Climate Change Vulnerability Assessment & Adaptation Strategies for Sierra Nevada Resources

Sierra Nevada Workshop Series

October 14-17, 2014

WORKSHOP SUMMARY REPORT[1]

Photo: ESA

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Introduction

EcoAdapt and the U.S. Forest Service (USFS) led the Sierra Nevada Climate Change Vulnerability Assessment and Adaptation Strategy project (SN-VAAS), a cooperative venture that identified vulnerabilities of and adaptation actions for regionally important ecosystems and species to changing climate conditions. This 1.5-year project was supported by the California Landscape Conservation Cooperative (CALCC) and resulted in a number of key products including: (1) vulnerability assessment findings for eight ecosystems and fifteen species; (2) climate change adaptation strategies for five ecosystems and three species; and (3) downscaled climate data and maps for the Sierra Nevada.

As a follow up to this project, EcoAdapt led a series of workshops for Sierra Nevada resource managers and planners of the U.S. Forest Service (USFS) in October 2014. The goal of these workshops was to create an opportunity for managers to review the results of the SN-VAAS project, discuss their options for managing resources in the face of climate change, and improve understanding of how these products can inform on-the-ground decisions and aid climate adaptation actions. Three workshops were held in the Sierra Nevada: (1) Lassen National Forest Supervisor's Office in Susanville; (2) Lake Tahoe Basin Management Unit Forest Supervisor's Office in South Lake Tahoe; and (3) Sierra National Forest Supervisor's Office in Clovis. Workshop attendees included managers and planners that work on Sierra Nevada National Forests; attendees represented a variety of disciplines and resource areas.

The objectives of the workshops were to:

1. Present findings from Sierra Nevada Vulnerability Assessment and Adaptation Strategy project.
2. Evaluate potential vulnerabilities of participant goals, activities, or projects by using Sierra Nevada vulnerability assessment findings.
3. Brainstorm opportunities to incorporate adaptation strategies into participant planning and management activities, and/or to reduce vulnerabilities of participant goals, activities, or projects.
4. Collaboratively identify additional climate adaptation strategies for focal resources.
5. Provide climate change adaptation training and tools to extend this process to similar efforts in participants' own work.

The workshops consisted of a 1-hour presentation followed by a 2-hour activity where participants evaluated the vulnerabilities of current management goals and activities and identified adaptation actions, including where and when to implement actions. A large group discussion was held following this activity in order to share activity findings, discuss issues and/or barriers to implementing actions, and identify common needs and recommendations for overcoming barriers.

The following section presents the findings from this workshop series, beginning with general notes from the workshop discussions and continuing into more specific vulnerabilities and

adaptation actions for current management activities. For more information about the Sierra Nevada Climate Change Vulnerability Assessment and Adaptation Strategy project, including project reports and other documents, workshops, and links to spatial data and mapping products, please go to http://ecoadapt.org/programs/adaptation-consultations/calcc.

General Notes from Workshop Discussions

Common Issues Identified by Workshop Participants

- Many of the recommended actions (documented below) are permitted under current Forest Plan documents, but implementation may be challenging.
    - Examples:
        - Prescribed burning (large acreages): USFS sometimes faces public concern when they try to implement large-scale prescribed burns (e.g., due to air quality or landscape aesthetic concerns).
        - Culvert replacement issues: "In-kind" (i.e., same size) replacements are common practice following wildfires due to funding constraints and/or prohibitive paperwork processes to install larger culverts, however changed conditions (potential for larger flows and debris torrents) may make larger culverts more desirable.
        - Extensive documentation process (e.g., NEPA) can be prohibitive to project-level adaptation implementation.

Common Needs and Recommendations Identified by Workshop Participants

- Develop regional guidelines (where possible) on how to incorporate climate change information at different management levels: Regional Office, Forest Plan, Program, and Project Level, and cross-link throughout these levels. Guidance on how to incorporate climate into project-level NEPA is needed.
    - Focus on developing effective strategies and treatments and providing managers with a range of options for a given resource area. For example, provide numerous hydrology options that could be implemented at the project level, and the option selected is context-specific.
    - Encourage and promote wildland fire management.
- Integrate strategies and management actions across different federal landscapes (National Forests wilderness & non-wilderness, National Parks, National Monuments) to facilitate healthier and connected landscapes.
- Increase public education and outreach, both in-house and through regional partners, to encourage greater public understanding and buy-in regarding long-term management goals and short-term management actions needed to achieve those goals (i.e., large-scale prescribed fire). Creating short, public education and outreach handouts could be helpful (e.g., how management action is addressing climate change; what climate change means for forest resources); could use air quality board examples for how to do this effectively.

