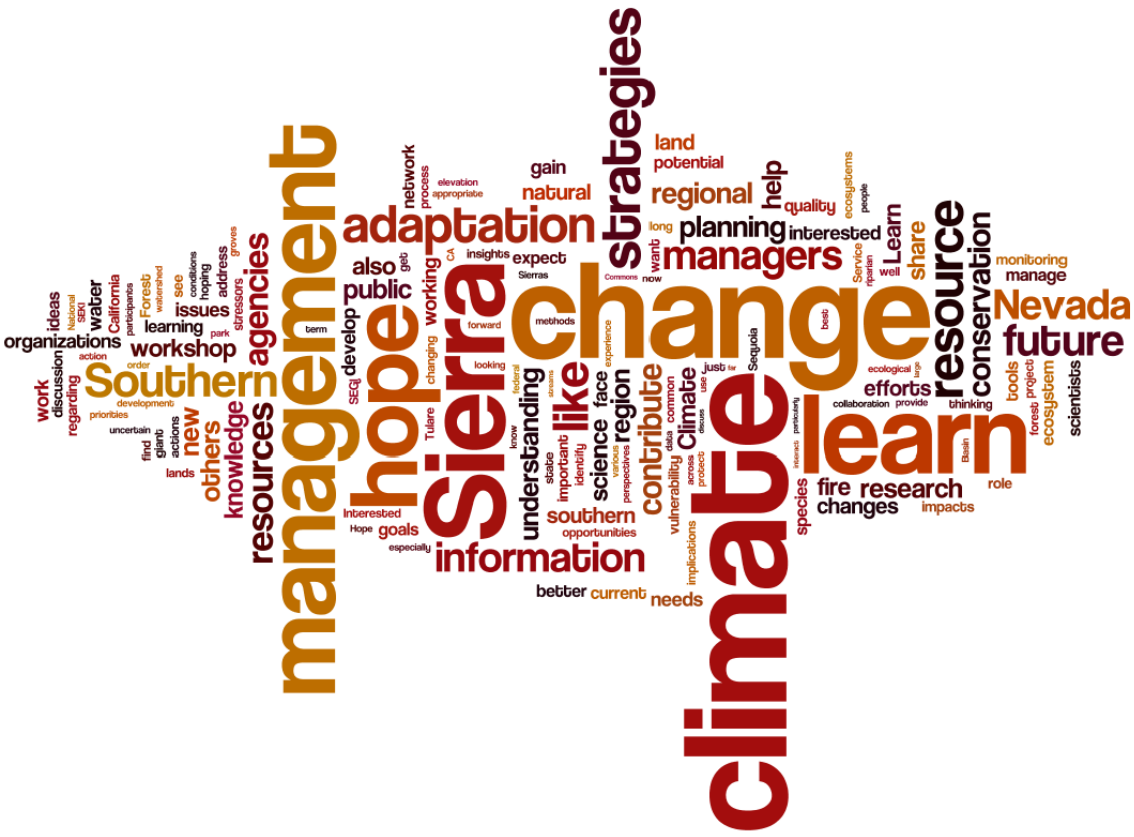
Southern Sierra Change Adaptation Workshop – Final Report Appendix



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Contents

Agenda

AGENDA - SOUTHERN SIERRA CHANGE ADAPTATION WORKSHOP

February 20-22, 2013 - Visalia, CA

Wednesday, February 20 – Charter Oak Ballroom – Visalia Convention Center

7:30 am	*Registration opens and coffee available. All registrants check in.*	
SESSION I – INTRODUCTION *What do we know?*		
8:30 am	Welcome: workshop purpose, agenda, desired products	Charisse Sydoriak, Chief of Resource Management & Science, Sequoia & Kings Canyon National Parks (SEKI)
8:45 am	Line officer introductions & welcome	Karen Taylor-Goodrich, Superintendent, SEKI & John Exline, Acting Forest Supervisor, Sierra NF
Keynote Presentations – What Do We Know?		
9:00 am	Agents of Change	Dr. Nate Stephenson, Research Ecologist, USGS
9:40 am	Natural Resources	Dr. John Battles, Professor, UC Berkeley
10:20 am	*30 minute break*	
10:50 am	Human Imperatives Panel: Social Trends, Ecosystem Services, and Ecology	Drs. Deb Whitall, Social Scientist; Sonja Lin, Social Scientist; Mark Metcalfe, Economist; Joanne Fites-Kaufman, Ecologist - USFS Region 5
11:45 am	Change Adaptation Framework	Dr. Koren Nydick, Science Coordinator, and Eric Winford, Projects Facilitator - SEKI
12 noon	*Lunch on your own (see map of restaurants)*	
SESSION II – SHARED CONSERVATION VALUES *What do we really care about (value)?*		
1:30 pm	Session Introduction	Charisse Sydoriak and Dr. Deb Whitall
1:45 pm	Governance Perspectives (Panel)	BLM, USFS, NPS, State representatives
2:05 pm	Exercise Introduction	Charisse Sydoriak
2:20 pm	Shared Values Exercise	*All participants in work groups at their tables.*
4:00 pm	Selected Groups Report Out	*Self-directed 20 minute break at 3 pm. All groups turn in results at session's end.*
4:40 pm	Shared Values Discussion	Moderator: Dr. Deb Whitall
EVENING SESSION: POSTERS & COLLABORATION STATIONS		
5 - 8 pm	Poster & Collaboration Station Session – *Appetizers and no-host bar provided by Sequoia Natural History Association (SNHA)*	
5:30 - 7:30 pm	Poster & Collaboration Station core hours – Hosts please try to be available for some of this time	
9 pm	Poster session room closes	

Thursday, February 21 – Charter Oak Ballroom – Visalia Convention Center

7:30 am	*Registration opens and coffee available. Please check in if you did not yesterday.*	
SESSION III – VULNERABILITY *How can we determine the vulnerabilities of shared conservation values?*		
Please sit at a table for your selected "critical attribute".		
8:30 am	Vulnerability Assessments: Components and Overview	Danielle LaRock, CA LCC & USFWS National Conservation Training Center
9:00 am	Watershed Hydrology	Dr. Joshua Viers, UC Davis
9:20 am	Meadows/Wetlands	Dr. Matt Brooks, Research Botanist, USGS
9:40 am	Oak Woodlands	Susan Antenen, Conservation Biology Institute

AGENDA - SOUTHERN SIERRA CHANGE ADAPTATION WORKSHOP

February 20-22, 2013 - Visalia, CA

10:00 am	Forests		Dr. Mark Schwartz, UC Davis
10:20 am	*20 minute break*		
10:40 am	Pacific Fishers		Dr. Wayne Spencer, Conservation Biology Inst.
11:00 am	Birds		Dr. Rodney Siegel, Institute for Bird Populationss
11:20 am	Vulnerability Mini-Exercise		All participants in work groups at their tables. *Bring your notes to the strategies session.*
12 noon	*Lunch on your own (see map of restaurants)*		
SESSION IV – STRATEGIES, CONSTRAINTS, & MANAGEMENT TOOLS *What can we really DO to prepare for rapid change and an uncertain future?*			
1:30 pm	Change Adaptation Strategies		Dr. Hugh Safford, Regional Ecologist, USFS Pacific SW Region
1:50 pm	Climate Change Adaptation Strategies in Water Management		Michelle Selmon, Climate Change Specialist, CA Dept of Water Resources
2:10 pm	Alternative Futures for Fire Mgmt.		Dr. Koren Nydick, Science Coordinator, SEKI
2:30 pm	Exercise Instructions & Rm Assignments		Eric Winford, Project Facilitator, SEKI
2:40 pm	*20 minute break*		
3:00 pm	Strategies Exercise - All participants in work groups in different rooms		
Room assignments & facilitators	Watershed/River/Riparian	San Joaquin-A	Danielle LaRock & Deb Schlafmann, CA-LCC
	Meadow/Wetland	San Joaquin-B	Dr. Matt Brooks, USGS & Sylvia Haultain, NPS
	Oak Woodland	Charter Oak-A	Denis Kearns, BLM & Eric Winford, NPS
	Mixed Conifer/Fisher/Owl	Charter Oak-E	Mark Schwartz, UC Davis & Hugh Safford, USFS
	Giant Sequoia	San Joaquin-C	Nate Stephenson, USGS & Vance Russell, NFF
	High-Elev. 5 Needle Pines	San Joaquin-D	John Battles, UC Berkeley & Jonny Nesmith, NPS
5:00 pm (–ish)	*Work groups adjourn and are ready to present results to the plenary at 9 am the next day. Turn in all electronic and hard copy notes to the facilitator.*		

Friday, February 22 - Charter Oak Ballroom – Visalia Convention Center

7:30 am	*Registration opens and coffee available. Please check In if you have not yet.*	
SESSION IV – STRATEGIES continued from yesterday		
8:00-9:00 am	Extra time for work groups to finish note taking and prepare presentation	Work groups in different rooms. Return to plenary room by 9 am.
9:00 am	Work group presentations	Moderator: Dr. Koren Nydick
10:00 am	*30 minute break*	
SESSION V – CONCLUSIONS & NEXT STEPS *What's Next?*		
10:30 am	Session Introduction	John Exline
10:40 am	Conservation Valuing – Final Exercise	Charisse Sydoriak (plus many facilitators)
11:10 am	Managing for Desired Change When Uncertainty is the Only Certainty	Dr. Debra Schlafmann, Coordinator, California Landscape Conservation Cooperative (CA-LCC)
11:30 am	What's Next? Open Dialog	Deb Whitall, John Exline, and Charisse Sydoriak
11:50 am	Federal Line Officers' Panel	Moderator: Charisse Sydoriak
12:20 pm	Parting thoughts	Charisse Sydoriak & John Exline
12:30 pm	*Workshop Adjourns*	

Contributions and Acknowledgements

The following sponsors contributed funding and staff time to make this workshop a reality.

- **California Landscape Conservation Cooperative** paid for the rental of the convention center.
- **Sequoia Natural History Association** paid for the appetizers and no-host bar for the poster session.
- **Sequoia & Kings Canyon National Parks** paid for creation, layout, and printing of the workshop booklet.
- **BLM – Bakersfield Office** contributed supplies, including hand-built easels, name tags, etc.
- **California Fire Science Consortium** hosted the workshop website.
- **NPS Climate Change Response Program** sponsored a *George Melendez Wright Climate Change Intern* (Katy Cummings) who co-wrote the information briefs.

The following individuals contributed considerable time and effort to design and carry out the workshop. These people are your workshop hosts.

