develop adaptation strategies and actions to reduce vulnerabilities or increase resilience of habitats and species

Midpen Adaptation Workshop

- Build out potential **future** adaptation strategies/actions/projects

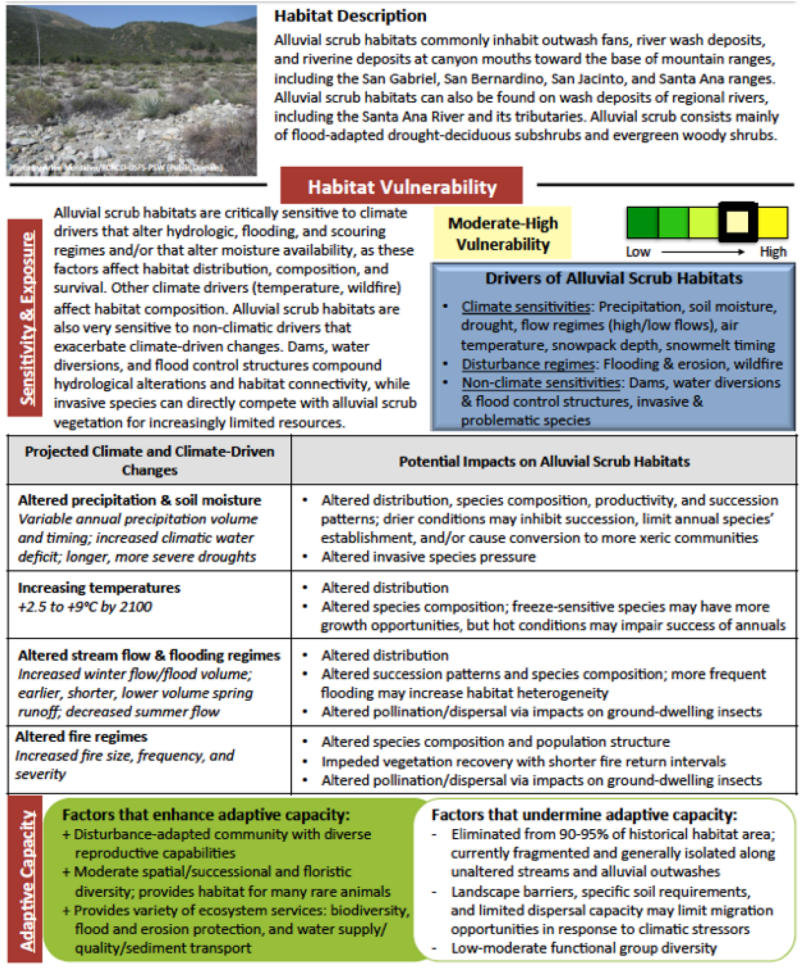
Example Future Strategy and Action:

Targeted removal of invasive species to increase water yield

- Identify and prioritize removal of invasive species that will increase water yield to the greatest degree (e.g., tamarisk)
- Prioritize treatment locations based on site/invasive species (e.g., if water-dispersing species, prioritize removal in upstream locations)
- Plant climate-adapted or more resilient native species

Final Products

1. Short synthesis report on climate projections, trends, and impacts
2. Two-page vulnerability-adaptation briefs
3. Short report summarizing workshop proceedings
4. Print-ready maps and GIS layers



Habitat Description

Alluvial scrub habitats commonly inhabit outwash fans, river wash deposits, and riverine deposits at canyon mouths toward the base of mountain ranges, including the San Gabriel, San Bernardino, San Jacinto, and Santa Ana ranges. Alluvial scrub habitats can also be found on wash deposits of regional rivers, including the Santa Ana River and its tributaries. Alluvial scrub consists mainly of flood-adapted drought-deciduous subshrubs and evergreen woody shrubs.

Habitat Vulnerability

Sensitivity & Exposure

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 (temperature, wildfire) affect habitat composition. Alluvial scrub habitats are also very sensitive to non-climatic drivers that exacerbate climate-driven changes. Dams, water diversions, and flood control structures compound hydrological alterations and habitat connectivity, while invasive species can directly compete with alluvial scrub vegetation for increasingly limited resources.

Moderate-High Vulnerability

Low → High

Drivers of Alluvial Scrub Habitats

- Climate sensitivities: Precipitation, soil moisture, drought, flow regimes (high/low flows), air temperature, snowpack depth, snowmelt timing
- Disturbance regimes: Flooding & erosion, wildfire
- Non-climate sensitivities: Dams, water diversions & flood control structures, invasive & problematic species

Projected Climate and Climate-Driven Changes	Potential Impacts on Alluvial Scrub Habitats
Altered precipitation & soil moisture *Variable annual precipitation volume and timing; increased climatic water deficit; longer, more severe droughts*	• Altered distribution, species composition, productivity, and succession patterns; drier conditions may inhibit succession, limit annual species' establishment, and/or cause conversion to more xeric communities • Altered invasive species pressure
Increasing temperatures *+2.5 to +9°C by 2100*	• Altered distribution • Altered species composition; freeze-sensitive species may have more growth opportunities, but hot conditions may impair success of annuals
Altered stream flow & flooding regimes *Increased winter flow/flood volume; earlier, shorter, lower volume spring runoff; decreased summer flow*	• Altered distribution • Altered succession patterns and species composition; more frequent flooding may increase habitat heterogeneity • Altered pollination/dispersal via impacts on ground-dwelling insects
Altered fire regimes *Increased fire size, frequency, and severity*	• Altered species composition and population structure • Impeded vegetation recovery with shorter fire return intervals • Altered pollination/dispersal via impacts on ground-dwelling insects