- Prioritize funding for no-regrets actions and actions that reduce long-term costs. Also, allow site-specific flexibility in how funds are spent because future conditions are uncertain, and adapting to changes will have to occur at the site level.
    - Examples:
        - Install larger culverts in burned areas: reduces costs of replacing roads that are washed out or destroyed by larger flows and debris torrents in burned landscapes.
- Prioritize projects that have cross-division applicability and benefits.
- Explore opportunities to leverage external funding. For example, the USFS could lead project design and NEPA documentation, while external groups could be engaged to leverage funding and/or partnerships for implementation and monitoring.
- Encourage management for the species and systems (including system structure and function) desired for the future.
- Enhance flexibility within policy (e.g., ability to burn more acres more frequently). Providing institutional documentation, guidance, and/or tools to succinctly and efficiently demonstrate and evaluate risk thresholds, as well as identify ways to manage risks, would facilitate project-level management.
- Create post-fire Best Management Practices (BMPs) and recommendations that include climate considerations for restoration and replanting activities, salvage logging, culvert and infrastructure replacement, invasive species management, and carbon storage.

Adaptation Actions for Aquatic Systems

Management Goal:
Maintain or improve aquatic ecosystems

Goal Vulnerabilities:
Extreme precipitation events; higher peak flows

Adaptation Strategy:
Reduce adverse effects from large, extreme precipitation events

Specific Adaptation Actions	Implementation Timeframe[2]	Action Application Areas	Implementation Scale
Disperse flow and disconnect roads from stream network by outsloping, drain dips, or ditch relief culverts	Near- to Mid-term	Areas prone to landslides and flooding (e.g., elevation bands with current or projected high rain-on-snow incidence)	Project level
Decommission un-needed or unused roads	Near- to Mid-term	Roads near aquatic and wildlife habitat (cross-division opportunities)	Project level
Update road stream crossings to facilitate Aquatic Organism Passage (AOP) and to accommodate 100-year flood events and large woody debris[3]	Near- to Mid-term	Roads near key aquatic species habitat	Program level

Management Goal:
Lower human-caused sedimentation rates to reduce impacts on aquatic systems

Goal Vulnerabilities:
Extreme precipitation events; higher peak flows; more frequent and severe fire

Adaptation Strategy:
Reduce human-caused erosion

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Decommission un-needed roads, install larger culverts, and/or convert roads to low water crossings	Near-term	Post-salvage areas (NEPA), Burned Area Emergency Response (BAER) areas, crossings with undersized culverts, all burned areas	Project, Program, Forest Plan, and National level
Examine culvert size in climatically vulnerable watersheds	Mid-term	Across landscape	Program level
"Rock in" low water crossings	Mid-term	Post-salvage areas (NEPA), BAER areas, crossings with undersized culverts, all burned areas	Program level

Adaptation Actions for Vegetation

Management Goal:
Create landscape-scale Wildland Urban Interface (WUI) on landscape with complex topography and dense forest dependent species

Goal Vulnerabilities:
Longer fire season & higher severity fire; reduced soil moisture; increased sedimentation and erosion

Adaptation Strategy:
Increase forest resilience to fire and drought while protecting dense forest species

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Mechanically thin in non-controversial areas	Near-term	Areas with less than 35% slope and outside of Protected Activity Centers (PACs)	Project level
Use prescribed fire in areas that were mechanically thinned and/or areas that are inaccessible	Mid-term	Areas with greater than 35% slope and low fuel content (e.g., ridge tops), and/or in mechanically thinned stands 3(+) years post-treatment	Project level
Practice sequential thinning of PACs to reduce fuels and protect dense forest habitat from fire and drought	Long-term	PACs; use Strategically Placed Land Area Treatments (SPLATS) to create effective treatments	Program level (e.g., adjust LRMP)

