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
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>
<thead>
<tr>
<th>BIODIVERSITY</th>
<th>WATER</th>
<th>FIRE</th>
<th>HUMANS</th>
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<tr>
<td>Eradicating high-priority invasives especially those having impact on biodiversity, but also those that are manageable</td>
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<td>Downscale climate models</td>
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<td>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</td>
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<td>Using traditional knowledge</td>
<td>Low fire (prescribed burns)</td>
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<td>Larger scale programs to manage matrix (increase habitat connectivity and heterogeneity) e.g. working across reserves and developing comprehensive broad-scale management programs</td>
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<td>Early detection and rapid response through education of volunteers</td>
<td>Experiments and research with new tools, e.g. burning grass around oaks to get more water thus reducing water stress on oaks</td>
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<td>Management heterogeneity (use multiple strategies)</td>
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<td>Expand plant palette and work with those you have</td>
<td>Educating public to value new communities and accept change</td>
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<td>Find ways to enhance new niches</td>
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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

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).
Case Study #1: Gunnison Basin sage-grouse

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

Key Vulnerabilities:
• Increased drought
• Increased erosion from intense precipitation events
• Invasive species
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