ALTERNATIVE FUTURES FOR FIRE MANAGEMENT

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A Southern Sierra Change Adaptation Workshop February 20-22, 2013

A Collaborative Effort

National Park Service

- Sequoia & Kings Canyon NPs
- Climate Change Response Program

US Forest Service

Sequoia NF/Giant Sequoia NM

US Geological Survey

Western Ecological Research Center

University of California

- UC Davis
- UC Berkeley



Funding from NPS & USFS



≥USGS





Seguoia and Kings Canyon National Parks

California

National Park Service

U.S. Department of the Interio

Fire & Fuels Management Goals



Restore and maintain the **natural fire regime**

in a manner consistent with firefighter and public safety <u>Future</u> Objectives?

Future natural fire regime?

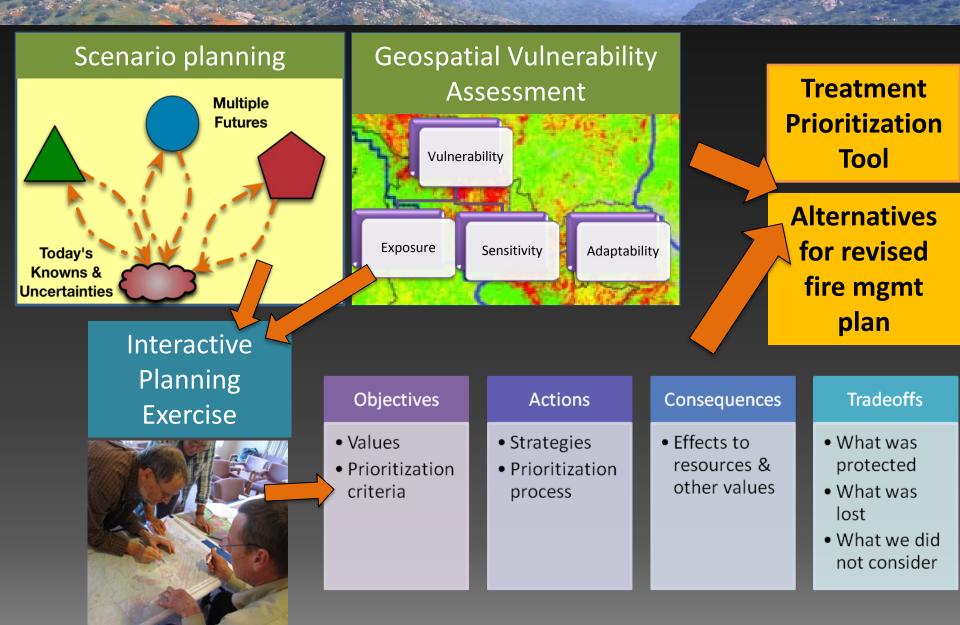
Future composition & structure?

Climate – Adapted Goals for the Future?

• What should we be doing with fire/fuel management to meet future resource goals?

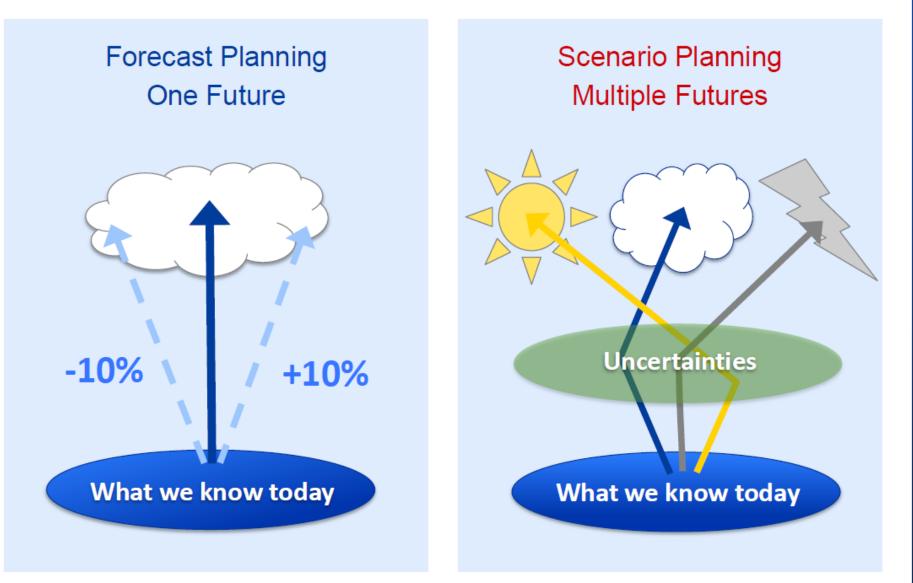
• What can we realistically accomplish under rapidly changing and uncertain conditions?