Management Goal:
Increase landscape resilience to fire & disturbance

Goal Vulnerabilities:
Increased temperature and fire; altered precipitation; decreased snowpack

Adaptation Strategy:
Increase landscape and stand heterogeneity

Specific Adaptation Action	Implementation Timeframe	Action Application Areas	Implementation Scale
Create and maintain variable density through thinning, opening creation, and selective plantings from different seed zones	Near-term	Eastside pine forests; accessible areas; south-facing slopes with less than traditional basal area	Project level
Increase use of prescribed fire; use broader prescription windows and larger landscape areas	Near- to Mid-term	Areas with little pine regeneration or where pine regeneration is desired; areas without structures/homes; south-facing slopes; test/demonstration plots to inform management	Project and Program level

Management Goal:
Restore fire on the landscape, especially in forest and meadow ecosystems

Goal Vulnerabilities:
Decreased snowpack, earlier runoff, and drier conditions increase risk of high intensity fire

Adaptation Strategy:
Increase resilience of forests & meadows to climate change

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Thin vegetation to create conditions that allow fire to enter ecosystems without detrimental results (i.e., stand-replacing fire)	Near- to Mid-term	Every project involving forest vegetation, and some meadows	Project level
Use prescribed fire on a larger scale (try to burn more acres more frequently, rather than patchy, small acreages currently burned)	Near-term	Start with favorable areas, but have landscape-scale management as goal	Project, Program, and Forest Plan level
Modify Forest and Land Resource Management Plans (LRMP) to allow use of natural ignitions to treat landscape with fire	Mid-term	Amend Forest Plans and LRMPs	Forest Plan level

Management Goal:
Maintain gray pine

Goal Vulnerabilities:
Not stated

Adaptation Strategy:
Ensure resilience of gray pine to climate change

Specific Adaptation Action	Implementation Timeframe	Action Application Areas	Implementation Scale
Prune and thin to increase drought resistance	Near-term	Accessible lower elevation Forest Service lands; pursue grants to work with private landowners	Project level
Prevent invasive species movement via firewood transport through public education and outreach	Near-term	Recreational sites across various ownerships; public education and outreach on all Forest Service Lands	Project and Program level
Plan for assisted migration of gray pine	Near-term	Lower elevation Forest Service lands	Forest Plan level

Management Goal:
Maintain and increase red fir populations at the landscape level

Goal Vulnerabilities:
Not stated

Adaptation Strategy:
Enhance red fir resilience to climate change, increased fire, and disease potential while increasing population percentages of all species to historic levels

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Thin encroaching species (target white fir) and maintain other lesser compositional species (sugar pine, Jeffery pine, cedar, western white pine, hemlock)	Near-term	Areas with encroaching white fir	Project level (optimistically watershed-scale)
Eliminate cytospera-infected trees	Mid-term	Where infected trees occur (very specific areas)	Project level
Increase fire resilience by designing fuel buffers and removing surface fuels (mechanically or through prescribed fire)	Mid- to Long-term	Healthy stands with success potential	Project level (within a watershed)

Adaptation Actions for Wet Meadows and Fens and Range Management

Management Goal:
Maintain and restore fen habitat in the Sierra Nevada

Goal Vulnerabilities:
Tree and shrub encroachment; high intensity fire; drier conditions may drive cows into fens, decrease groundwater recharge, and reduce extent of perennially saturated soils

Adaptation Strategy:
Increase resilience of fens under climate change

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Restore fen hydrology by plugging incised channels, performing headcuts & collaborating with hydrologists to design other beneficial management options	Near-term	Fens with altered hydrology	Project level
Thin surrounding forest to promote low intensity fire, increase water yield, and reduce fen isolation while maintaining snags for downed woody debris recruitment in fens	Near- to Mid-term	Around all fens	Project level
Evaluate grazing intensities & densities within fens experiencing hoof punch impacts & consider fenced exclosures (adaptive management)	Mid-term	Fens with high hoof punch cover	Project level (allotment scale)

Management Goal:
Maintain and increase wet meadow mature vegetation species and decrease invasive species (conifers, sagebrush)

Goal Vulnerabilities:
Drying conditions and/or drought may favor invasive or competitor species establishment

Adaptation Strategy:
Use range management to help restore meadows and increase meadow resilience to climate change impacts

