DRAFT - SUMMARY
STAKEHOLDER SCIENCE COMMITTEE MEETING
LAKE TAHOE WEST RESTORATION PARTNERSHIP

Tuesday, November 7, 9:00 am to 3:00 pm
North Tahoe Convention Center, 8318 N Lake Blvd, Kings Beach, CA 96143

All meeting materials are publicly available on the Lake Tahoe West website http://nationalforests.org/laketahoewest. For questions please contact the program manager/facilitator Sarah Di Vittorio at sdivittorio@nationalforests.org or (530) 902-8281.

Meeting Synopsis

The Lake Tahoe West Restoration Partnership (Lake Tahoe West) Stakeholder Science Committee (SSC) met on November 7, 2017, at the North Tahoe Event Center in Kings Beach. The meeting goals were to: (1) Review the role of "potential landscape restoration strategies" in Phase 2 modeling and learn about key considerations for development of the potential strategies; (2) Collect stakeholder input and ideas on which treatment approaches will be important to vary in the modeling in order to evaluate trade-offs; (3) Collect stakeholder input and ideas on construction of initial modeling strategies; and (4) Provide an update on the process and timeline for Phase 2 and completion of Phase 1. The next SSC meeting will take place on December 5, 10am – 4pm at the Lake Tahoe Basin Management Unit in South Lake Tahoe. The goal of the next SSC meeting will be to present the final Landscape Resilience Assessment and seek the Stakeholder Science Committee's recommendation for approval. The Interagency Design Team (IADT) will also provide an update on development of strategies for Phase 2 modeling.

Contents

Welcome, Agenda Review, and Introductions

Sarah Di Vittorio began the meeting with welcoming comments on the current state of the Lake Tahoe West project and overall goals for the day's meeting. The meeting was designed to focus

on initial stages of Phase 2, development of a Landscape Restoration Strategy. The goal of the next stakeholder committee meeting will be to wrap up Phase 1, development of the Landscape Resilience Assessment (LRA), by seeking the Stakeholder Science Committee recommendation for approval.

Ms. Di Vittorio also presented the 2018 LTW proposed meeting calendar. There were no objections to the proposed meeting schedule (*dates will generally follow the first-Tuesday pattern, except January and July*.)

- January 9 (time TBD)
- February 6 (time TBD)
- March 6 (time TBD)
- April 3 (time TBD)
- May 1 (time TBD)
- June 5 (time TBD)
- July 10 (time TBD)
- *No August meeting*
- September 4 (time TBD)
- October 2 (time TBD)
- November 6 (time TBD)
- December 4 (time TBD)

There were no interested party comments.

1. Phase 1 and Phase 2 – Status and Next Steps

Ms. Di Vittorio provided a brief status update on the timeline of transition from Phase 1 into Phase 2 of the Lake Tahoe West project.

- Phase 1 has taken longer to complete than anticipated (about 4 months behind schedule).
    - Executive Summary still needs to be finalized.
    - Ms. Di Vittorio will send the final LRA materials for stakeholder review one week prior to the 12/5 meeting.
    - At the 12/5 meeting we will ask:: what did we learn from LRA? And, how does this inform our Lake Tahoe West goals?
    - This will inform development of the Landscape Restoration Strategy in Phase 2.
- We have begun Phase 2, but results are needed from Phase 1 to develop potential strategies for modeling. The overlap is causing Phase 2 to also move slower than anticipated.
- The Core Team is remapping the Phase 2 timeline.

2. Lake Tahoe West Goals

Forest Schafer reviewed the LRA and how it may inform management goals of the Lake Tahoe West project.

- The following LTW goals were distilled from the Essential Management Questions developed by the Interagency Design Team and Stakeholder Science Committee:
  1. Restore an ecological fire regime while protecting life and property and maintaining water quality.
  2. Minimize impacts to air quality from prescribed burning restoration treatments.
  3. Restore vegetative structural heterogeneity and species composition.
  4. Maintain and restore wildlife populations and habitat (including plants and animals).
  5. Maintain and restore water supplies and associated snowpack.
  6. Maintain and restore appropriate carbon dynamics.
  7. Take advantage of opportunities for restoration and recreation to benefit one another.

Mr. Schafer provided examples of how the LRA findings may be used add specificity to these LRA goals (see attached presentation slides).

Discussion followed:

- This would also be a good place to bring in the air quality indicator – call out thresholds based on goals.
- Q: What is the role of these goals?
  - Ms. Di Vittorio: They are to help us ensure we stay on the same page about what we are planning for and to help us get more specific.
- Patrick Wright, California Tahoe Conservancy: Some of these are outcome based, some are not. I would encourage the group to develop outcome-based goals and to share withthe Executive Team.
  - Mr. Schafer: The Executive Team should be aware of the goals. The goals come from the management questions, and will be refined as LRA progresses, with the intention of making them more accurate and data driven.
- It might be a good idea to look at California's statewide goals, and potentially align/make adjustments to them. This would be especially beneficial from a funding perspective.
- We need to translate the goals down to metrics. There may be some tensions that need to be resolved – are we talking about resilience of natural ecosystems? Of socioecological systems?
- Q: Should the air quality indicator goal be around minimizing impacts to human health?
- The essential management questions could simply be turned around directly into statements which reflect the management goals.