(Listed in alphabetical order by first name)

Name	Affiliation	Program Committee	Logistics Committee
Anne Pfaff	USGS Western Ecological Research Center, Sequoia-Kings Field Stn		X
Annie Esperanza	NPS Sequoia & Kings Canyon National Parks		X
Bill Kuhn	NPS Yosemite National Park	X	
Charisse Sydoriak	NPS Sequoia & Kings Canyon National Parks	X	
Colleen Bathe	NPS Sequoia & Kings Canyon National Parks	X	
Danielle LaRock	CA Landscape Conservation Cooperative & USFWS Training Center	X	
Denis Kearns	BLM Bakersfield Field Office	X	X
Eric Winford	NPS Sequoia & Kings Canyon National Parks	X	
John Exline	USFS Sequoia National Forest & Giant Sequoia National Monument	X	
Katy Cummings	NPS Sequoia & Kings Canyon National Parks		X
Koren Nydick	NPS Sequoia & Kings Canyon National Parks	X	X
Marc Meyer	USFS Region 5	X	
Maria Ulloa	USFS Sequoia National Forest & Giant Sequoia National Monument	X	
Nate Stephenson	USGS Western Ecological Research Center, Sequoia-Kings Field Stn	X	
Rebecca Fris	CA Landscape Conservation Cooperative	X	X
Savanna Boiano	Sequoia Natural History Association		X

Session 2 – What do we really care about?

Change Adaptation Planning Template (CAPT)

DISCLAIMER: The terms and definitions used in this template are provided for the purpose of facilitating dialog at a workshop about shared conservation values in the southern Sierra Nevada. The terms and definitions provided (separate handout) do not represent the official position of any agency, organization, or individual. The intent is simply to create a common vocabulary for a conservation valuing exercise. This version of the "Change Adaptation Planning Template" (CAPT) only looks at current objectives (future objectives are captured later) to establish a baseline for dialog.

Change Adaptation Planning Template (CAPT)

Organization	Mission Statement						DESCRIBE THE RATIONALE FOR THE CRITICAL ATTRIBUTES AND OBJECTIVES THAT YOUR GROUP SELECTS
Parent	The mission of ….						
Unit	The mission of ….						
	What do we really care about (VALUE)?						
	GOALS	Fundamentals	Defining Features	Critical Attributes	Current Objectives	Relative Priority	Current Values
	Ecological Goals:	Ecosystems: Composition and Structure					
			Soils				
			Geomorphology	Landform/topography			
				Geology			
		Ecosystem Functionality (Maintenance Processes)	Weather & Climate	Temperature			
				Precipitation			
				Snowpack			
				Drought			WHAT CRITERIA DID THE GROUP USE TO PRIORITIZE THEIR TOP PRIORITIES FOR REGIONAL SCALE CONSERVATION CHANGE ADAPTATION PLANNING?
				Storm Events			
			Fire				
			Biogeochemical	Physical, chemical, and biotic processes			
				Nitrogen cycle			
				Carbon cycle			
			Air	Quality	Meets regulatory standards		
				Visibility			
			Hydrologic Cycle	Timing			
				Quantity			
				Quality	Meets regulatory standards		
			Geomorpho-logical	Erosion &mass wasting			
				Fluvial processes			
							LIST THE TOP 3 CRITICAL ATTRIBUTES AND THE CRITERIA YOU USED IF YOUR PERSONAL OPINION DIFFERS FROM THE GROUPS COLLECTIVE CHOICES

What do we really care about (VALUE)?						DESCRIBE THE RATIONALE FOR THE CRITICAL ATTRIBUTES AND OBJECTIVES THAT YOUR GROUP SELECTS
GOALS	Fundamentals	Defining Features	Critical Attributes	Current Objectives	Relative Priority	
Human Dimension Goals:	Opportunity	Experiential	Present Generations			Current Values
			Future Generations			
		Recreational	Wilderness	Minimize alterations of the community of life (untrammelled)		
				Maximize natural qualities		
				Minimize developments for any purpose (Undeveloped)		
				Provide opportunities for solitude & primitive experience		
				Allow commercially supported recreation to the "extent necessary"		
			hunting and fishing			
			snow play			
			camping and hiking			
		Educational				
	Culture	Diversity	race and gender			
			experience			
			tradition			
			perspective			
		Cultural Legacy	tribal			
			prehistoric			
			historic			
			ethnic			
	Community Capacity	People	skills			WHAT CRITERIA DID THE GROUP USE TO PRIORITIZE THEIR TOP PRIORITIES FOR REGIONAL SCALE CONSERVATION CHANGE ADAPTATION PLANNING?
			education			
			health and safety			
		Economy	public services			
			employment opp.			
			business opp.			
			housing			
			personal income			
		Politics/ Government	democratic principles			
			environmental justice			
			governance			
		Physical Infrastructure	Transportation			
			Water & Sewer			
			Communications			
			Energy Systems			
						LIST THE TOP 3 CRITICAL ATTRIBUTES AND THE CRITERIA YOU USED IF YOUR PERSONAL OPINION DIFFERS FROM THE GROUPS

Participant Responses

CRITICAL ATTRIBUTE CHOICES – SESSION 2

Table 1

1. Biodiversity
2. Fire Process
3. Hydrologic Process

Criteria for decision: 1) Coordinated regional effort, 2) benefits the most stakeholders and public interest, 3) potential for management action, 4) ramifications beyond ecoregion, 5) vulnerability/risk of defining feature

Table 2

1. Mixed Conifer
2. Water
3. Meadows/aquatic fauna

Criteria for decision: 1) Potential for management action, 2) scale of effect (how much land, people, cross-jurisdiction)

Table 3

Public scrutiny – major criteria

1. Giant Sequoia (serves human and ecologic goals)
2. Ecological Integrity
3. Human Element

Table 4

1. Natural Fire regime (resistance and resilience through fire regime management; forest heterogeneity)
2. Hydrologic regime – healthy trout streams (preserve water at high elevations)
3. Public trust (education, awareness, communication, early land stewardship)

Criteria used: 1) Cross regional, 2) fixable, 3) would benefit multiple attributes

Table 5

1. Biodiversity
2. Functioning riparian ecosystems
3. Economic Integrity and Sustainability of local communities

Table 6

1. Hydrologic Processes
2. Youth
3. Stewardship

Criteria: relevance-with the local communities

Table 7

1. Water
2. Ecosystem diversity (within and between)
3. Well informed electorate

Criteria used: economic/human values, intact landscape, measurability, public support

Table 8

1. Forests – especially mixed conifer
2. Fire -
3. Water –

Criteria: 1st tier: 1) How well it supports broad objective of maintaining biodiversity, 2) provides ecosystem services. 2nd tier: 1) Econimic value, 2) interconnects multiple values, 3) dominant in terms of area, 4) human iconic value. 3rd tier: 1) human health

Table 9

1. Mixed Conifer-Giant Sequoia Forest
2. Social Connectivity
3. Hydrologic Processes

Criteria used: 1) Broad features that capture multiple attributes, 2) ability to monitor or measure, 3) emphasis on opportunities to connect with the public – relevance!

Table 10

1. Mixed Conifer Forests
2. Aquatic and wetland ecosystems
3. Human connections to the environment

Criteria used: fixable, public desire, ramifications and economy, at risk, coordinated regional effort/ x-bound, scale of # people it will effect, potential for management action,

Table 11

1. Hydrology
2. Recreation/Education
3. Native Biodiversity

Criteria used: What is important we won't necessarily be mandated to monitor/manage, balance ecological and human feasibility (management action), demonstrable value (SEGI as charismatic), not too specific (give options and flexibility), number people affected/size of landscape (water, especially)

Table 12

1. Water quantity
2. Alpine Flora and Fauna
3. Iconic Places

Dollar, greatest value

Table 13

1. Water quality and quantity, and timing
2. Species of concern (SEGI are culturally important)
3. Forest integrity

Criteria used: socioeconomic components

Table 14

"RER"

1. Wetland Ecosystems Restoration
2. Natural Resource education and outreach to Central valley youth
3. Biodiversity research and monitoring

Criteria used: Reflect a broader management perspective to benefit as many critical attributes we could think of. Connect ecosystems, society, and the economy. Wetlands improve water quality, provide critical habitat for many species, increase water quantity, etc. Public support is necessary so our initiatives will succeed (focus on sequoias or something the public already cares about). Biodiversity increases resilience, genetic diversity, number of interesting features for recreational users, and ecosystem function.

Table 15

1. Connecting people to the landscape (engaged public)
2. Fire regimes
3. Aquatic systems

Table 16

1. Hydrologic function
2. Complex old forests
3. Experiential opportunities

Criteria used: 1) Water is the life blood of ecosystems and society and is a defining element in ecosystems. Transcend political boundaries. Is affected and affects many things. 2) Old forests are uncommon communities that have high biodiversity and are critical habitat for many of its species. Transcend political boundaries. High social value. 3) Maintain public support – stewardship. All) Provides a wide range of experiential opportunities, seemsless experience and separate competing or non-compatible activities

Table 17

1. Connections to place
2. Habitat connectivity
3. Adequate water supply – quantity

Table 18

1. Hydrologic Function
2. Connections to people and the resource
3. Habitat connectivity

Criteria: Relevant at a regional level

Table 19

1. Fire Regime
2. Native biodiversity
3. Water quantity

*Criteria: public perception – the public understand and appreciates water. Fire is an economical restoration tool. Native biodiversity is an indication of a healthy ecosystem. *Public perception, sense of stewardship, economical realities.*

Table 20

1. Ecosystem integrity
2. Recreation
3. Watershed function (hydrologic – water quality, quantity)

Overall Themes/Suggestions/Notes:

Experiential opportunities
Interconnections, cross boundaries, high social values
Lessons learned
Need to drill down
Definition
Tendency to move to strategy
Start with objectives and then work up –
Maintaining relevance to larger communities
Take care not to be too limited in identifying values. Iterative – talk to the public to many times.
Terms are an issue. Use a language the public uses.
Not enough time.
We converged – the good news.
Collecting information (measure water discharge) we can agree to.
List the attributes only and they give monopoly board
Continue to look for stretching the money in any and every way possible.

Session 3 – Vulnerabilities

Vulnerabilities Exercise Blank Worksheet

SESSION 3: VULNERABLITY MINI-EXERCISE

Defining Feature or Critical Attribute _____ Table # _____

Names (optional)_____

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1) What are the critical components of vulnerability for the "defining feature" or "critical attribute" in the southern Sierra? Do not try to be exhaustive. Focus on what you consider to be the most important agents of change/stressors and the factors that make the resource exposed, sensitive, and adaptive.

Exposure (stressors)	Sensitivity	Adaptive Capacity

2) **Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).**

3) **If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).**

Vulnerabilities Exercise Participant Responses

The following sheets are a combination of all tables for the resource group combined into one document. Table number is shown by a "T" and the number, or a "?" if the group did not record which table they were sitting at. Similar responses are grouped under a **bold** heading, and responses were tallied to get a most-mentioned characteristic ranking.

Watersheds and Rivers

Exposure (stressors)	Sensitivity	Adaptive Capacity

Other Land Use (3/4)
• Site specific human Impacts (T?)
• Land Use
  ○ Development (T22)
• Land use practices (T16)
 	
Changes in Flow (Climatic) (3/4)
• More variable winter flows (T6)
• Peak flow shifting to earlier times (T6)
• Decreased mean annual flow (T6)
• Supply/Flow Regime (T22)
• Changing hydrologic conditions (T16)
• Earlier and prolonged low flows (includes conversion of perennial to intermittent) (T6)
 	
Fire (3/4)
• Fire (catastrophic)
  ○ Canopy loss
  ○ Erosion (T22)
• Fire (T16)
• Fire (T6)
 	
Dams/Diversions (2/4)
• Anthropogenic – impacts of changing hydrologic flow (T?)
• Loss of habitat due to water diversion (T6)
• Dams, diversion, impoundments, and other developments (T6)
 	
Extreme Weather Events – Floods (2/4)
• Extreme weather events – flood, drought (T?)
• Rain-on-snow flood events (T6)
• Precipitation increased in intensity but less events (T6)
 	
Increased Moisture Stress - Droughts (2/4)
• Extreme weather events – flood, drought (T?)
 	