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Increase grazing distribution into uplands (i.e., away from wet meadows)	Near-term	All allotments, but prioritize grazing re-distribution away from allotments with low or degraded meadow condition	Project and Program level (amend management plans)
Provide alternative livestock water sources away from meadow areas	Near- to Mid-term	Where suitable range occurs, in reasonable proximity to forage, and in areas that provide reasonable access for cows	Project level (Allotment Management Plan – AMP)
Fence priority sensitive wet meadow areas[4] (e.g., categorical exclusion) to control livestock use and impacts	Near- to Mid-term	Areas where other actions have not met goals or objectives	Project level (AMP and Annual Operating Instructions - AOI)

[4] Some sensitive wet meadow areas have been identified (usually as a result of sensitive species occupancy; e.g., snails, frogs), but participants suggested that it may be beneficial to do a new sensitivity analysis based on climate vulnerability. In addition, participants suggested that all wetlands be monitored for grazing and climate impacts, and thresholds be established to trigger categorical livestock exclusion.

Adaptation Actions for Wildlife

Management Goal:
Maintain and/or increase wildlife habitat resilience and connectivity

Goal Vulnerabilities:
Not stated

Adaptation Strategy:
Increase habitat connectivity for wildlife species

Specific Adaptation Actions	Implementation Timeframe	Action Application	Implementation Scale
Increase road closures in specific areas	Near-term	Highly roaded areas	Project level
Create habitat corridors through reforestation or restoration	Mid-term	Areas that connect isolated habitats with backcountry unroaded areas	Program level
Protect/maintain/enhance current wildlife corridor areas	Near-term	Various plans	Forest Plan level

Management Goal:
Maintain and/or increase wildlife habitat resilience and connectivity

Goal Vulnerabilities:
Not stated

Adaptation Strategy:
Enhance population resiliency and resistance to invasive species

Specific Adaptation Actions	Implementation Timeframe	Action Application	Implementation Scale
Remove non-native, competitive, and invasive species	Near-term	Sites with high population of native species	Project level
Improve habitat conditions outside of core population areas to facilitate native population migration	Mid-term	Areas adjacent to current population locations	Program level
Introduce focal native species into new treated/prepared habitat locations	Long-term	Prepared areas outside of current range	Forest Plan level
Reduce and remove non-climate stressors and threats	Long-term	Across species range	Forest Plan level

Management Goal: Restore/maintain wildlife habitat connectivity and values

Goal Vulnerabilities: Shifting temperatures and soil moisture potentially leading to vegetation conversions; changing fire regimes

Adaptation Strategy: Restore forested lands in burned areas to make forest and wildlife habitat more resilient to projected future conditions

Specific Adaptation Actions	Implementation Timeframe	Action Application	Implementation Scale
Select climatically-favorable species (drought-tolerant, shade-intolerant species such as pines) in post-fire reforestation projects	Near	Burned areas	Project level
Select reforestation locations that are conducive for selected plant species establishment and growth	Near	Burned areas with greater soil moisture and soil depth in anticipation of decreased moisture	Project level
In reforestation site preparation, leave more downed woody debris to create favorable microclimates for planting and help reduce erosion during extreme precipitation events	Near	Selected reforestation sites within burned areas (e.g., those at increased risk of reduced soil moisture and/or increased soil erosion)	Project level

Adaptation Actions for Recreation

Management Goal: Provide high-quality, developed recreation sites

Goal Vulnerabilities: Altered precipitation; reduced snowpack; altered surface water availability

Adaptation Strategy: Maintain developed recreation opportunities with less water availability

Specific Adaptation Actions	Implementation Timeframe	Action Application Areas	Implementation Scale
Increase use of "dry" campgrounds[5]	Near-term	Remote and less used sites; sites near alternative water sources	Project and Program level
Replace surface water with ground water	Mid-term	High use sites and larger sites	Project and Program level
Remove completely dry campgrounds	Mid- to Long-term	Smaller, low-use sites; areas without recreational residences	Project and Program level
Increase water conservation education	Near-term	All USFS areas and campgrounds; prioritize in outreach programs	Program level

[5] Participants noted that it would be important to maintain and/or generate lists of which campgrounds are vulnerable to reduced surface water supply, and to use those lists to inform adaptive management actions.