3. Role and Features of "Potential Landscape Restoration Strategies" in LTW Phase 2 Modeling

Jonathon Long explained how potential landscape restoration strategies used in Phase 2 LANDIS modelingand discussed considerations for development of the strategies (see attached presentation slides):

- LANDIS modeling will incorporate major disturbances and dynamic processes, including climate change (CC).
- The current plan is to have 10 model runs:
    - 5 strategies x 2 climate scenarios (high and low CC).
- High contrast in the modeling strategies will best show differences in results of different treatment strategies and help us learn.
    - Fine scale treatment impacts may not show up in modeling, especially considering that the modeling timeframe is 50-100 years.
    - The group will address questions at broad or fine scale as appropriate.
- Mr. Long presented issues that could affect modeling for the group to prioritize and bin, with the goal of selecting the ones that are most important to concentrate on.
- We know we need "No Action" and "Business As Usual" strategies to serve as baselines.
    - (1) No action:
        - No further treatments.
        - Continued suppression of ignitions.
    - (2) Business as usual (BAU):
        - Focus on fuels reductions treatments in WUI.
        - Reliance on pile burning with limited understory burning.
        - Minimal managed wildfire.
- We need to decide how to develop contrasting management strategies. One approach would be to model high mechanical treatment and high prescribed fire treatment as contrasting strategies.
- We can use sensitivity analysis to test the effect of approaches such as biomass utilization vs. pile burning, treating in special habitat areas, salvage and replanting after fire, and treating on steep slopes.
- Timeline:
    - Baseline LANDIS modeling now through the end of 2017 while new management strategies are being formulated.
    - Presentation of initial results of some non-LANDIS models; engagement with managers (~January)
    - 1st quarter of 2018, LANDIS-II modeling of treatments for vegetation and fire and fuels, followed by subsidiary modeling of fire, wildlife, and air
    - Presentation of modeling results from management scenarios (~April)
    - Refine management strategy

Discussion followed. Questions were addressed by Mr. Long unless otherwise indicated:

Regarding model scale:

- Q: What is fine scale and what is large scale in the modeling?
    - 3 scales: Landscape scale (LANDIS), watershed scale (air/smoke, water quality/quantity), and fine-scale (e.g. specific thinning approach).
- Q: What would be the smallest treatment size relevant to LANDIS?
    - In theory, it goes down to one hectare, but something that small likely would not show up that well. Looking at treatments at a larger scale.
- Q: Are there plans to make adjustments to modeling/strategies after some have been run?
    - Yes, though there are limitations to how many iterations we can run.
- Q: We will likely want to implement combinations of different treatments – how will this fit into modeling and results?

Regarding potential treatment constraints and how LANDIS will handle them:

- Q: Will we be able to tell how much of the landscape can be treated with these constraints?
    - Yes, but there are some caveats – for example, it depends on which roads are reopened, which needs to be defined.
- Some of these constraints may overlap with "high hanging fruit." Part of the goal of LTW is to see where we can go beyond traditional constraints to address what is most needed on the landscape, rather than just going for the low hanging fruit.
- It would be helpful to have a clear list of what we agree are constraints to would help clarify terminology.
- We discussed the possibility of "no constraints," but haven't flushed out exactly what that looks like.
- What is a hard constraint? What is a soft constraint? What are we will to be flexible on?
- Q: Are roads a constraint?
    - Brian Garrett, Forest Service: Roads are a constraint because the west shore has lots of steep slopes and limited road networks. Roads are typically needed for any most treatment options (thinning, fire, etc.).
- How do we allow room for managers to take risks (treat with fire and without roads)?
- It would be valuable to also define where we should not be flexible on constraints.
    - Mr. Long: We need to know how constraints will be treated in order to run the model. Early on we want something as high contrast and simple as possible, and then we can add in the complexities.
- Q: Does LANDIS inform how to treat or just what treatment to use?
    - LANDIS will help inform some of this and treatments can get further specified through the model iterations. However, LANDIS operates at a relatively coarse scale and will be better answered by other models that work at finer scales. "How to treat" can be more of a finer scale question.
- Q: Could LANDIS be used as sort of an optimization model to determine best places for prescribed fire (where are ignitions most likely? where are we placing fire containers?)?

    - Mr. Long: Fire weather will have to come into the analysis to do this. LANDIS does not do that.
- Q: Do you think, if we had information on fire container locations, it would be able to feed into analysis?
    - We may want to keep things high contrast and less complex – base strategies on elevations, ecological communities, etc.
- LANDIS is an ecological model - it should be used to inform ecological indicators.

Regarding the idea of using high mechanical treatment and high prescribed fire treatment as the two contrasting strategies for the modeling (as suggested by Mr. Long in the above presentation):

- As an alternative to the "high fire versus high mechanical treatment" option, we could also develop scenarios as "goal oriented" toward ecosystem services.
- Biomass versus pile burning:
    - To increase contrast, the "Expanded Treatment - High mechanical" strategy should assume biomass removal instead of pile burning. Biomass removal would require more roads. High fire would use fewer roads and could be done more strategically (ex. use ridgelines).
    - Follow-up discussion acknowledged the tension between having realistic strategies and creating contrasts in the modeling.
    - Mr. Garrett: There are two points to consider: (1) If you went the route of no pile burning, you may severely limit where treatment can occur; (2) The contrast would come in with respect to the amount of treatment that is occurring.
- Mr. Wright: Keep in mind that the goals of modeling are to: (1) inform a strategy, (2) show differences, and (3) show benefits. We have to be able to show the benefits, this is what grant programs want to see.
- Q: The BAU scenario is very heavily focused on fuel reductions – it is almost goal oriented. Perhaps we should look at more goal oriented strategies?
    - This would be possible, but the two expanded strategies are also different because they go beyond the WUI and are over a much larger area
    - Differences between "Restoration" (i.e., through mechanical treatments) and "Fire" oriented treatments have been modeled before, and have not shown much contrast.
- Q: Where does economics (cost) come into the modeling of biomass removal treatments?
    - Mr. Long: It could be incorporated by distance to facility, distance to roads, etc. We were not planning on including that much detail, but we could look at building that in if desired.
- Q: Are the differences between the two treatments (high fire versus high mechanical treatment) sharp enough?
    - There will be differences spatially in where treatments occur - fire will probably be mostly used at higher elevation. We would need to discuss this further.