Recreational Use (2/4)
• Recreation (T16)
• Cumulative effects (OHV, etc) (T16)
 	
Agriculture
• Agriculture and traditional lifestyles T6)
 	
Fragmentation
• Land Use
	Geological Characteristics (3/4)
	• Geology (e.g. bedrock can be deficit or benefit) (T22)
	• Stream bank stability (T22)
	• Geological characteristics (T6)
	• Soils (T?)
	
	Stream Characteristics (2/4)
	• Landscape characteristics (T6)
	• Sensitivity of alluvial habitat (T22)
	• Discharge (T22)
	• Type of stream class (T22)
	• Temperature
	• Discharge (T22)
	
	Sensitivity of Individual Species
	• Individual species (golden trout; amphibians) have narrow tolerances and limited dispersal ability (high sensitivity) (T16)
	
	Sensitivity of Ecosystem Cycles
	• Ecosystems and cycling (nutrients, water, energy) can be perturbed (moderate sensitivity) (T16)
		Management Changes (2/4)
		• Change land use practice (T16)
		• Restore habitats (T16)
		• Potential for conversion to different types of ag (T6)
		• Potential for people to reduce consumption (modify infrastructure) (T6)
		• Ability to regulate flows by utilizing existing infrastructure (T6)
		• Change flow regime (T16)
		
		Ability to Recover from Change (2/4)
		• Dynamic nature of rivers and streams (T22
		• Riparian systems bounce back (T16)
		
		Biodiversity
		• Can be productive (productivity and diversity of riparian systems) (T22)
		
		Forest/Vegetation Structure
		• Forest Structure (T22)
		• % Vegetation Cover (T22
		
		Location
		• Higher elevation in southern Sierras allows for more snowpack (T6)

• Fragmentation of Habitat (T22) **Grazing** • Grazing (T16) **Human Water Use** • Population growth and associated resource demand (T6) **Lack of Information** • Indicators largely modified (low sensitivity) (T16) • Few benchmarks (low sensitivity) (T16) **Marijuana Grow Sites** • Illegal grow sites (T6) **Non-Native Species** • Non-native species (T22) **Pollution** • Nutrification o Atmospheric deposition (T22) **River Management** • River regulation (T16) **Roads** • Land Use o Runoff from roads (T22) **Soil Erosion/Loss** • Loss of soil structure and saturation (T?) **Vegetation/Habitat Change** • Vegetation change (T6)		

2) **Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).**
   - Managing for healthy ecosystems – yes, this objective is still feasible because healthy ecosystems/watersheds/riparian and wetland ecosystems help maintain water supply and quality (T6)

   - Maintain golden trout → Yes & No
     - Land use change possible
       - But thermal regime may compromise efforts
   - Maintain native biodiversity → Yes & No
     - In some places through active management
   - Maintain water supply → Yes
     - But with consequences for lower river (T16)

- Objective of keeping lakes and streams free of pollution is challenging because of factors beyond our control
- Maintaining water quality standards is feasible through current approaches
- Maintaining T & E species may need to be retrofitted
    - Protect/restore intact native riparian veg to preserve high quality stream functions (T22)

3) If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).

- Possible new objectives:
    - Managing hydrograph
    - Influencing resource use (e.g. through education) (T6)

- Maintain flows (regime) instead of species
- Accept poor water quality for some constituents (temperature) where management difficult (T16)

- For maintaining T & E species, focus on long-term benefit to benefit a suite of species vs a single species. Accept short-term impacts to improve long-term conditions
- Prioritize highly vulnerable watersheds to protect/restore stream functions (T22)

Most mentioned current objectives:

- Maintaining T&E species (67% of groups; 2 groups)

Most mentioned retrofitted objectives:

- Manage overall habitat characteristics instead of single species (67%; 2 groups)

Overall themes regarding objectives:

- Prioritizing and accepting losses in other areas
- Managing on an ecosystem scale instead of managing with specific species in mind
- Incorporating the public into management – influence resource use through education

Wetland Meadows

Exposure (stressors)	Sensitivity	Adaptive Capacity
Change in Flow (Anthropogenic)(2/2) • Altered hydrograph/flow regimes (T20) • Anthropogenic impacts of **changing hydrology**, roads, trails, **groundwater pumping** (T?) • Historic restoration management/practice (stream alteration, dams, etc.) (T20) • Timing and duration of hydrology (T?) • Change in meadow hydrology (T?) • Loss of hydrologic recharge (T20) • Dewatering of critical habitat (T?) • Loss of floodplain connectivity (T20) **Change in Flow (Climatic)(2/2)** • Timing and duration of hydrology (T?) • Change in meadow hydrology (T?) • Loss of hydrologic recharge (T20) • Dewatering of critical habitat (T?) • Altered hydrograph/flow regimes (T20) • Loss of floodplain connectivity (T20) **Fire (2/2)** • Fire suppression (T20) • Fire regimes (T?) **Non-Native Species (2/2)** • Invasive species (T20) • Invasive species (T?) **Other Land Use (2/2)** • Land use (T?) • Historic use (misplaced roads and railroad grades, grazing) (T20) • Logging (T20) **Pollution (2/2)** • Contaminants (T20) • Nutrients/pollutants (T?) **Recreational Use (2/2)** • Recreation (T?) • Anthropogenic impacts of changing hydrology, roads**, trails**, groundwater pumping (T?) • Off-highway vehicles (T20) • Compaction (**trampling**, grazing) (T20) • Development (campgrounds, roads, trails, etc.) (T20) **Roads (2/2)** • Development (campgrounds, roads, trails, etc.) (T20) • Anthropogenic impacts of changing hydrology,	**Meadow structure (2/2)** • Meadow type (dry, sedge, hydro signif) (T20) • Elevational gradient (T20) • Meadow gradient (T20) • Vegetative structure (T?) **Location of meadow** • Proximity to contaminant source (N-S, wind direction, etc.) (T20) **Rare species presence** • Meadows w/ rare species (ex: toads, frogs, etc.) (T20)	**Biodiversity (2/2)** • Biodiversity (T20) • A lot of species (T?) • Diversity of meadow types (T?) • Biodiversity (T?) **Change in management (2/2)** • Management actions (T?) • Management styles (T20) **Hydrologic function** • Hydrologic function (T20)

roads, trails, groundwater pumping (T?) **Biodiversity Loss** • Species loss (T?) **Fragmentation** • Fragmentation effects on fauna (T20) **General Climate Change** • Climate change (T?) **Grazing** • Compaction (trampling, grazing) (T20) **Soil Erosion/Loss** • Soil loss (organic) (T?) • Loss soil saturation timing (T?) **Vegetation/Habitat Change** • Significant alteration to wildlife habitat (T?)		

2) Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).

1. Amount of use
    a. Lade (??) of grazing at certain times
    b. Monitoring

    { Feasible, may need modification
2. Restoration – depends if cultural or natural signif.
3. Maintain current species composition – NO!
4. Retain water storage capacity (T20)

3) If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).

1) Adaptable schedule/permission of use/type
2) Allow for adaptation and species failure
    a. Designate refugia areas (ex: graze-free zones)
    b. Ensure done in appropriate areas where paleo record indicates persistence
    c. Improve water storage capacity/mitigation
3) Need to manage for reasonable spp. Representation based on climate and paleoecologic representation (not historic) (T20)

Most mentioned current objectives (only one group answered):

- Amount of certain types of land use allowed, especially grazing
- Restoration
- Maintain current species composition
- Retain water storage capacity

Most mentioned retrofitted objectives (only one group answered):

- Change strategies under land use (esp. in regards to grazing)
- Change "maintain current species composition" to allow for adaption, species failure, and managing for reasonable species representation based on climate and paleo representation

No longer feasible objectives:

- Maintaining current species composition

Overall themes regarding objectives:

- Some of the objectives don't have to change, but how we accomplish them does
- Maintaining current species composition is not feasible under a changing climate. Also reflected in "need to manage for reasonable species, with representation based on climate and paleo records

Blue Oak Woodlands

Exposure (stressors)	Sensitivity	Adaptive Capacity

Grazing (2/2)
• Grazing(T13)
• Grazing
  ○ Seedling predation
  ○ Bare soil under oak trees
  ○ Invasive plants
  ○ Soil erosion (T15)
• Trampling of soil (T13)
 	
Human Encroachment (2/2)
• → Human development (T13)
• Human encroachment (T15)
 	
Increased Moisture Stress – Droughts (2/2)
• Drought (T13)
• Water loss (drawdown of water table, etc.) (T15)
 	
Pests and Pathogens (2/2)
• Pests/pathogens (T13)
• GSOB (T15)
• SOD (T15)
• Mistletoe and other parasites (low) (T15)
 	
Predation (2/2)
• Acorn predation (T13)
• Seedling/acorn predation (T15)
 	
Fire
• Change in fire regime (T15)
 	
General Climate Change
• Climate change (T15)
 	
Lack of Information
• Lack of information also sort of a stressor (T15)
 	
Non-Native Species
• Invasive species in understory (T15)
 	
Pollution
• Air pollution (?) (PM2.5, N, etc.; decreased photosynthesis, increased invasives (T15)
 	
Recreational Use
• Recreational use (visitors cutting live trees for fire wood) (T15)
	Location (2/2)
	• Oaks in marginal habitat (low elevations) (T15)
	• Private lands (T13)
	• Boundary lands (T13)
	• Ridge tops (T13)
	
	Low Recruitment
	• Low current recruitment (low small size classes) (T15)
	• No replacement (T15)
		Drought Adaptations
		• Adapted to drought
		  ○ Long tap roots (T15)
		• May do better (or at least not be as negatively affected) under warming (T15)
		
		High Dispersal
		• High dispersal through animals (T15)
		
		Management Changes
		• Acquire lands (T13)
		• State/federal grants (T13)
		
		Plasticity
		• Plasticity (T13)

2) **Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).**
   - FS Objective: Preserve oak woodlands. BUT little management implementation (not helping recruitment, no monitoring, grazing allowed)
     - Not feasible under listed vulnerabilities (the little management implementation part)
   - NPS Objective: Enhance recruitment to have stable populations; maintain native biodiversity
     - Feasible
   - BLM Objective: Maintain oak woodlands; facilitate recruitment
     - Feasible

Top 3:

1) Maintain woodlands
2) Facilitate recruitment
3) Maintain native biodiversity (not as feasible b/c so complicated, loss of birds, mammals, etc.) (T15)

- ~~Improve~~ Maintain oak regeneration, ~~not possible~~ too low currently
- Can we maintain diverse vegetation types? Should focus on blue oak woodlands
- Maintain native biodiversity: already invaded…depends on precipitation…some difference in forb diversity, an increase in Italian thistle with increase in canopy cover (T13)

3) **If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).**
   - Work more with private landowners to help encourage recruitment on private lands
   - Grazing should be more carefully addressed
   - Enhance/assisted dispersal outside current distribution
     - Experimental research on this
   - Fence saplings to protect them from predation
   - More extensive monitoring (determine current status, etc.)
   - Manage for soil health and topography, esp. in areas of potential future expansion (grazing was mentioned here as an issue)
   - Work more w/ ranchers and how they manage their land in the face of climate change, esp. in terms of forage
   - More research to ensure we know the key info for oak life history
   - Restore natural fire regime (T15)

- Improve oak regeneration, need to find where oak regeneration occurs

- Prevent invasion of new non-native (T13)

Most mentioned current objectives:

- Oak regeneration/recruitment (100%; 2 groups)
- Maintain native biodiversity (100%; 2 groups)

Most mentioned retrofitted objectives

- Improve oak regeneration (100%; 2 groups)

Overall themes regarding objectives

- Some current objectives don't need to be changed – but how we accomplish those does.
- Retrofitted objectives include working more with the public and private landowners of oaks
- Retrofitted objectives include monitoring objectives in order to get more information to inform good management activities.