Project Process



Scenario Planning vs. Forecasting

Scenarios overcome the tendency to predict, allowing us to see multiple possibilities for the future



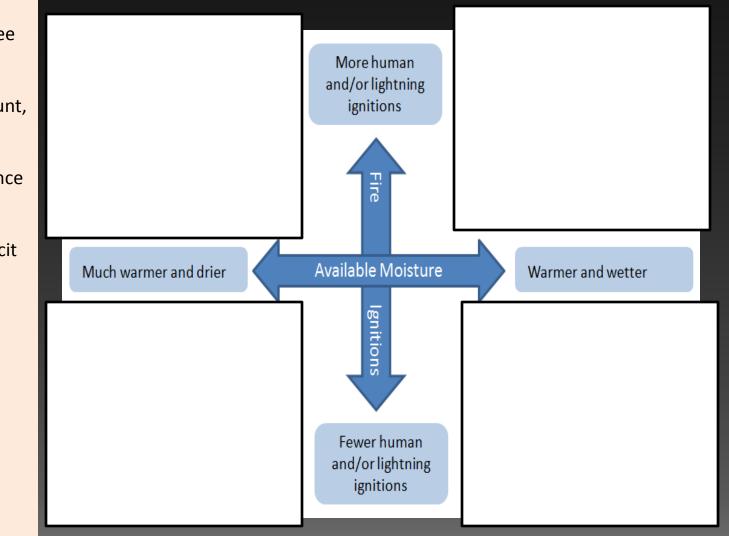
Scenarios are a tool for helping us take a long view in a world of great uncertainty. They are stories about the ways the world might turn out tomorrow that can help us recognize and adapt to changing aspects of our current environment