- Q: Whatever our strategies are, we need to "own" them. We need to decide how much we are willing to live with. Perhaps we may need to just accept living with smoke, for example. We should use modeling to decide where to treat and extent of treatment – what's ideal? What's realistic?
- Q: What about soil conditions? What are the effects of mechanical removal and Rx fire on soils/nutrients? What are the long-term/short-term tradeoffs of treatment options?
- Mr. Long: Previous analyses have looked at what management actions need to be taken to get to historical fire frequency - you have to pull out all the stops (mechanical treatment, prescribed fire, etc.). We have to consider not just what to do, but the intensity necessary to achieve our goals.

4. How Would You "Pin the Corners"?

Ms. Di Vittorio led a discussion to collect stakeholder input and ideas on which treatment approaches will be important to vary in the modeling in order to evaluate tradeoffs.

- The group identified the following potential contrasts:
    - High fire vs. High mechanical (as proposed by Mr. Long, above)
    - Resilience/Benefits vs. Risk reduction (Goal oriented)
    - Pace and scale of restoration
    - Treatment intensity level
    - Biomass utilization vs. Pile burning
    - Fire risk vs. Restorations

In generating the above list, the following discussion occurred:

- We should link resilience and desired conditions with respect to the pinned corners. The "hows" (management strategies) should be linked to the "whats" (management goals).
- In thinking about resilience, we should consider how much uncertainty there will be in climate.
- Pacing and intensity of treatment is extremely limited by resources.
- Both "high fire" and "high mechanical" strategies have hurdles to overcome. The "high fire" strategy must overcome public perception, while "high mechanical" will have to overcome an absence of markets for the byproduct.
- Opening roads will come with costs of opening, maintaining, etc., as well as ecological costs. Will our modeling account for this?
    - Mr. Long: This is being considered - the economics team will endeavor to find information on costs.
- There is a huge water quality cost of having roads; it may not be worth it to open any roads.
- Roads, including road that could potentially be reopened, are identified and classified in the water quality modeling. Could it be possible to input potential road openings into a hierarchical structure in LANDIS?
    - Mr. Long: This could be possible in later modeling, if we want to get into those complexities.

- The main question is - how much of the landscape do we really need to affect to get us to a resilient landscape? Consideration of the economic questions and constraints would be further down the road, as necessary.
    - This could be one of the corners.
- There are 3 issues: (1) Fire/Mechanical; (2) How much do you treat; (3) Pacing/How fast?
    - These could serve as 3 axis and map out to 8 scenarios
    - If you tested the 8 scenarios → Will help figure out which of these 3 is really driving resilience
- There has been a lot of talk about increasing pace and scale of restoration. This could be a framework for it.
- Q: Would it be useful to have a middle ground of intensity of treatment?
    - Mr. Garrett: The middle ground comes in after you have results and are taking constraints into account.
- Pitting fire against mechanical treatment is concerning when we know we are going to have to use multiple methods. Perhaps one of the corners should be treat all ways, with best tools, as much as possible.
    - Yes, and perhaps another corner could be treating what is realistic under current constraints.
- Q: Could pace/scale be worked into a lever to be switched on/off in LANDIS modeling?
    - Mr. Long: This could feed into LANDIS really well, if these corners (everything, everywhere) can be defined.
- Assuming BAU represents WUI treatments given constraints that we currently have, this would be 2/3 of the landscape, leaving only 1/3 for differences. But perhaps some of the changes would occur within the WUI to increase contrasts.
- Location could be another axis.
- It would be useful to develop a matrix of all options and then select which are most interesting and informative to model.
- Mr. Long: To get to the possibilities matrix, think about what outcomes we want to achieve, and use that as a corner. Then, think about what the strategies we could use to get to that corner.
- Mr. Long: We do not need to treat 100% of the landscape to get to resilience. How much do we need to in order to get there?

5. Small Group Exercise on Building Strategies

The committee organized themselves into four breakout groups to explore how to build contrasting strategies for modeling. Each group explored one of the following concepts/contrasts:

- High fire vs. high mechanical.
- Ecological benefits vs. risk reduction.
- Pace and scale.
- Full treatment, with constraints vs. full treatment, without constraints.

The groups were asked to address the following questions in building their contrasting strategies:

A. What areas of the landscape would be prioritized for management treatments in the next 10 years? (Please specify/distinguish among thinning and fire treatments)

B. What would be the intended treatment objectives? (e.g., effects on vegetation structure, composition, and fuels)

C. What other elements should be considered or incorporated into this strategic approach for it to be informative?

Mr. Garrett presented vegetation and treatment maps for the breakout groups to help in placing planning actions.

Following the small-group discussions, each group reported out on their results, as follows:

Group 1: High fire vs. High mechanical

	Group 1	
	High Fire	High Mechanical
Prioritized Areas	*Fire containters *Meadows & streams *Edges of wilderness *Highly roaded areas (good opp for Rx fire) *More Rx fire outside the WUI	*Anywhere groud-based equipment would be possible (<30% slope, relax constraint?) *Cable yard where roads and high slope *Helicopter log eslewhere, when possible *Increase utilization of existing roads and ghosts roads where possible, or build new roads
Treatment Objectives	*Manage surface fuel loads *Create gaps of tree mortality *Save large trees	*Move towards old growth forest development *Create clumps gaps *Create heterogeneity *Focus on treating low hanging fruit (furthest/fastest) and mid seral stage

Group 2: Benefits vs. Risk reduction (Ecological resilience vs. community fire protection)