Giant Sequoia Groves

Exposure (stressors)

Fire (5/5)
- Fire (T4)
  - Catastrophic fire
  - Available nutrients
  - Reduce competition (T14)
- Fire Regimes (T17)
- Altered fire regime and the effects on forest composition, structure, fuel loads, and fire behavior (T11)
- Fire suppression (seedling dynamics)
  - Too much shade, duff (T8)
- Climatic drought – high fire severity- stand-replacing fires (T8)

Increased Moisture Stress - Droughts (5/5)
- Drought (T4)
- Warmer temps (increased evap demand – moisture stress (T11)
- Direct drought effects on seedlings? (T8)
- Water
  - Available moisture for recruitment/ retention (T14)
- Climate change (water and temperature)
  - CWD (T17)
- Climatic drought – high fire severity- stand-replacing fires (T8)

Non-native species (2/5)
- Non-native insects and pathogens (root fungus), or something new (T8)
- Potential non-native species introduction (T11)

Pollution (2/5)
- Ozone
  - Increased ozone due to fossil fuel burning (T17)
- Air
  - Ozone effects to seedlings (T14)

Recreational Use (2/5)

Sensitivity

To Fire (4/5)
- Adults-
  - Crown fires and potential mortality
  - Affects other species
  - H2O balance of groves (T11)
- Mortality due to unusually severe fire (T4)
- When management suppresses fire, leads to more fuel build-up then more intense fires, which may kill sequoia trees (T17)
- Also lack of fire leads to decreased regeneration (T17)

Seedling Sensitivity (2/5)
- Younger trees are at greater risk to fire (T14)
- Seedlings
  - Changes in forest structure could create inappropriate seed bed and germination and establishment
  - Vulnerable to fire (T11)

To Drought (4/5)
Seedling Sensitivity (4/5)
- Lack of seedling survival (T4)
- Moisture – require mesic sites (seedlings) (T8)
- Seedlings (T11)
- Younger trees more sensitive to drought, less absorption, intense fires (T17)

Adult Sensitivity (3/5)
- Extreme drought eventually will affect adults (T4)
- Adults-
  - Giant sequoias require a lot of H2O and are sensitive to moisture stress (T11)
- Isolated trees more sensitive ???? (T17)

To Air Pollution (2/5)
- Younger trees more susceptible (T17)
- Trees more exposed to ozone worse off (T17)
- Seedlings are more sensitive than mature trees (T14)

To managing fire (2/5)
- Management priorities across administrative boundaries – ability to manage fire (T14)
- Probability of severe fire (but huge, severe fires not unprecedented, e.g. Mountain Home) (T8)

Dispersal Limitations

Adaptive Capacity

Management changes (3/5)
Mechanical Thinning (3/3)
- Mechanical thinning(T4)
- Consider thinning of non-sequoia trees to increase water availability to sequoia trees (T17)
- Consider thinning (T17)
- Mechanical thinning (T14)

Prescribed Fire (3/3)
- Prescribed fire(T4)
- Consider prescribed burning (T17)
- Rx fire (T14)

Irrigation (2/3)
- Irrigation(T4)
- Irrigate (T14)

Assisted Migration (2/3)
- Planting in cooler climates(T4)
- Assisted migration to areas optimal for SEGI growth (T14)

Other Management Changes
- Limiting access including fences, trails (T17)
- Monitor & use data to effect regulatory changes (T14)
- Policy and management (T17)
- Restore hydrology (T4)
- Wildland fire (T14)

Dispersal Ability (2/5)
- Upward/northward movements (T8)
- Good ability to disperse seeds even after high-severity fire (T11)

Longevity (2/5)
- Longevity (T8)
- The long-lived nature of adult trees to produce more seedlings will help (T11)

Genetic Diversity (2/5)
- We want genetic diversity (T17)
- Genetic diversity
  - May be very adaptable (T8)

To fire
- Thick bark (T11)
- High crowns (T11)
- Limited ladder fuels (T11)

• Anthropogenic influence – Trampling (T17) • Root disturbance (T8) **General Climate Change** • Timing (T14) • Change in rain/snow ratio (T14) **Vegetative Management** • Management (T14)	• Cannot migrate above 7000 feet (T17) **Not highly sensitive to severe fire** • May not be highly sensitive to severe fire (T8) **Shallow roots** • Roots are shallow (T8) **To non-native species** • Unknown (T11)	• Fire density establishment (T11) • Ability to resprout (T11) **High Planted Seedling Survival** • Planted seedlings have a high survival (T11) **Unknown AC for Non Natives** • Unknown (T11) **Water Loss Control** • Sequoia have a good ability to control H2O loss (T11)

2) **Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).**
   - Restoration of natural fire regimes
   - Maintain sequoia planted outside of designated groves
   - Maintaining hydrology (T17)

   - Short term: Increase resilience via prescribed fire and mechanical thinning ….. good for a while.
   - Long term: Eventual failure (T4)

   - Restoration of natural fire regimes – influence of Native Americans – not enough lightening strikes to restore pre-EuroAmerican fire regime. Too many societal restraints – smoke, etc., budget, politics
   - Self-sustaining sequoia population with mixed size-class distribution in current grove location. → Not achievable in near future in some USFS lands that were logged
   - Protect grove hydrology to maintain reproduction and persistence → how can we affect this? By not withdrawing? By thinning to increase available water? Watering <u>not</u> sustainable (T8)

   - Fire treatment – feasible but limited in both area and by politics
     - Prioritize groves
   - Water – current policies do not include actively watering sequoias (T14)

3) **If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).**
   - Maintaining hydrology not feasible! Sequoia trees (mature) resilient…
     - Maybe just around iconic trees, and a few select areas (esp. saplings) (T17)

   - Education

- Irrigate sequoias
- Monitor sequoia water status
- Monitor sequoia populations
- Monitor mycorhizal fungi (T4)

- Use fire surrogates in addition to fire
- Look for other suitable location (strategy to plant or seed sequoia seeds at higher elevations or expand grove boundaries). Consider other species in the community as well.
- Try to maintain grove locations only in the most suitable, mesic sites
- Minimize severe negative impacts of management actions (Rx fire, thinning) to all mature sequoias. (T8)

- Fire – in absence of fire consider active planting, assisted migration
- Water – plan for/design for water diversion/containment for SEGIs (T14)

Most mentioned current objectives

- Restore natural fire regimes (100%; 4 groups)
- Maintain hydrology of SEGI groves (75%; 3 groups)

Most mentioned retrofitted objectives

- Regarding maintaining hydrology (100%; 4 groups)
    - Irrigate sequoias (75%; 3 groups)
    - Don't irrigate sequoias (25%; 1 group)
- Use fire surrogates/other actions in addition to fire (50%; 2 groups)
- Assisted migration (50%; 2 points)

No-longer-feasible objectives:

- Maintaining hydrology (why - mature sequoia trees are resilient; perhaps only around iconic trees or a few areas, saplings)
- Restoring fire regime (why - smoke, budget, politics)

Overall themes regarding objectives:

- Discussion about maintaining current grove structure and facilitating movement outside of groves
- Split between how sequoia hydrology should be maintained in the future
- Prioritization of sites

Mixed Conifer Forest

Exposure (stressors)	Sensitivity	Adaptive Capacity

Fire (4/4)
• Fire
  ○ Uncharacteristically more intense and severe
  ○ Fire exclusion (T5.2)
• More fire and more severe fire with greater patch size (T?)
• Fire – un characteristically more intense and severe
  ○ Lack of fire (T5.1)
• Fire
  ○ Uncharacteristically severe wildfire
  ○ Fuel loading… exclusion, community change → fir/sugar pine (T5.3)
 	
Increased Moisture Stress – Droughts (3/4)
• Climate water deficit (T5.2)
• Increase in annual climate water deficit (T?)
• Climate water deficit (T5.3)
 	
Pests and Pathogens (3/4)
• Insects/Pathogens (T5.2)
• Insects/Pathogens
  ○ Blister rust – white pine
  ○ Mtn pine beetle – yellow pine (T5.1)
• Insects/Pathogens
  ○ Bark beetle
  ○ Thessock moths????
  ○ Uknown, unknown (T5.3)
 	
Pollution (3/4)
• Airborne pollutants (T5.2)
• Ozone Damage (T5.1)
• Pollution
  ○ Adding stren???
  ○ Pine→ fir
  ○ Differential needle death (T5.3)
 	
General Climate Change
• Precipitation Change – seasonality, amount, type (snow/water), duration (drought stress) (T5.1)
	To Insects and Pathogens: Mod-low at low FRID; high at high FRID (3/4)
	• Med-low due to conifer diversity at low FRID; high at high FRID and in concert with other drivers (T5.2)
	• Moderately low sensitivity at low FRID because of system diversity but increased sensitivity with other drivers of change (T5.3)
	• Moderately low due to species composition: low at low FRID, higher at high FRID (T5.1)
	
	Moderate Sensitivity to Precipitation Change (3/4)
	• Mod low to ??? drought, but in concert w/ other drivers… (T5.2)
	• Moderately resilient to previous prolonged drought, but projected to have increased sensitivity with fire and increasing stress (T5.3)
	• Moderately resistant but…in concert with fire and insects and pathogens may be highly sensitive (T5.1)
	
	High Sensitivity To Fire (w/ Climate Change) (2/4)
	• High, in concert w/ CWD (T5.2)
	• Moderate under current conditions but become more severe with climate change (T5.3)
	
	Moderately Low Sensitivity to Air Pollution: (2/4)
	• Moderately low, but can act synergistically under climate/ pathogen/ fire issues (T5.2)
	• Moderately low but species specific (T5.1)
	
	Homogenous forests
	• Homogenous forests have low adaptive capacity (T5.1)
		Conifer Biodiversity (3/4)
		• Conifer diversity (T5.2)
		• System diversity (T5.3)
		• Species composition (T5.1)
		
		High Dispersal (3/4)
		• Dispersal capacities (T5.3)
		• Dispersal good (T5.1)
		• Dispersal abilities (T5.2)
		
		Unknown AC under synergistic effects (2/4)
		• Uncertain/low capacity to synergistic effects of multiple stressors. (T5.2)
		• Less clear how adaptive the system will be to synergistic effects of multiple stressors (T5.3)
		
		Adapted to drought and fire
		• Adaptations to drought stress and fire – moderately good adaptive capacity (T5.3)

2) **Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).**
   - More species composition – how much of mechanical treatments are possible vs. how much will actually be accomplished?
   - Increase heterogeneity – yes – more prescribed and "managed" wildfire but – how much can agencies accomplish by using fire (with current funding and public opinion?)?
   - Restoring "natural" fire regime – no – given funding, WUI, public opinion, air quality (T5)

   - Restoration of natural fire regime. Not very given funding, air quality concerns, distribution of anthropogenic ignition, and WUI
     - Mixed size class, composition, heterogeneity, diversity is mostly driven by fire.
   - Intact and functioning trophic system
     - Not very feasible as a management objective, given unknown interactions. Thus, very little actual actions focus on changing this… (T5.3)

   - Restoring Fire Regime – Not very, due to funding, public, WUI, air quality, etc. (T5.2)

   - Restoration of natural fire regime
   - Move composition toward natural range of variability (T?)