—Peter Schwartz: The Art of the Long View

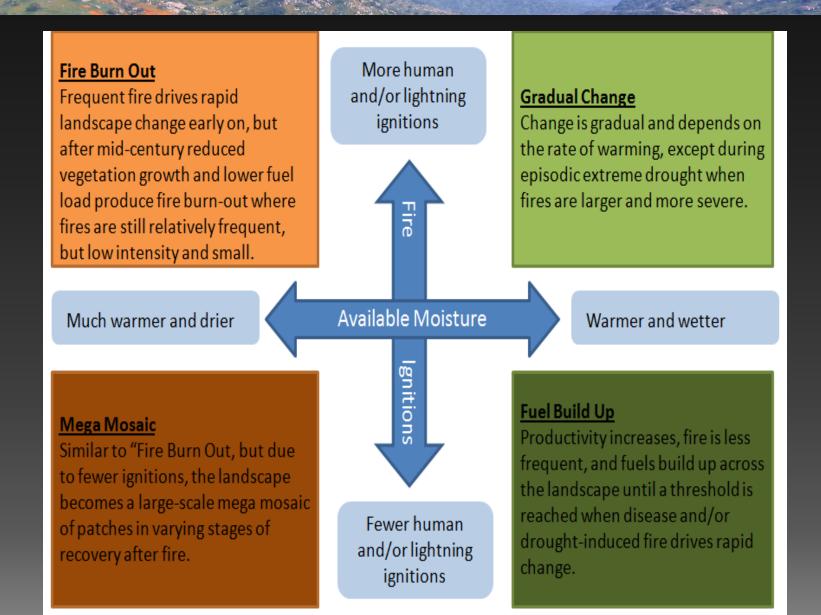
Ecological Scenarios

System Drivers

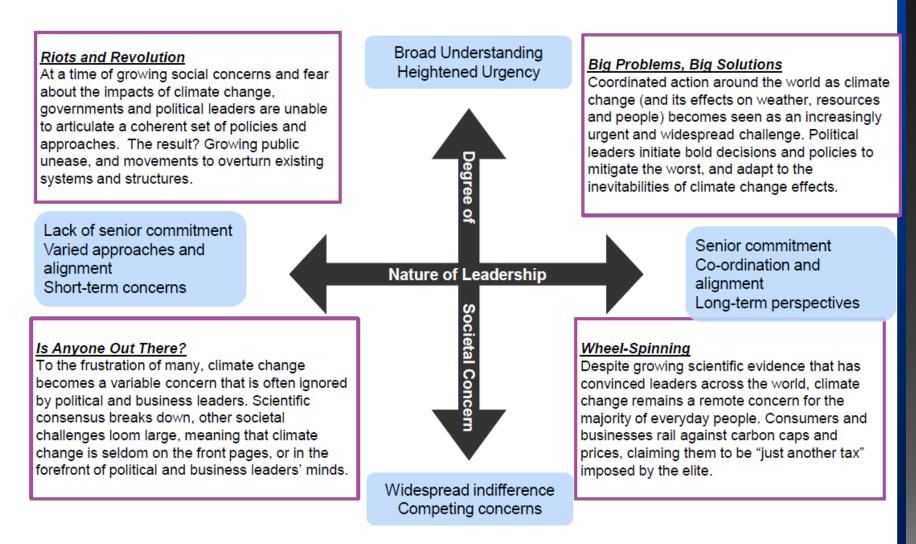
- Temperature (degree of warming or seasonality)
- Precipitation (amount, seasonality, variability)
- Snowpack persistence
- Soil moisture
- Fuel moisture
- Climate Water Deficit (CWD)
- Drought (duration, timing, frequency)
- Fire Return Interval Departure (FRID)
- Fire season length
- Lighting storms
- Fire ignitions
- Forest dieback
- Air quality
- Rate of climate change



Ecological Scenarios



Socio-Political Scenarios



Integrated Scenarios

Ecosystem Management (Fire Burn Out/Big Problems/Big Solutions): Much warmer & drier, more wildfires, longer fire season, rapidly altered environment. Bold decisions. More flexibility. Focus on ecosystem services (water, carbon). Funds & support increase. Status Quo (Gradual Change/Wheel Spinning): Warmer & wetter, more fires but change is gradual, at least for first few decades until large fires become more common. Funding is moderate but public support for fire mgmt is low and constraining due to air quality.

Much warmer and drier

Available Moisture

bre hum

/or light

gnition

Fire

<u>Water Wars Ignite (Mega</u> Mosaic/Riots & Revolutions):

Warmer & drier, larger fires, landscape full of varying response to fires & drought. Increasing public pressure for water (dams). Gov't not responding. Illegal water harvesting and arson to increase water yield in foothills.



ewer hum nd/or light ignitions Warmer and wetter

Mega Fire Looms (Fuel Build Up/Is Anyone Out There?):

Warmer & wetter, fewer fires but dangerous fuel loads. Budgets slashed. Decreased public support but foothill development rampant. Public outcry only after mega-fire destroys homes and sequoias.

Interactive Planning Exercise

Intent:

Think "outside the box" to ID potential new management objectives, strategies, and ways to prioritize them.

Practice planning for the long-term.

Test geospatial products and decision support tools.

Identify + Map Values [Socio politically] What Model habitat Species Ubiquitous Step 2. Consider Prioritizing (Spatially) Why what where How Step 3. Evaluate Vulnerabilities (Temporily) Why what where How Step 4. Game Futures [Uncertainty Manifest] Why What Where in Value Changes Step 5. Look for Investment (Strenghts) Why What Where How Step6. Predict consequences" How What where

Interactive Planning Exercise

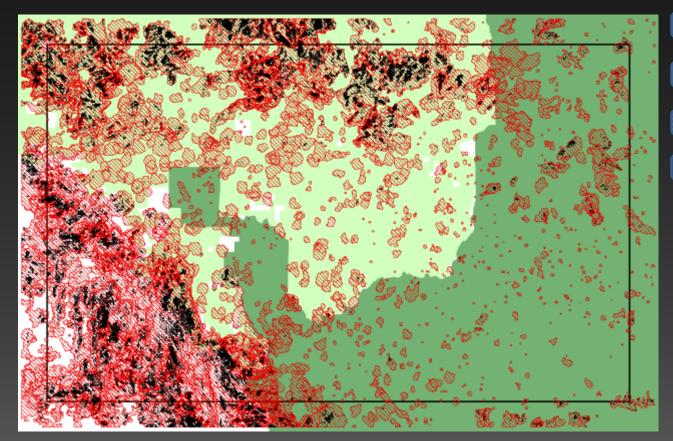
ECOSYSTEM MGMT: Fire Burn Out/ **STATUS QUO: Big Problems Big Solutions** Gradual Change/Wheel Spinning More human and/or lightning ignitions Fire Available Moisture Much warmer and drier Warmer and wetter WATER WARS IGNITE: gnitions **MEGAFIRE LOOMS:** Mega Mosaic/Riot & Revolution Fuel Build Up/Is Anyone Out There? Fewer human and/or lightning ignitions