	Group 2	
	Ecological Benefits	Risk Reduction
Prioritized Areas	*Areas not resilient to fire: riparian areas, canyons with floodplains, others *Initial treatment in these areas likely to be mechnical	*Similar to BAU (WUI), but expanded *Canyons/ridgetops *Incoporate SEZs, roads *Treatments more linear, and similar across all areas (homogeneous)
Treatment Objectives	*Increase structural and compositional diversity of forest, especially in context of overrepresented ecoystems *Increase diversity, soil resilience and water quality through restoration of meadow and riparian ecoystems	*Maximize opportunities for fire control *Minimize fire severity across the landscape *Maximize air/water quality *Focus on surface fuel and thinning from below *Minimize smoke impacts through use of mechanical treatments *Minimize ember intrusion and control unwanted wildfire

Group 3: Pace and scale

	Group 3
	Pace and Scale
Prioritized Areas	*Class 3 areas from FRID fire departure layer
Treatment Objectives	*Four approaches: Slow Pace & Fast Pace (2,500 ac/yr vs. 5,000 ac/yr) X Small Scale & Large Scale (10 years vs. 20 years) *Use fire return interval by forest type to set a disturbance rate and determine how much to treat (3,000 ac/yr for Jeffery Pine) *Fast pace could be a signicant ecological disturbance, and may help us identify areas we may want to go easier on.

Group 4: Full treatment, with constraints vs. Full treatment, without constraints

	Group 4	
	Full Treatment w/ Constraints	Full Treatment w/o Constraints
Prioritized Areas	*Areas that have large, high severity patch sizes *Areas that build fire containers *Fill in any gaps in the WUI *Outside WUI where not bound by any constraints	*Similar areas to prioritize, focus on fire containers and high severity patches, but: *More aspen, meadow, and riparian areas (SEZs) *Greater use of roads *More treatments like helicopters *More Rx wildfire
Treatment Objectives	*Reduced fire risk *Habitat improvement *Lower density in basal area *Water quality protection *Increased spatial heterogeneity *Increased resilience	*Similar to "w/ contraints"

Discussion followed:

- When discussing pace and scale, moving slowly is not realistic, especially considering that LTW has a time constraint of 10 years. Is it more about what areas are prioritized?
- Mr. Long: There are a lot of synergies in what areas the groups chose to prioritize (ex. fire containers, meadows and riparian areas, etc.).
    - Discussion about SEZs was also useful.
- Mr. Shaw explained the distinction between the concepts of fire return interval and fire rotation, as related to the pace/scale group's discussion of disturbance frequency.
    - Fire return interval is defined across a landscape. If a fire return interval is 7-10 years, the entire landscape might take 200 years to be fully disturbed.
    - The calculation for the amount of area to treat can vary significantly based on how you define fire return interval. The pace/scale group was using this concept in a way that translated into much more frequent treatment.
    - "Catching up" (i.e., using a faster restoration pace now to make up for slow pace of the past) is another important notion that came out of the Pace/Scale group.
- It is ok to use FRID as a guide, but be careful not to just go after the hotspots of high departure. There are areas that we could restore more efficiently and effectively than the hotspots, giving us a better bang for our buck. There are other areas that could be leveraged to better meet management goals (meadows etc.).
- Outlining a robust monitoring effort is important to inform if we are having effects we did not anticipate. There is only so much area you can treat without hurting a species. Modeling efforts might help us to determine where those thresholds/areas of concern might be.

Ms. Di Vittorio explained that the Interagency Design Team (IADT) will use the ideas generated from this meeting to develop the contrasting modeling strategies, and will present those to the Stakeholder Science Committee at a future meeting (likely in January).

- Once modeling is being done, interaction with IADT and SSC should be more frequent. What is the best vehicle for this – could we use webinars?
    - The group noted a preference for in-person meetings but that focused one-hour calls could also be useful.
- Ms. Di Vittorio: we are at a transition point in this project, where there are many uncertainties about what the next steps look like. We are working to develop a more complete process map and timeline.
- Mr. Long: It will be important for the LANDIS group to present on results for the first BAU scenario so that the group can understand model inputs/outputs.
- We should invite the Environmental Review Team to engage in strategies development. The Environmental Review team could provide good feedback and insights, and it may also benefit their process.

Closing Remarks

Ms. Di Vittorio thanked everyone for a productive meeting, calling attention to the engagement, commitment, hard work, and focus of the group as a whole. The next Stakeholder Science Committee Meeting will be December 5, from 10am to 4pm at the Lake Tahoe Basin Management Unit, 35 College Dr, South Lake Tahoe, CA 96150.

There were no interested party comments.

Meeting Attendees

Organizing and Participating Agencies
CTC – California Tahoe Conservancy
NFF – National Forest Foundation
State Parks – California State Parks
TFFT – Tahoe Fire and Fuels Team
USFS LTBMU – U.S. Forest Service Lake Tahoe Basin Management Unit
USFS PNW – U.S. Forest Service Pacific Northwest Research Station
USFS PSW – U.S. Forest Service Pacific Southwest Research Station

Stakeholder Science Committee Members

1. Jeff Brown
2. Jennifer Quashnick
3. Matt Freitas
4. Tricia Maloney
5. Sue Britting

Staff

6. Brian Garrett, USFS LTBMU
7. Daniel Shaw, State Parks

8. Forest Schafer, TFFT
9. Jason Vasques, CTC
10. Jen Greenberg, CTC
11. Jonathan Long, USFS PNW
12. Patrick Wright, CTC
13. Randy Striplin, USFS LTBMU
14. Sarah DiVittorio, NFF
15. Evan Ritzinger, NFF
16. Stephanie Coppeto, USFS LTBMU
17. Whitney Brennan, CTC
18. Keith Slauson, USFS PNW
19. Eric Abelson, USFS PSW
20. Patrick Wright, CTC
21. Amy Jirka, TFFT

Interested Parties from the Public
none

Appendix: Presentation slides

Presentation slides are included on the following pages for presentations by:

1. Forest Schafer (*Topic: Lake Tahoe West Goals*)
2. Jonathan Long (*Topic: Role and Features of "Potential Landscape Restoration Strategies" in LTW Phase 2 Modeling*)

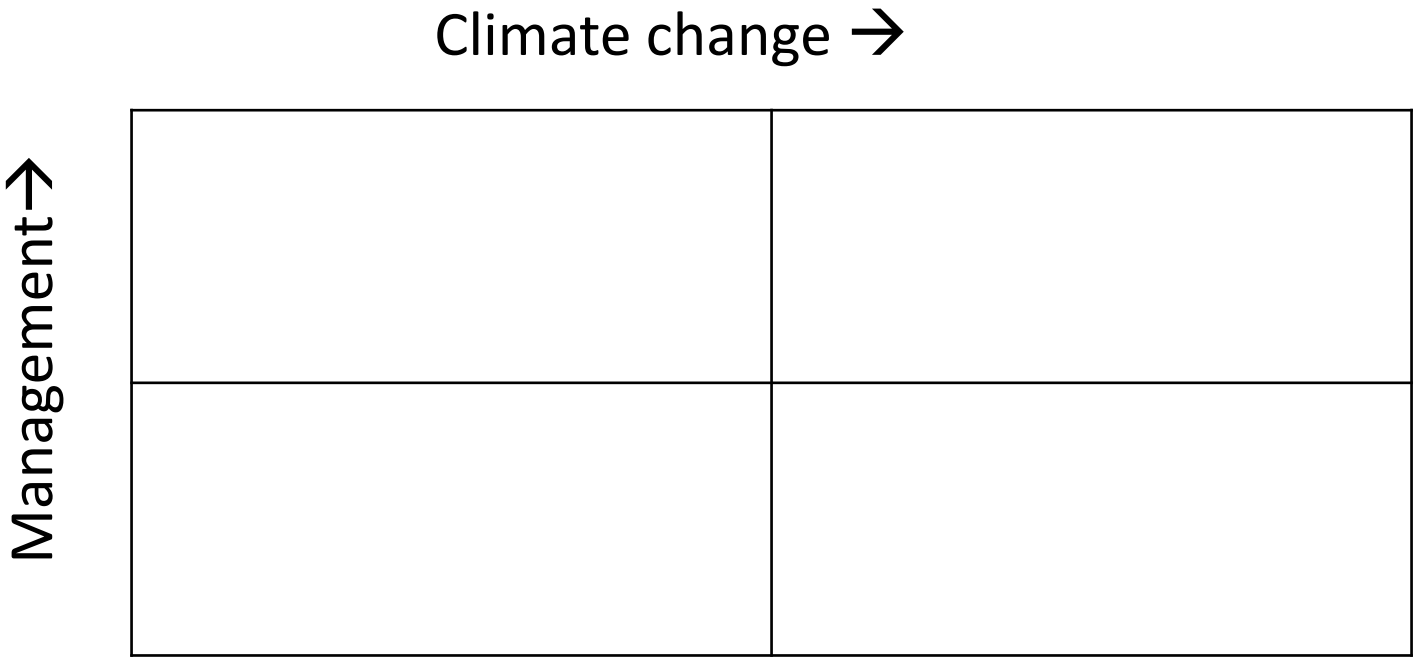
Science Stakeholder Meeting
Lake Tahoe West Restoration Partnership

Jonathan Long

7 November 2017

Modeling Scenarios

Combinations of Basic Management Strategies and Climate Change Scenarios



Big Picture Landscape Modeling

- Longer term, broad landscape picture that incorporates major disturbances and dynamic processes, including climate change
- Current plans for 10 “scenarios” for landscape modeling (→ ~5 management strategies X 2 climate scenarios)
- Need high contrast scenarios to promote learning (“pin the corners”)
- Address questions at broad or fine scale as appropriate