3) **If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).**
   - More mechanical thinning
   - More prescribed fire
   - Strategic wildfire management
   - Allow wildfires to burn in desirable areas and conditions
   - *Prioritize sites*
     - Strategic fire management (T5)

   - Increased strategic prioritization of sites for values such as diversity, heterogeneity, large trees
   - Option for exercising constraint (T5.3)

   - Increased strategic prioritization of ???? (T5.2)

   - Use fire as a tool to create resilient forested ecosystems
   - Maintain ~~sustained~~ forest resiliency for long term sustainability acknowledging environmental constraints (T?)

Most mentioned current objectives:

- Restore natural fire regime (100%; 4 groups)

Most mentioned retrofitted objectives:

- Strategic prioritization (75%; 3 groups)
- Regarding fire regime (50%; 2 groups)

No-longer-feasible objectives:

- Fire – not because it is not ecologically important, but due to funding, public perception, WUI, air quality, etc.
- More species composition is possible, but depends on the scale

Overall themes regarding objectives:

- Prioritization of sites to manage
- Constraints on using fire, but agreement that fire is very important for mixed conifer forest health
- Among all 3 attributes (fisher and owl), fire and habitat composition are mentioned
- Generally, things that benefit forest health will also benefit wildlife.

Pacific Fisher

Exposure (stressors)	Sensitivity	Adaptive Capacity

Fire (3/3)
• High severity fire, large-scale(T18)
• Habitat loss/frag
  ○ Severe fire (T5)
• Fire function on habitat suitability (T?)
 	
Marijuana Grow Sites (3/3)
• Rodenticide (T18)
• Rodenticides (T5)
• Rodenticide (T?)
 	
Predation (3/3)
• Predation(T18)
• Predation(T5)
• Increased predation (T?)
 	
Roads (3/3)
• Roads (T18)
• Roadkill (T5)
• Vehicle mortality (T?)
Fragmentation (2/3)
• Habitat loss/frag
  – Severe fire
  – Vegetative management (T5)
• Fragmentation (T?)
 	
Reduced/Changes in Prey (2/3)
• Reduced prey (T5)
• Reduced availability of prey (porcupine) (T?)
 	
Vegetation Management (2/3)
• Vegetation treatments(T18)
• Habitat loss/frag
  ○ Vegetative management (T5)
	High Sensitivity to Fire (2/3)
	• High (dependent on patch size) (1 mile^2)^2 (T18)
	• High (T5)
	
	High Sensitivity to Predation (2/3)
	• Uncertain (hypothesized high) (T18)
	• High (T5)
	
	High Sensitivity to Roads (2/3)
	• Unknown/high (T18)
	• Localized high (T5)
	High Sensitivity to Marijuana Grow Sites (2/3)
	• High uncertainty (T18)
	• High (T5)
	
	Low Genetic Diversity (2/3)
	• Low genetic diversity(T18)
	• Low genetic diversity(T?)
	
	Small Population (2/3)
	• Small population (isolation) (high) (T18)
	• Small population size (T?)
	
	Habitat Specialist
	• Habitat specialist (T?)
	
	Low Reproductive Rate
	• Reproductive rate (T?)
	
	Moderate Sensitivity to Veg Treatments
	• To vegetation treatments - Dependent on intensity – moderate (T18)
	
	Uncertain Sensitivity to Reduced Prey
	• Uncertain to reduced prey (T5)
		Low AC to Roads(2/2)
		• Low (T18)
		• Low due to local effects on ??? population segment (adult females) (T5)
		Moderate-High AC to Predation (2/2)
		• Unknown? (moderate-high?) (T18)
		• Generally high, except local critical segment of population = v. low (q / breeding season and denning habitat) (T5)
		
		Low AC to Marijuana Grow Sites
		• To rodenticide: low (T18)
		
		Low AC to severe fire
		• To severe fire: low (T5)
		
		Moderate/Uncertain AC to Veg Mgmt
		• To vegetation management: moderate, but uncertain, localized (T5)
		
		Uncertain AC to small populations
		• To small populations: uncertain (T18)

2) Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).

- Current Management Objectives:
    - Understand the genetic diversity and attributes of the plateau range of fishers (learn from "fringe species"). (Kern Plateau)
    - Better understand critical habitat
    - Range expansion by reintroduction – feasible (T18)

- Yes; but objective should be sustain and increase population to increase resiliency (T5)

- Fisher – Reduce vehicle mortality on Hwy 41. Yes, is feasible. Are building underpasses.
    - Persistence of fisher population. Yes, is feasible
- Restoration of natural fire regime
- Move composition toward natural range of variability (T?)

3) If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).

- They were feasible <u>but</u> some alternative options:
    - Understand baseline conditions, demography in NPS
    - More cause and effect analysis
    - Refine habitat relation models for different ecosystems (T18)

- Strategic vegetation treatments to protect habitat from severe fires
- Reduce mortalities
    - Road crossing structures
    - Clean up pesticides
    - Close/rehab old roads
- Increase prey?
    - Reintroduce porcupines?
    - Control squirrel hunting (T5)

- Use fire as a tool to create resilient forested ecosystems
- Maintain ~~sustained~~ forest resiliency for long term sustainability acknowledging environmental constraints (T?)

Most mentioned current objectives:

- N/A

Most mentioned retrofitted objectives:

- N/A

Overall themes regarding objectives:

- Some current objectives are still feasible, but we need to change *how* they are accomplished.
- Among all 3 attributes (fisher and owl), fire and habitat composition are mentioned
- Generally, things that benefit forest health will also benefit wildlife.
- Many of the current and retrofitted objectives are monitoring-related, reflecting a lack of information about this species.
- Use fire but be mindful of how sever fire could negatively affect fisher habitat
- Shift from broad statements to specific strategies

California Spotted Owl

Exposure (stressors)	Sensitivity	Adaptive Capacity

Competition (2/2)
• Barred owl competition (T?)
• Fire suppression
  ○ increased tree density,
  ○ **increased competition**
  ○ large trees die (T12)
 	
Vegetation/Habitat Change (2/2)
• Lack of suitable habitat (T?)
• Fire suppression
  ○ **increased tree density,**
  ○ increased competition
  ○ **large trees die** (T12)
• Change in structure of forests (T12)
 	
Fire
• Fire suppression
  ○ increased tree density,
  ○ increased competition
  ○ large trees die (T12)
 	
Marijuana Grow Sites
• Rodenticides (T12)
 	
Reduced/Changes in Prey
• Change in prey, reduced density of prey (T12)
	Specialized Habitat Requirements (2/2)
	• Sensitivity to change in microclimate (increased temperature) around nest stand (T12)
	• Specific habitat requirements (T12)
	• Habitat specialist (T?)
	• Limited large trees for nest sites results in decreased reproduction and increased home range (T12)
		Ability to Use Other Habitats
		• Can use riparian forests in dry environment (e.g. San Bernadino) (T12)
		• Can select cooler habitat (T12)
		• Can disperse to better habitat (T12)
		
		Ability to Change Prey Items
		• Can change prey from woodrat or flying squirrel (tracking habitat at different elevation) (T12)
		
		Ability for Management Change
		• Needs larger societal support for change management (T12)

2) Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).

Objective: maintain healthy population and size. We can do this since we can:

- Provide for larger trees
- Change forest density with thinning and fire
- Change age class distribution of trees
- Change rodenticides is a much bigger issue (T12)

- Restoration of natural fire regime
- Move composition toward natural range of variability (T?)

3) **If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).**
   - Probably need some change in management strategies to achieve above (T12)

   - Use fire as a tool to create resilient forested ecosystems
   - Maintain ~~sustained~~ forest resiliency for long term sustainability acknowledging environmental constraints (T?)

Most mentioned current objectives:
- Fire regime (100%; 2 groups)
- Change forest composition (100%; 2 groups)

Most mentioned retrofitted objectives:
- N/A

Overall themes regarding objectives:
- Among all 3 attributes (fisher and owl), fire and habitat composition are mentioned
- Generally, things that benefit forest health will also benefit wildlife.
- Current objective is feasible but need to change strategies to achieve them.

High Elevation Five Needle Pine

Exposure (stressors)	Sensitivity	Adaptive Capacity
Pests & Pathogens (3/3) **Blister rust (3/3)** • Exotic pathogen blister rust (T?) • White Pine Blister Rust (T24) • Pathogens - WPBR (T23) **Mountain Pine Beetle (3/3)** • MPB – secondary stressor b/c temperature changes first (T?) • Mountain Pine Beetle (T24) • Pest – MPB (episodic and spatially variable; *P. albicaulis* mostly) (T23) **Competition (2/3)** • Potential invasion of native spp. pinyon, juniper (T?) • Competition w/ colonizers – LPP, community composition (T23) **Fire (2/3)** • Fire regime (T?) • Fire (low priority) (T23) **General Climate Change (2/3)** • Seedling survival due to high summer temps (T?) • Temperature fluxes (T?) • Climate change (T24) **Pollution (2/3)** • N deposition (atmospheric) (T?) • Air Quality (T24) **Soil Erosion/Loss** • Erosion/soil (T24)	**Low potential for expansion (2/3)** • Sites availability; increased sensitivity (T?) • Limited expansion (T24) • Dispersal: Whitebark mostly (T23) • Dispersal: Small and isolated pops (T23) • Dispersal: Fox – small pops (T23) • Dispersal: Limber – (T23) • To dispersal: Whitebark, limber, to some degree other spp. (T23) • Limited seed dispersal; limited agents (T24) • Dispersal? (T23) **Higher sensitivity to Pests & Pathogens (2/3)** • To MPB: Increased sensitivity (T?) • To pathogens (WPBR) - All 5N sensitive to (T23) • *Combo of MPB and WPBR – high risk (T23) **Poor Competitors (2/3)** • Shade intolerant (T24) • Poor competitors (T23) **High sensitivity to Fire (2/3)** • To fire: High sensitivity, low vulnerability (T?) • To fire: long recovery time but little removal from "natural"; higher risk in more connected forest (T23) **Higher sensitivity to Temperature Change** • To higher summer temps: increased sensitivity (T?) • To temperature fluxes: Seedling high sensitivity (T?) • To temperature fluxes: Mature trees low sensitivity (T?) **Loss of biodiversity** • Loss of biodiversity (T24) **Lower Sensitivity for dispersal agent** • Clark's Nutcracker ○ Low sensitivity (T?) **Low Sensitivity to climate change** • Lower sensitivity to climate change (T?) **Slow Growing Species** • Slow growing species (T24)	**Better competitors** • Better competititor than native spp. like pinyon and juniper (T?) **Broader tolerance to climate change** • To climate change: Broader tolerance (T?) **Inherent resistance/ adaptability** • Some inherent resistance; evolution/capacity to vary (T23) • Well adapted to recovery from disturbance (T23) **Well mixed populations** • Bird dispersed so well mixed (T23)

2) **Given the vulnerability of this "defining feature" or "critical attribute" in the S. Sierra, are current management objectives feasible? Why or why not? (Don't try to be exhaustive. List 1-3 objectives and discuss those).**

MGMT: Restraint, not enough data? But assume these pines have higher tolerance

- No MGMT?
  - No good options
    - Planting if recruitment low
- Yes MGMT: transport to suitable locations?
  - 5 needle will move up and down in elevation (T?)