Adaptive Capacity

Factors that enhance adaptive capacity:

+ Disturbance-adapted community with diverse reproductive capabilities
+ Moderate spatial/successional and floristic diversity; provides habitat for many rare animals
+ Provides variety of ecosystem services: biodiversity, flood and erosion protection, and water supply/ quality/sediment transport

Factors that undermine adaptive capacity:

- Eliminated from 90-95% of historical habitat area; currently fragmented and generally isolated along unaltered streams and alluvial outwashes
- Landscape barriers, specific soil requirements, and limited dispersal capacity may limit migration opportunities in response to climatic stressors
- Low-moderate functional group diversity

All final products will be available to Midpen and the Network

NEPA/EIS Requirements: *Southern California Riparian Restoration Project*

NEPA: consider and disclose the potential effects of project actions on the environment

How can we best respond to NEPA requirements to explicitly address climate change in projects?

Invasive species

Shifts in climate conditions can allow invasive species to establish or expand into riparian habitats. For instance, warming temperatures and extended dry conditions may reduce the length of time that vernal pools are filled with water, which allows invasive species to encroach into the basin in dry periods (Bartolome et al. 2014). Invasive species compete with native plants and wildflowers and increase evapotranspiration, which speeds drying and makes conditions even more susceptible to invasion (Marty 2005).

Overall, lower-elevation and/or drier sites may be more vulnerable to invasive species; in southern California, two species that are particularly aggressive at lower elevations are saltcedar (*Tamarix* spp.) and giant reed (*Arundo donax*; Stephenson and Calcarone 1999). Both grow well in areas of high disturbance and form dense stands that may outcompete native vegetation (Stephenson and Calcarone 1999). Saltcedar is more tolerant of drought and can use water very efficiently (Vandersande et al. 2001). It also takes up large quantities of water, resulting in reduced groundwater levels, and exudes salts that accumulate in the soil; both of these factors make surrounding areas less suitable for native groundwater-dependent riparian plants (Stephenson and Calcarone 1999; Vandersande et al. 2001). On the other hand, regular flooding flushes salts out of the soil and inundates vegetation, creating conditions allow the reestablishment of native species better suited to flooding (Vandersande et al. 2001).

Adaptation Category	Adaptation Strategy	Specific Adaptation Actions
Enhance resistance	Reset tree succession by managing disturbance in meadows	• Use low-density grazing to prevent woody plant encroachment and reduce non-native herbaceous species[1]
	Preserve native riparian habitat and maintain habitat connectivity	• Establish wilderness areas, focusing on intact riparian habitat[1] • Use vegetation to increase shading of riparian habitat and maintain cool, wet areas[3]
	Reduce the impact of public use and infrastructure	• Redesign trail system infrastructure to minimize impacts from trails in popular areas[1] • Barricade roads as needed to protect riparian systems[1] • Upgrade road crossings (e.g., install higher-capacity culverts) in areas that are prone to sedimentation and/or provide habitat for sensitive species[2] • Assess the location of roads and consider removing those within sensitive riparian systems[2]
	Manage grazing to reduce impacts on riparian vegetation and soil structure	• Focus grazing on non-native species in spring and prevent grazing on native species in summer[3] • Build livestock exclosures to protect riparian habitats that are easily damaged by grazing[3] • Implement moderate grazing around vernal pools to maintain vernal pool hydrology[4]
	Reduce water extraction from springs	• Decrease the number of permits for water extraction[1] • Do not renew expired permits for water extraction[1]
	Reduce impact of invasive species	• Remove invasive, water-consuming plants[1] • Manage invasive species that may increase during drought events (e.g., grasses, bullfrogs)[1]

Case Study #1: Gunnison Basin sage-grouse



Key Vulnerabilities:

- Increased drought
- Increased erosion from intense precipitation events
- Invasive species

Adaptation Strategies:

- Retain water in most vulnerable brood-rearing habitats (*reduce exposure)*
  - Improve irrigation practices
  - Restore seeps, springs; remove headcuts, gullies
- Improve and restore nesting and wintering habitats (*reduce sensitivity*)
  - Maintain and expand perennial grass and forb cover
  - Abate/prevent cheatgrass encroachment

Case Study #2: Sierra Nevada oak woodlands

Key Vulnerabilities:

- Increased water deficit leading to lower seedling survival
- Continued grazing/browsing of planted seedlings leading to decreased survival, making it more difficult to restore sites and enhance recruitment

Adaptation Strategies:

- Plant native bunch grasses to reduce spread of invasive species that outcompete oak seedlings for limited water supply (*reduce sensitivity)*
- Maintain and enhance landscape habitat connectivity to support top predators in order to help reduce/control herbivore numbers (*enhance adaptive capacity*)

Thank You!!

Before you leave…

1. Please turn in all worksheets!
2. Take food home

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