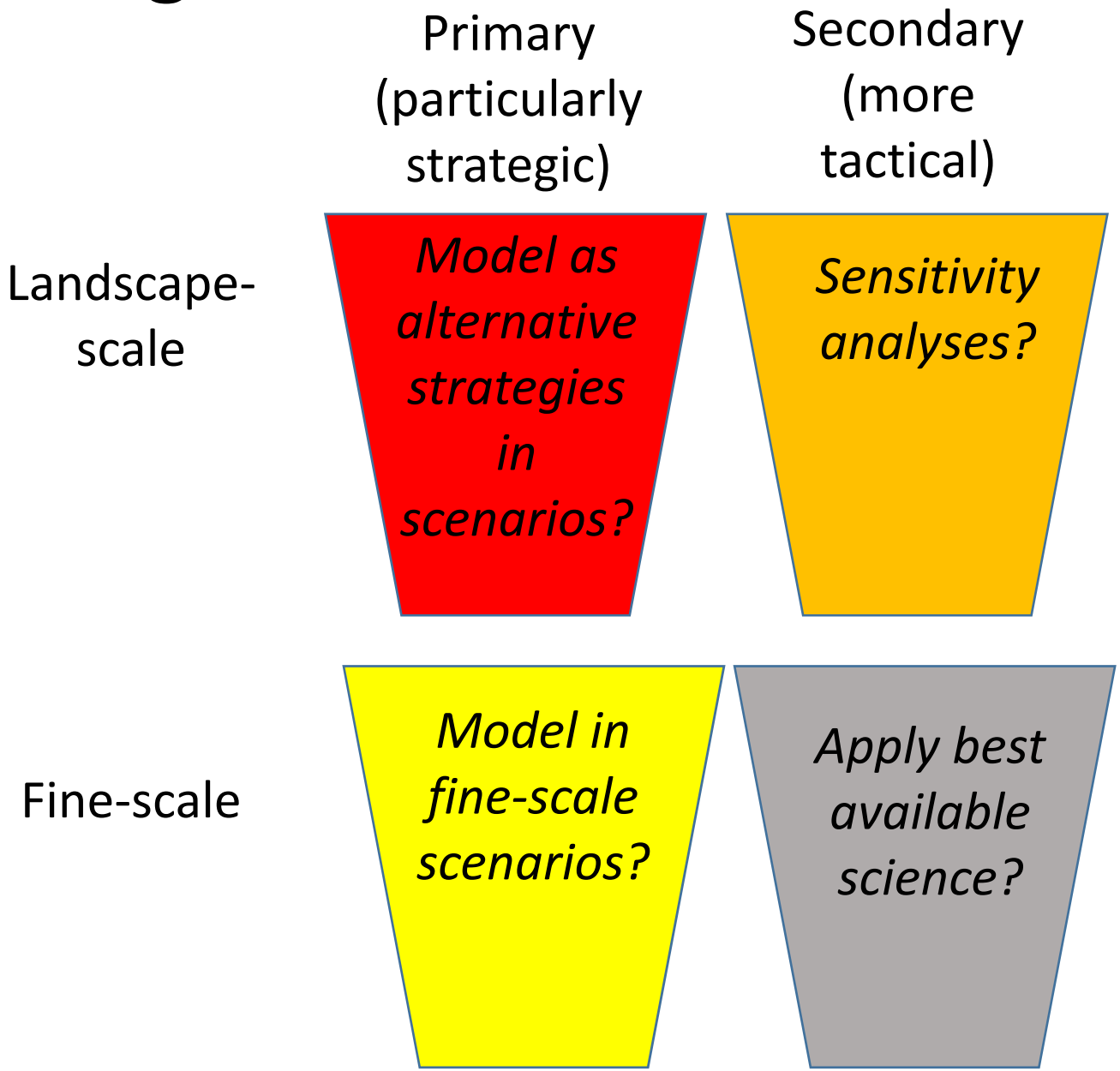
Scales and Tools for Modeling

Scale	Modeling Tools	Needed Inputs
Landscape scale, decadal scale change over time	*Vegetation and disturbances* Carbon (carbon stocks and biomass burning emissions) (LANDIS) Wildlife habitat (biodiversity-functional groups and old-forest species)	Frequency, timing (e.g. season and/or weather), location, and planned effects of treatments on vegetation structure, composition, and fuels
Watershed-scale, comparison of disturbance events	Air/smoke modeling Water quality Water quantity Old forest species	Extent and timing of treatments within watershed areas
Fine-scale, disturbance event	Fine-scale fire Fine-scale snow pack	Details on thinning treatments (gap size, trees to be removed)

Potential Issues to Prioritize/Bin

- using managed wildfire
- using large scale prescribed fires
- using pile burns and biomass removal
- reopening roads
- building or widening roads
- mechanically treating steep slopes
- treating upper montane forests
- treatments around downhill ski resorts
- treating conifer invasion in meadows and aspen stands
- creating forest gaps and within-stand variability (clumps/gaps)
- treating owl and goshawk PACs or other special wildlife areas
- diameter limits
- treatments in riparian areas/SEZs
- post-fire treatments (salvage, shrub control, replanting)

Sorting Issues



Basic Management Strategies

- Frequency, timing (e.g. season and/or weather), location, and planned effects of treatments on vegetation structure, composition, and fuels
- Treatments theoretically can include any type of harvest and burning that can be specified (including managing wildfire for resource objectives)

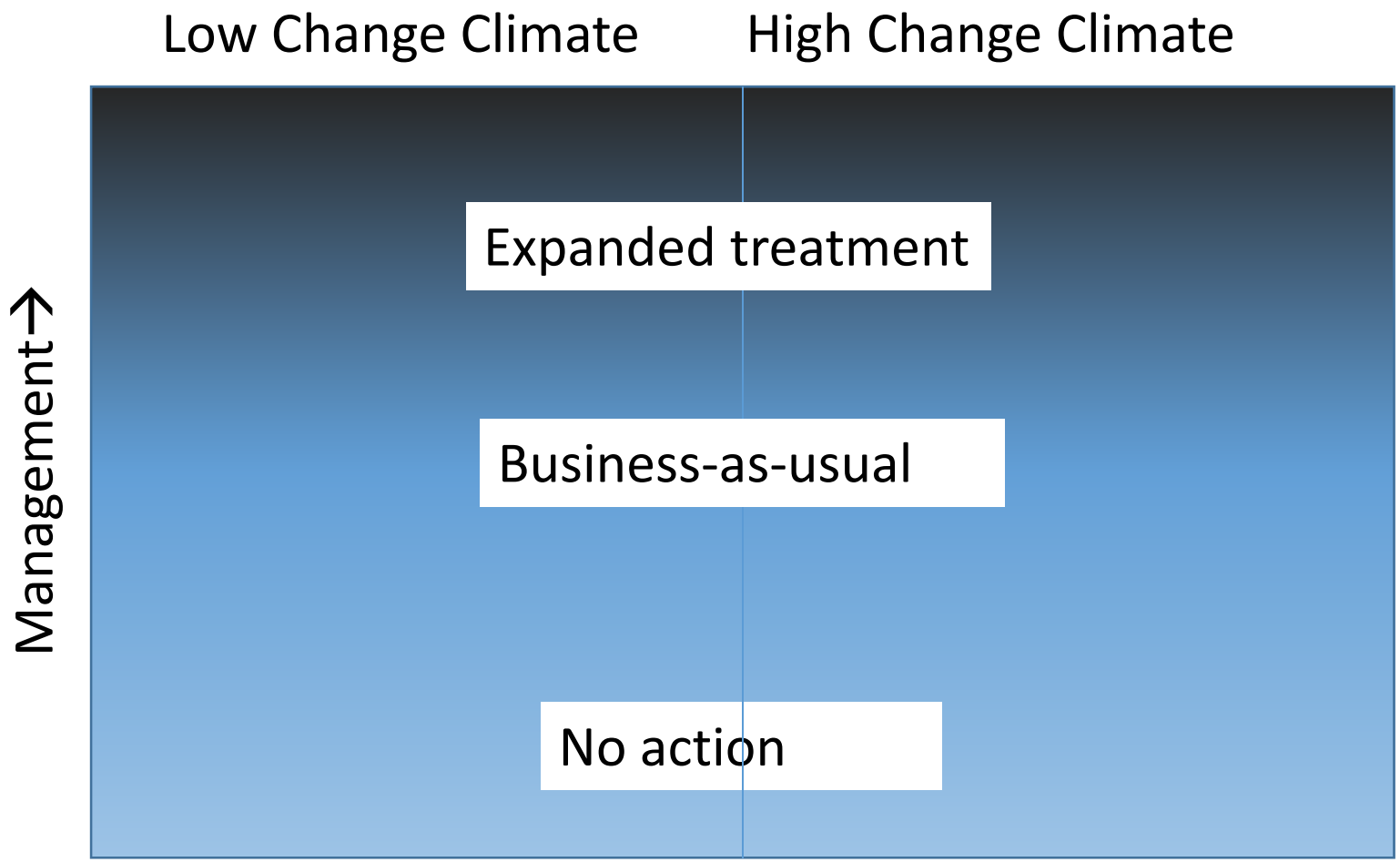
Framing Questions for Landscape Modeling from LANDIS Subteam