- Stable and persistent populations of High 5 Pines in subalpine and treeline areas
- Less paperwork
- Feasible Y/N? – Depends on spp. and time frame
  - White bark: persistence, 100yrs – Yes – but in reduced density and vigor, potentially reduced range
  - W. White: qualified yes
  - Foxtail and limber: qualified yes (T23)

1) No, maintain communities
2) Yes, maintain biodiversity
3) Yes, persistence of high altitude white pine species (T24)

3) **If you answered no above, what should be the "retrofitted objectives" for this "defining feature" or "critical attribute"? (List as many as you want).**

- We answered yes.
- Management strategies:
  - Tweak forest composition
  - Pheromone packs
  - Not thinning
  - In planting (T23)

- Maintain communities
  - Maintain a certain amount of tree cover that would represent the whole community within Sierra Nevada
  - Maintain WPBR resistance seeds in seed banks (T24)

Most mentioned current objectives:

- Persistence of high elevation five-needle pines (67%; 2 groups)

Most mentioned retrofitted objectives:

- N/A

No-longer-feasible objectives:

- Maintain communities

Overall themes regarding objectives:

- Some current objectives are feasible but need different strategies to accomplish them
- Acknowledgement that under climate change maintaining communities may not be feasible
- Feasibility of objectives depends on species and time frame.
- For no-longer-feasible objectives, take a more regional view – maintain X% tree cover that represents whole community within the Sierra Nevada
- Maintaining is not the correct word for populations in decline

Session 4 – Vulnerabilities, Objectives, and Strategies

Strategies Exercise Blank Worksheet

SESSION 4: EXERCISE (LINKING VULNERABILITY, OBJECTIVES, THEMATIC STRATEGIES & MANAGEMENT TOOLS)

Feature/Attribute: ____________ Sub-grp: ______________________________ Note-taker name: ______________________

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	*2. What are current objectives for the resource in the S. Sierra?*	*3. What should "retrofitted objectives" be for the resource in the S. Sierra?*	*4. What are possible thematic strategies and management tools to meet our objectives for the future?*			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate and plan reaction to extreme events**

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?	
Potential Management Tools	**Constraints**

6. What thematic strategies and management tools are most likely to enable us to meet objectives? Who has the capacity to use different management tools? Where will the tools be most successful? What factors will enable us to meet objectives in certain places?

7. BONUS QUESTIONS: A) What would success look like? What are the indicators of success? B) How can we work together to overcome constraints? C) What gaps in monitoring and research are most important to fill? How do we work together to fill these gaps?

Strategies Exercise Participant Responses

(See tables on following pages)

Watersheds and Rivers

Feature/Attribute: Watersheds, Rivers, Lakes Sub-grp: Mid-slope waters Note-taker name:

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	*2. What are current objectives for the resource in the S. Sierra?*	*3. What should "retrofitted objectives" be for the resource in the S. Sierra?*	*4. What are possible thematic strategies and management tools to meet our objectives for the future?*			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate and plan reaction to extreme events**
Exposure: • High exposure • Grazing • Fire • Most active land use • Snow pack • Temperature • Recreation • Invasive plants • Diversions/hydrologic modifications (inter-basin transfers; e.g., Yuba into Bear River) • Runoff • Sedimentation • Roads Sensitivity: • Nutrient cycling • Energy fluxes • Declining aesthetic value (e.g. Wild and Scenic Rivers) Adaptive Capacity: • Moderate (change land use practices)	• Maintaining water quality standards • Managing healthy ecosystems • Threatened and endangered species protection • Maintaining water supply • Managing forests • Maintain hydrograph • Vegetation diversity • Controlling invasive species • Providing recreational opportunities • Preservation and restoration • Maintain properly functioning ecosystems/biodiversity	• Stratified water quality standard • Optimize management of ecosystems to support threatened and endangered species, rather than focusing on the individual species (i.e., avoid focusing on the symptoms) • Manage hydrograph using existing infrastructure • Manage forests to preserve snowsheds (preserve snow pack, decrease evapotranspiration) • Reevaluate transportation network • Assimilate available information/Data management (e.g., take advantage of currently available information that organizations may not know exist). • Improve natural water storage in meadow	• Managing vegetation along lotic waterways • Discharge manipulation – License agreement – Joint issuance of licenses • Shortening licensing period under FERC • Thinning • Forest structuring/management • Fire to manage forests	• Adjusting grazing • Reevaluate transportation network • Education/public outreach – What a hydrograph is and why its important – Stakeholder participation in planning – Develop a constituency for ecosystem services		• Better monitoring/rebuilding monitoring infrastructure • Monitoring • Rebuilding previously abandoned monitoring infrastructure • Modern data structuring • Education/public outreach – What a hydrograph is & importance – Stakeholder participation in planning – Develop constituency for ecosystem services (to deal with problem early on by preserving upstream functionality)

		wetland complexes				

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?	
Potential Management Tools	**Constraints**

5. What thematic strategies and management tools are most likely to enable us to meet objectives? Who has the capacity to use different management tools? Where will the tools be most successful? What factors will enable us to meet objectives in certain places?

i. Forest management
ii. Managing for snowsheds and evapotranspiration
    1. Thinning
    2. Structuring
    3. Fire
iii. Improving natural water storage in meadow wetland complexes
iv. Managing vegetation along lotic waterways
v. Discharge manipulation
    1. License agreement
    2. Joint issuance of licenses
vi. Shortening licensing period under FERC
vii. Monitoring
viii. Rebuilding previously abandoned infrastructure
ix. Modern data structuring
x. Education/public outreach
    1. What a hydrograph is and why it's important
    2. Stakeholder participation in planning
    3. Develop a constituency for ecosystem services (to deal with the problem early on by preserving upstream functionality)

b. Who has the capacity to use different management tools? (Focused on **snowsheds/maintaining snow pack**)
    i. Any landholder, but likely public (although the larger the better)
    ii. Kings River Experimental Watershed
    iii. Organizations with existing partnerships
    iv. IRWM
c. Where will the tools be most successful?
    i. Any mid-elevation forested watershed
    ii. NPS watersheds where prescribed fire have been used.

iii. Sierra Nevada Adaptive Management Project
iv. U.S. Forest Service lands

d. What factors will enable us to meet objectives in certain places?
   i. Public participation/ Local community involvement
   ii. $$$Funding$$$

7. BONUS QUESTIONS: A) What would success look like? What are the indicators of success? B) How can we work together to overcome constraints? C) What gaps in monitoring and research are most important to fill? How do we work together to fill these gaps?

a. How do we work together to fill these gaps?
   iii. Leverage existing partnerships

Wetland Meadows

Feature/Attribute: Wetland Meadows Sub-grp:_____ Note-taker name:_____

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	*2. What are <u>current</u> objectives for the resource in the S. Sierra?*	*3. What <u>should</u> "retrofitted objectives" be for the resource?*	*4. Possible thematic strategies and management tools to meet our objectives for the future?*			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate & plan rxn to extreme events**
<u>Exposure:</u> • Historic restoration practices • Compaction • Invasive species • Altered flow regimes/hydrograph • Contaminants (pesticides pollutants) • Off-highway vehicles • Development • Historic Use • Climate change • Fire regimes - alteration, fire history • Grazing – livestock/pack stock • Ground & surface water diversion • Logging • Loss of soil saturation • Timing/duration hydrology • Soil loss and compaction • Fragmentation effects on fauna • Species Loss • Anthrostock (non-mechanized) <u>Sensitivity:</u> • Meadow type- vary w/ environ-mental & latitudinal gradient • Meadow gradient • Proximity to contaminant source • Rare species (toads, owls, etc.) • Significant alternatives to wildlife habitat • Vegetation structure • Carbon storage • Change in hydrology <u>Adaptive Capacity</u> • Biodiversity	• Meet water quality standards • Maintain water supply for ecosystems and humans • Maintain sensitive species ○ i.e. YOSE toad, Great grey owl, plant spp. WIFL, goshawk • Maintain riparian vegetation and stream function • Maintain and restore meadow health • Biodiversity • Persistence of native spp. • Maintain municipal and agricultural water supply • Recreation activities • Wilderness/scenic values • Forage production for stock	• Meadow habitat connectivity • Maintain peat-accumulating wetlands • Prioritize and protect high quality refugia • Maximize hydrogeobiom orphic complexity • Maintain the integrity & prehistoric record captured in meadows • Restore hydrologic function	• Stabilizing streambanks • Remove trails • Control existing populations of non-natives • Actively manage hydrology	• Maintain native species composition by preventing weed introductions – Early detection/control – Education – Supplemental feed controls • Limit water diversion • Limit practices that cause erosion • Exclude livestock grazing • Fire management – include in fire management planning • Limit OHVs	• Identify "most likely to succeed," prioritize peatlands & commit to preserve • Accept widespread type conversion to wet meadows • Prioritize research contribution of high risk sites • Targeted fire management	1. Extreme fire events: implement protective strategies to prevent inputs of mineral soil, loss of organic soils e.g. construct catchments at heads of meadows, establish buffers around vulnerable sites 2. Extreme drought: unknown how much of a threat this is; may have to consider augmenting hydrology

• Floodplain connectivity • Hydrologic recharge						

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?

Potential Management Tools	Constraints

Protection of single species (e.g. T&E) vs. maximizing biodiversity

Focus on vulnerable/at risk wetlands vs. investing in those most likely to persist

Wilderness constraints

What might the criteria for selecting high priority refugia be?

- High likelihood of persistence—hydrologic stability
- High likelihood of success re restoration: use proven methodology
- Accessibility/cost
- High public value
- T&E species habita/richness
- Maximize species diversity
- Focus on high elevations? Follow the water?

5. What thematic strategies and management tools are most likely to enable us to meet objectives? Who has the capacity to use different management tools? Where will the tools be most successful? What factors will enable us to meet objectives in certain places?

6. BONUS QUESTIONS: A) What would success look like? What are the indicators of success? B) How can we work together to overcome constraints? C) What gaps in monitoring and research are most important to fill? How do we work together to fill these gaps?