Interactive Fire/Resource Mgmt Game



Interactive Fire/Resource Mgmt Game

Computer simulation modeling



Next Step: quantitative modeling

National Park
National Forest
Burned 2010-2050
High intensity burn

- FRID and FARSITE with random ignitions.
- Three 15 year periods.
- Use Fire Line Intensity to approximate high intensity fire.
- Different future climate scenarios have different ignition climates (warmer, wetter/ drier) and different numbers of ignitions.

Values/Objectives

- Ecosystem integrity (not individual species) of middle to high elevations
- Exception is giant sequoia, which retain high social value.
- Human infrastructure.
- Ecosystem services, especially water yield and carbon storage.
- Prevention of catastrophic wildfire identified as an objective to protect these values.
- Individual species habitat, such as Pacific fisher & CA spotted owl = lower priority.

Management Strategies:

Manage actively (facilitate transformation)

- Experiment with re-vegetation by watering seedlings.
- Plant resilient vegetation in mortality areas.
- Active planting to encourage growth of native grasses as shrublands convert to grasslands
- Plant giant sequoia in higher elevation areas.
- Invasive plant control for unwanted new invaders

Protect (increase resilience): Protect from future catastrophic wildfire & die-off with

thinning and prescribed burning.

Leave (restraint) - No action taken

ECOSYSTEM MANAGEMENT



Fire Burn Out: Much warmer/drier & more ignitions Big Problems Big Solutions: Effective leadership & high societal concern

Mgmt Prioritization Framework

Sequoia Grove	Social Value	Current risk	Relative future risk	Priority	Reason
Grant	High	Low	high	Low	High social value dictates protection of an area with high long-term exposure. Priority depends on FRID.
Grant	High	Moderate	high	High	
Evans	Low- mod?	high	low	High	Low future risk. Treatment now can make a difference in long-term.
Converse	Low- mod?	high	high	Low	In bad shape now and unlikely to persist in long- term
Big Stump	High	?	?	Moderate	High value for C storage.

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Consequences Summary

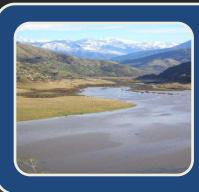
Large areas of forest maintained current vegetation
type, but some areas suffered substantial insect outbreaks, mortality, and crown fire. Shrub-lands colonize disturbed forests the lower end of the mid elevations.
Maintained Grant Grove. Evans Grove and Converse Groves maintained but at high risk to future loss. Lost Landslide Grove.
Protected Grant Grove and Hume Lake communities.
Water yield increased due to type conversions, but water quality decreased. Carbon storage – hard to assess.
Type conversions (shrublands to grasslands) were prevalent in low elevation areas. Management facilitated the transformation to native grasslands in small areas. Pacific fishers move up and out of the area.

Exercise Outcomes



Persistent Values

- Infrastructure & giant sequoia were most valued & targeted for protection.
- Still, loss of some infrastructure & giant sequoia were inevitable in most all scenarios. How do we decide where to prioritize protection?



Changing Values

- Water delivery & carbon storage are ecosystem services not mandated for NPS today, but their societal value skyrocketed in 2 scenarios and were mandated in one.
- How should we prepare for this possibility?



Trade-Offs

- Biodiversity and wildlife habitat consistently were valued below sequoia & infrastructure. Treatment allotments were not adequate to target them for protection.
- What trade-offs will we accept? What are the consequences?

And rapidly changing central cooperate Regionally What do we value? Where do we value it most? Most are current What are current

Where? When?)

+ VALUES

What strategies & tools accomplish the new objectives?

How vulnerable are these things? Where, when & why?

things?

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objectives? Do current objectives make sense? What are new objectives? & LEARN TOGETHER SUOD DAJEUS JNO BALLY