- In general where do you expect management to be more intensive across the landscape in the coming decades?
- If two stands are similar, how do you determine which one gets treated? (e.g., rules rather than maps)
- How big an area is treated at a time? Does this change depending on the objectives of the treatment?
- What tree species are generally targeted for fuels reductions? Are these the same species that are targeted for restoration objectives?
- What are the technical or legal restraints on where or how treatments take place (e.g. DBH limitations)?
- What are some other management or strategic objectives besides hazardous fuels reductions? How are those objectives prioritized?
- What areas are prioritized for fire suppression? How are those areas ranked?
- What areas are prioritized for prescribed fire in the coming decades?

Data Needs for Landscape modeling by LANDIS Subteam

- Maps of past and future planned management activities
- Maps of management areas
- Total acres-treated targets per year and decade by treatment type and scenario
- Average/minimum/maximum size of treated areas
- Decision matrix documents outlining conditions for fuel treatment type(s)
- Details from land management plans that detail target species and ages for fuels reduction, ecological restoration, forest health treatments, etc.
- Details from land management plans that detail areas for prescribed fire
- Description (0-1) of suppression level efforts of the various identified suppression zones

Modeling Scenarios



Contrasting Landscape Strategies

1) No Action

No further treatments

Continued suppression of ignitions

2) Business-as-Usual

Focus on fuel reduction treatments (thinning white fir, reducing ladder fuels) in WUI areas

Reliance on pile burning with limited understory burning

Minimal managed wildfires

Contrasting Landscape Strategies

3) High Mechanical

Expanded fuel reduction and restoration treatments (thinning dense stands to favor pines and create openings)

→Considerable pile burning (or removal for biomass utilization where feasible)

Some expanded understory burning as follow-up treatment

More treatments in aspen areas and meadows?

More treatments on steep slopes?

More treatments at higher elevations?

More roads?

4) High Fire

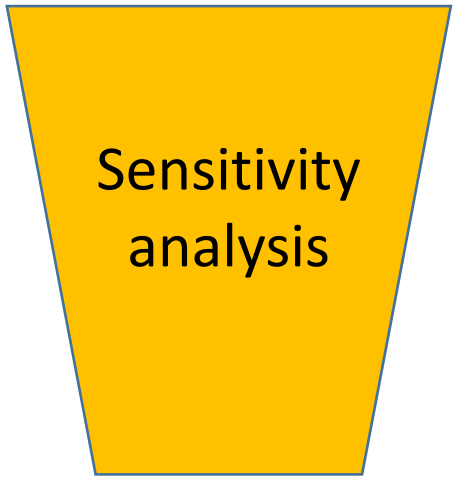
Managed wildfires, likely at upper elevations initially

Using thinning treatments to facilitate large prescribed fires and/or managed wildfires in non-WUI areas

Greater tree mortality from fire treatments (not simply reducing surface fuels)

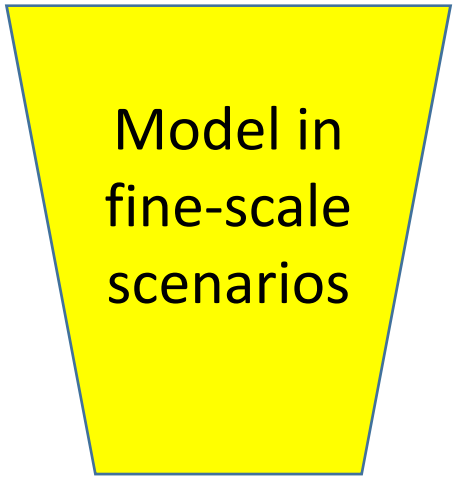
More frequent smoke episodes (but managed to mitigate daily impacts)

Secondary Landscape-scale Issues



- Extent of biomass utilization versus pile burning
- Special habitat areas
- Salvage and replanting after fire