What would success look like?

- Delay loss of high priority high functioning wetlands across a range of types and environments

Research gaps: Identify hydrologic vulnerability to facilitate priority setting on a regional scale

Co-benefits:

1. Improved ecosystem benefits – flood control and slower/sustained release through summer season
2. Carbon sequestration via improved meadow health and integrity

Blue Oak Woodlands

Feature/Attribute: BLUE OAK WOODLANDS Facilitators: Denis Kearns, Eric Winford Note-taker name: Malinee Crapsey

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	*2. What are current objectives for the resource in the S. Sierra?*	*3. What should "retrofitted objectives" be for the resource in the S. Sierra?*	*4. What are possible thematic strategies and management tools to meet our objectives for the future?*			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate and plan reaction to extreme events**
Exposure: • Grazing • Lack of acorn-eater predators • Fire clearance in WUI • Change in fire regime • Mistletoe • Non-native plants • Lack of control on private lands • Ozone air quality (black oaks) • N-deposition • Drawdown of water table • Firewood cutting • Limited protected area. • Sudden Oak Death • Golden Spotted Borer Sensitivity: • Location – private lands • Lack of Recruitment Adaptive Capacities: • Dry-climate adapted (esp blue oak) • Long tap roots	• Varies so much by ownership. • USFS some preservation but no management implementation other than grazing. • Fence park boundaries to keep out pigs and cows. • Enhance recruitment so that we have stable populations. • BLM: maintain oak woodlands and facilitate recruitment.	• Improve oak recruitment • Maintain native biodiversity • Acquire oak woodlands • Improve buffering of oak woodlands	• Education. • Support NRCS efforts. • Exclosures/enclosures. • Plant native grasses. • Remove invasive non-natives. • Work with stock users on weed-free techniques. • Limit firewood cutting of oaks. • Protect dead/down wood habitat. • Protect seedlings with sleeves/mesh/fence • Work with CalFire to protect oaks while providing safe clearance. • Require mitigation when oaks are removed • Reduce herbivores that eat acorns/seedlings • Reintroduce fire to improve conditions (while protecting trees that are sensitive to fire.)	• Education. • Work with private oak land owners. • Research improving recruitment. • Seed with native grasses. • Sustainable landscaping • Reintroduce predators on acorn-eaters. • Map areas where there is recruitment. • Work with private oak land owners. • Manage grazing practices as needed. • Identify/protect areas with native grasses. • Work with counties to pass oak ordinances. • Establish oak	• Education. • Work with private oak land owners. • Assist migration • Investigate suitability of soils/ other conditions in future climate envelope. • Experiment with hybridization to improve vigor in changing conditions. • Identify potential seed sources to maximize plasticity. • Sustainable landscaping. • Designate blue-oak botanical research areas. • Experiment with traditional	• Education. • Work with private oak land owners. • Seed/genetic banking. • Use fire to limit disease invasion.

• Far dispersal through birds and rodents				reserves.	management practices.	

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?	
Potential Management Tools	**Constraints**
Culling deer	Public concerns; agency regs.
Assisting oak recruitment.	Lack of knowledge.
Reintroducing fire.	Control, air quality,
Grazing limitations.	Economic impacts on ranchers/other publics.

6. What thematic strategies and management tools are most likely to enable us to meet objectives? Who has the capacity to use different management tools? Where will the tools be most successful? What factors will enable us to meet objectives in certain places?

1) Assist oaks in recruitment in their current range distribution:

- Map and protect where recruitment is successful, and find out why. Fed agency cooperation with researchers.
- Improve knowledge of factors affecting recruitment, e.g. overabundance of deer?
- Plant and protect acorns.

Research: Any agency can work within its guidelines on this.
Create Research Natural Area: Agencies can work freely with researchers there. BLM can do by contract or channeling funds to USFS.
Factors: Funding, public support. Blue oak woodland is in its best condition in the southern Sierra.
Need good clear research objectives.

2) Planting acorns:

All agencies. Where research shows best likely success. Identify potential refugia – all areas.
New areas, after fires.
Factors: Funding - predictions of suitable habitat, timing, best stand densities.

3) Protect existing oak woodlands:

- Everyone, all agencies. Leasees/ranchers. Private landowners. BLM has fewer limitations on buying land than other agencies.
- BLM Tehachapi Conservation Area has a lot of blue oaks.
- National Land Conservation System: Is this an option?
- Partner with Foothills Legacy Program – USFWS program to buy areas.
- Williamson Act equivalent for trails and protect of oaks in the foothills.
- Conservation easements. Develop and enhance corridors. Tejon, Tehachapis, to southern Sequoia NP.
- Need corridor from Sequoia to YOSE and north.
- Public education campaign to build support regarding oaks. Advocate for oak as iconic California species to be loved/protected/enjoyed.

Factors: staffing, funding, public resistance. Grazing leasees/economic impacts to public/private interests.

7. BONUS QUESTIONS: A) What would success look like? What are the indicators of success? B) How can we work together to overcome constraints? C) What gaps in monitoring and research are most important to fill? How do we work together to fill these gaps?

Success: More oaks. Healthy population structure. Public support for and enjoyment of oak lands.
Species diversity in foothills.

How can we work together to overcome constraints?

Education.
Partnerships between fed, state, local, and NGOs.
Actions. Field trips. Cooperative projects.

What gaps in monitoring and research are most important to fill? How do we work together to fill these gaps?

Genetics. Factors that limit recruitment (especially RE acorn and seedling eaters).

Giant Sequoia Groves

Feature/Attribute: Giant Sequoia Sub-grp: _____ Note-taker name: _____

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	***2. What are <u>current</u> objectives for the resource in the S. Sierra?***	***3. What <u>should</u> "retrofitted objectives" be for the resource in the S. Sierra?***	***4. What are possible thematic strategies and management tools to meet our objectives for the future?***			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate and plan reaction to extreme events**
Drought, Water Loss, Climate Fire, Increased Tree Densities Invasive Species Human/Direct Impacts Air Pollution <u>Exposure</u>: Warmer temps, earlier snowmelt, more drought (climate-change driven) & high severity fire; fire suppression; non-native insects (climate-driven) & pathogens; ozone & interactions <u>Sensitivity</u>: Spatial variation in water requirements & availability; probability of severe fire/resilience to severe fire <u>Adaptive capacity</u>: Genetic diversity; migration potential; management	• Protect, restore, and maintain naturally functioning sequoia groves • Restore natural hydrology in sequoia groves • Promote regeneration of sequoias • Restore fire regime. • Provide recreation and education • Protect social and cultural values of sequoias. • Prevent invasion of transformer species • Sequoia groves & ecosystems they occupy are restored, maintained & protected • Restoration of natural (pre-Euro-American) fire regimes. • Self-sustaining sequoia population w/mixed size-class distribution in current grove locations • Maintain existing trees, stumps & large fallen trees, ensure adequate reproduction, protect from catastrophic fire, maintain reproduction & persistence • Avoid damage to iconic sequoia trees	<u>Short Term</u> Protect prioritized (vulnerability & social value) groves <u>Long Term</u> Establish sequoia groves in alternate habitat of the sierra bioregion Preserve genetic diversity. (How depends on each agency)	Irrigate sequoia Plant in current groves Install strategically placed fuel breaks Maintain in-situ, ex-situ seed banks Control invasive weed and insect outbreaks Early detection and control of non-native invasive	Prescribed fire Mechanical thinning Allow selected wildfires to burn Re-establish natural hydrology where impacted Eliminate grazing Reduce other stressors, such as air pollution & tourism/development (soil compaction, root damage, etc)	Research to understand genetic and functional diversity of sequoia Collect seed and/or establish living seed banks with known genetic make-up Plant with drought resistant genotypes Plant in new areas with suitable soil & future climate	For large-scale high severity fire or vegetation die-off Learn from other places – how they responded, what worked well, and prepare for these events ahead of time Prepare for (incl. compliance) pre-planned but location-flexible experiment with erosion controls & planting plan to test more adapted genotypes and species, etc. Inter-agency cooperation and management

actions	• Maintain sequoia planted outside of designated groves					

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?	
Potential Management Tools	**Constraints**
Fire	Smoke, Budget, Public Perception, Agency Culture, Public Health, Competing laws & regulations
Mechanical Treatment	Public Perception, Budget, Access, Compliance, Wilderness, Scale, Capacity
Education	Budget, Public Perception,
Relocation	Budget, Lack of Knowledge, Time, Regulation, Public Perception, "playing god", land ownership, compliance,
Irrigation	Budget, Public Perception, water supply, agency policy, scale, infrastructure, feasibility,
Artificial Planting	Budget, Public Perception,

6. What thematic strategies and management tools are most likely to enable us to meet objectives? Who has the capacity to use different management tools? Where willthe tools be most successful? What factors will enable us to meet objectives in certain places?

Prescribed Fire: Everyone, everywhere
Mechanical: Mostly USFS, State, & Private and not everywhere
Irrigation: Small scale only, iconic trees only
Genetic Diversity: ex-situ private entities & USFS
Planting: Everyone, everywhere
Hydrology: Everyone, everywhere
Interpretation/Education/Information: Initial emphasis with NPS, then build capacity everywhere, unified messaging
Collaboration/Partnerships: Everyone, everywhere

Mixed Conifer Forest

Feature/Attribute: Mixed Conifers Sub-grp: Note-taker name:

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	*2. What are current objectives for the resource in the S. Sierra?*	*3. What should "retrofitted objectives" be for the resource in the S. Sierra?*	*4. What are possible thematic strategies and management tools to meet our objectives for the future?*			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate and plan reaction to extreme events**
Exposure: Warmer temps, reduced water availability,, more fire/more severe fire. **Conifers**-fire suppression, human recreation, increased insect & pathogen outbreaks, airborne pollutants; **Fishers**-habitat loss, fragmentation, human development; **Owls**-habitat loss, assoc. prey changes, barred owl competition Sensitivity: **Conifers-**moisture requirements, reproductive methods; **Fishers-** dep. on forest structure typical of old growth, isolated populations, low genetic diversity, low reproduction, limits on dispersal; **Owls--** dep. on forest structure typical of old growth, isolation of some populations, low reproduction Adaptive capacity: **Conifers**-some sp. have wind or animal seed dispersal and high reproductive outputs, shade tolerant; **Fishers**- dispersal under right conditions; **Owls,** dispersal ability. **All-**Mgmt action can increase adaptive capacity	Mixed size-class distribution Move composition towards natural range of variability (pine versus fir) Increase heterogeneity Restoration of natural fire regime Maintain species diversity Preserve functionality of cold-air refugia Maintain large trees Maintain populations of T&E and sensitive species Persistence of fisher, CA spotted owl, and American Marten Maintain healthy predator prey populations and interactions Intact and functioning trophic system No species overabundant	1 Manage for forest wildlife, emphasis on old forest 2 Maximize biodiversity (heterogeneity) 3 Reduce daily emissions from wildfire 4 Water provision 5 Recreation and aesthetics 6 Forest Mixed conifer forest 7 Self sustaining ecosystems	Locate and remediate marijuana grow sites and remove chemicals Capture/translocate/kill bared owls Install artificial snags for nesting/resting habitat Spray pesticides on beetle outbreaks Irrigate seedlings Thinning to meet specific needs (1-7) Reintroduce porcupines Clean pesticides and illegal poisons from environment (1,2) Regulate squirrel hunting	Allow wildfires to burn under right conditions (1-7) Prescribed fire (to reduce fuels & competition for water; & promote conditions for regeneration) (1-7) Mechanical thinning (1-7) followed by planting Avoid harvesting structural features /large dbh trees Avoid harvest in known owl and fisher nesting sites Prioritize protection of suitable habitat (minimize mechanical disturbance) Close/remediate old and unnecessary roads, including forest roads Identify problem road crossing areas for fishers and install wildlife crossing structures (1,2) Novel funding sources Payments for ecosystem services (water users) Management to reduce risk of high severity fire.	Create seed banks for vulnerable tree /herbaceous species Plant conifers upslope now to ensure old growth characteristics in the future Screen sugar pine seedlings for genetic immunity to WPBR; start out-planting program with them Reduce barriers to species movement (unnecessary roads, etc) Protect contiguous migration corridors Capture-release programs for fisher and owl (1,2) Integrate genes from trees in stressed environments to foster stress tolerance. Foster Black oak expansion Assisted migration	Do compliance work for possible extreme events Investigate resistance of sugar pine to WPBR Start nursery of WPBR immune sugar pines Investigate/implement environmentally-friendly eradication methods for pine bettles Have planting plan for mixed conifers Before-and-after experiments to assess impacts of fuels treatments, prescribed burns, and wildfire to fisher and owl Captive breeding (1,2) Forest thinning (1-7) Rx fire (1-7) Managed fire (1-7)