Fine-scale Modeling

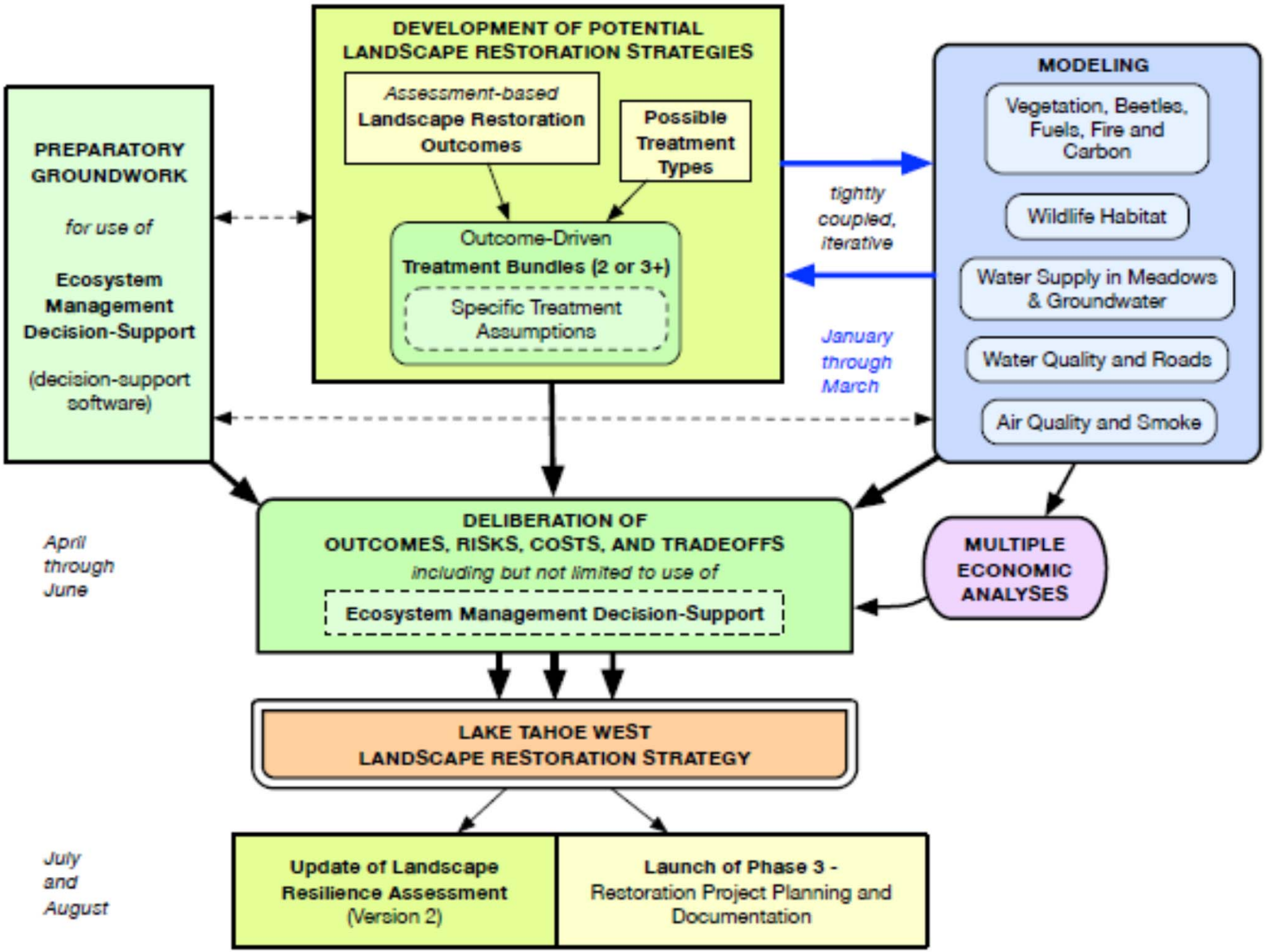


In riparian areas and uplands

- Size and configuration of gaps and other thinning (biomass removal) at stand-scales
- Tree diameter or age limits

Fine-scale issues not planned in modeling

- Fish habitat
- Stream morphology
- Mycorrhizae
- In-forest black carbon (charcoal) dynamics


DEVELOPMENT OF POTENTIAL LANDSCAPE RESTORATION STRATEGIES
Assessment-based Landscape Restoration Outcomes
Possible Treatment Types
Outcome-Driven Treatment Bundles (2 or 3+)
Specific Treatment Assumptions
PREPARATORY GROUNDWORK
for use of
Ecosystem Management Decision-Support
(decision-support software)
MODELING
Vegetation, Beetles, Fuels, Fire and Carbon
Wildlife Habitat
Water Supply in Meadows & Groundwater
Water Quality and Roads
Air Quality and Smoke
tightly coupled, iterative
January through March
DELIBERATION OF OUTCOMES, RISKS, COSTS, AND TRADEOFFS
including but not limited to use of
Ecosystem Management Decision-Support
MULTIPLE ECONOMIC ANALYSES
April through June
LAKE TAHOE WEST LANDSCAPE RESTORATION STRATEGY
Update of Landscape Resilience Assessment (Version 2)
Launch of Phase 3 - Restoration Project Planning and Documentation
July and August

Time Frame

- Baseline LANDIS modeling now through the end of 2017 while new management strategies are being formulated.
- Some teams are likely to have additional results
- Presentation of those results and engagement with managers (~January)
- 1st quarter of 2018, LANDIS-II modeling of treatments for vegetation and fire and fuels, followed by subsidiary modeling of fire, wildlife, and air
- Presentation of modeling results from management scenarios (~April)
- Refine management strategy

Possible Distinctions between Fire-centric and Mechanical-centric Strategies (besides smoke)

Mechanical	**Fire**
Targeting species and size classes for removal	Wider effects on species and tree sizes
Potential for removal of biomass as wood products	More intense fire effects, especially from managed fires
Greater dependence on road network	More effects at higher elevations