(1,2)

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?	
Potential Management Tools	**Constraints, cobenefits and tradeoffs**
Forest thinning	Leave large trees, leave dead material,
Planting (including genotypic variation)	Education, knowledge and uncertainty, agency mandates, public acceptance, financial and regulatory constraints, expand sources of genotypes to other regions, loss of genetic integrity
Assisted migration/reintroduction	Education, knowledge and uncertainty, agency mandates, public acceptance, financial and regulatory constraints, expand sources of genotypes to other regions, loss of genetic integrity
Wildland Fire	
Spatial variation	Strategies must vary across space and time with learning. For example, drift is a strategy that should be deployed strategically; as should both resisting and facilitating change.

6. What thematic strategies and management tools are most likely to enable us to meet objectives? Who has the capacity to use different management tools? Where will the tools be most successful? What factors will enable us to meet objectives in certain places?

Business practices: Apply tools where they are accepted and ecologically relevant; encourage experimental management to foment learning; take advantage of natural experiments/opportunities (severe wildfires, orphaned wildlife being used for short-distance assisted migration); use landscape heterogeneity as a template for management; manage with expectation of change rather than stasis; take advantage of interannual variability in conditions for management (WFU, planting, etc.); use jurisdictional differences to design experiments and learning (NPS as control areas, e.g.)

High Elevation Five Needle Pine

Feature/Attribute: **High Elevation Five Needle Pines** Sub-grp: _____ Note-taker: Krystina Webster

1. What are critical vulnerabilities or components of (exposure, sensitivity, adaptive capacity)?	*2. What are current objectives for the resource in the S. Sierra?*	*3. What should "retrofitted objectives" be for the resource in the S. Sierra?*	*4. What are possible thematic strategies and management tools to meet our objectives for the future?*			
			Manage for Persistence		**Manage for Change**	
			Resist change	**Build resilience**	**Facilitate transformation**	**Anticipate & plan reaction to extreme events**
Exposure: WPBR (whitebark cases already in Sierra) Sensitivity: unknown, but assumed high (not many Sierra cases; based on Tahoe/Rockies) Adaptive Capacity: inherent genetic diversity; move up in elevation (natural migration); drier climate further limits blister rust dispersal Exposure: Pine Beetle (prefer western white/whitebark) Sensitivity: increasing in drought/warming climate; seedling mortality may be high Adaptive Capacity: move up in elevation (natural migration) Sensitivity: Stand Structure – Woodland is more sensitive than Krummholz Exposures: Climate Change, Air Quality, Pathogens, Competition w/ colonizers, Fire, Nitrogen Deposition, Fire, Temperature, Nutcracker? Sensitivities:	Persistence of high altitude white pine species including foxtail pine, whitebark pine, and western white pine. Maintain communities within historic variation Maintain native biodiversity ESA? – preserve in perpetuity	Maintain communities through sustainable natural recruitment Manage for targeted refugia More research Improve resistance to pathogens? Maintain foundational species? Manage “iconic viewscapes” Protect high value trees	Find/protect sites for refugia Use fire to thin/increase recruitment Remove/ thin Lodgepole from Whitebark stands? Thinning in woodland areas Adopt a Tree – donation program	Maintain range-wide connectivity Public engagement Develop rust-resistant genotypes prior to beetle outbreaks Plant diverse seed sources	Find sites of historic range at higher elevations Plant rust-resistant genotypes	Build in early warning system Measure effectiveness of restoration treatments

Dispersal limitation Seedling Dynamics					

5. What are constraints & trade-offs to implementation (including other objectives that present conflicts)?

Potential Management Tools

- Thinning in woodland areas
- Adopt a Tree – donation program
- Public engagement
- Fire
- Develop rust-resistant genotypes prior to beetle outbreaks
- Plant diverse seed sources
- Plant rust-resistant
- Protect high value trees
- Measure effectiveness of restoration treatments

Constraints

-Wilderness
-$$, apathy, (lack) charisma
-$$, apathy, (lack) charisma
-Air quality, lack of fuels
-science ability; timing
-current policy
-timing, lag of response
-cost, access, regulations
-$$, time

6a. What thematic strategies and management tools are most likely to enable us to meet objectives?

- Acknowledge management limitations
- Take advantage of events that draw public attention/concern
    - (public concern for June Mountain – use to draw attention)
    - Adopt-a-tree program (Whitebark Pine Foundation model; poster child for change)
- Management strategy we can follow quickly and adapt as necessary
- Monitor for early detection – promote ability to adjust strategy; publicize for funding
- Monitor specific stands based on different vulnerabilities (Krummholz and Woodland)

6b. Who has the capacity to use different management tools? Where will the tools be most successful? What factors will enable us to meet objectives in certain places?

- Jurisdiction, wilderness designation (affects what tools are available)
- Whether species gets listed as endangered (limits manipulating the species)

6. BONUS QUESTIONS: A) What would success look like? What are the indicators of success? B) How can we work together to overcome constraints? C) What gaps in monitoring and research are most important to fill? How do we work together to fill these gaps?

A) Self-sustaining population; persistence

B)

C) Don't know much about growth response/demographics; Not much Sierra-specific information; unknown rust resistance/exposure level; fire effects/regime is poorly understood; need more information on the changing life history of the beetle; lack understanding of native pathogens/insects; co-migration/range expansion of species and competitors and pathogens

Session 5 – What's Next?

Participant Responses

REVISED VALUES – SESSION 5

Table 1

1. Public engagement
2. Prioritization strategy
3. Functioning hydrologic system

Originally tried to select overarching defining features to try capturing as many values as possible. May not be prepared to retrofit current goals/values, we realize the incredible importance of narrowing goals: prioritization, public perception, budget – all vital/key for focusing goals and objectives.

Table 1 and 2 (combined)

4. Biodiversity
5. Human connections
6. Hydrologic processes
7. Fire regime

How to get down to 3? Promote stewardship and understanding. Avoid workshop exercise sequestration.

Table 3

1. Human element
2. Ecological integrity
3. Giant Sequoia

Encompasses recreation, biodiversity, water/aquatic ecosystems, and fire.
Not changed from S2 except for the order.

Table 4

1. System integrators (species that encopass our values, iconic species)
2. System function
3. ?

Criteria used: 1)Conduct triage on integrator species and system function, 2)work across boundaries, 3) recognize we will lose things, 4) identify vulnerable areas and work in those that have a high probability of success

Table 5

No answer

Table 6

1. Relevance
2. Forests and woodlands
3. Watershed hydrology and aquatic diversity (worksheet)

Worksheet focuses from management down; we think it is important to focus on surrounding community up.
Prioritization criteria: 1) Important for future long-term, 2) importance of biodiversity, nutrient cycling (integrity)

Table 7

1. Water (but with more measurement)
2. Ecosystem diversity (within and among)
3. The human element

Slight modifications, but overall the same. Criteria used: 1) Measurable, 2) interconnectedness

Table 8

No reply

Table 9

1. Mixed conifer forest (including SEGI)
2. Social connectivity
3. Hydrologic processes

No change

Table 10

No reply

Table 11

No reply

Table 12

1. Water Quantity
2. Unique alpine flora and fauna
3. Iconic places

No change – service, nature, and human perspective are represented; focus on Sierra-specific/unique aspects; these reflect the "triple bottom line"; compelling and relevant to people

Criteria used: unique to southern Sierra Nevada, represent key dimensions of SSN, data available, social/economic value, "Keystone" or "umbrella" element, feasible to manage for.

Table 13

No reply

Table 14

1. Wetland Ecosystems Restoration

2. Natural Resource education and outreach to Central valley youth
3. Biodiversity research and monitoring

Table 15 combined with 2 Unknown tables

1. Integrated functioning watersheds
2. Native biodiversity

Criteria used: connectivity, coordination between agencies, economic services
Original values between 3 tables: 1) Aquatic systems and wetlands, 2) Water/hydrologic regime, 3) Biodiversity/native vegetation, 4) Fire regime, 5) Mixed conifers, and 6) Human conncetions with landscape

Table 16

No answer

Table 17

1. Adequate Water
    a. *Water is critical to a well-functioning ecosystem*
    b. *Water is a limited/critical resource in the S. Sierra Nevada*
    c. *High level of interest and demand*
2. Habitat connectivity
    a. *Allows for movements and greater genetic variability of plants and animals*
    b. *Encompasses a large area with lower cost*
3. Connection to Place
    a. *Public support*
    b. *Inspiration*
    c. *Relevancy*
    d. *Political buy-in*

Overall, same values as Session 2.

Table 18

1. Hydrologic Function
2. Connections to people and the resource
3. Habitat connectivity

Table 19

1. Fire Regime
2. Native biodiversity
3. Water quantity

Same as Session 2, but recognize they were missing the human element, which should be an item within everything. Critical attributes of public trust, support, and relevancy.

Table 20

1. Watershed use/function management
    a. Coordinated, efficient and for ecosystem integrity and human use
2. Increase the human dimension
    a. Relevance, understanding, education (importance plus imports)
3. Ecosystem connectivity

Recreation did not capture all human effects. Need to foster better relationships with public to foster understanding of importance of meadows and need to conserve ecological integrity. Need to identify human influence

Individual/Dissenting Opinions

1. Water quantity
2. Heterogeneous forest structure that support many values (wildlife habitat, resilience to catastrophic fire, water quality, recreation/tourism, timber)
3. Aquatic habitats

Prioritization criteria: water will be the focus of the future. Water will pay to keep our forests as healthy and resilient as possible to catastrophic fire, disease, etc.
My group could not prioritize – they wanted to pick everything.