DRAFT SUMMARY

STAKEHOLDER SCIENCE COMMITTEE MEETING

LAKE TAHOE WEST RESTORATION PARTNERSHIP

Tuesday, November 14, 2018, 9:00 am to 3:00 pm
Tahoe Regional Planning Agency, 128 Market St, Stateline, NV 89410

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 (LTW) Stakeholder Science Committee (SSC) met on November 14, 2018, from 9:00am to 3:00pm at the Tahoe Regional Planning Agency (TRPA) in Stateline, Nevada. Meeting objectives were to: (1) Share and discuss results of landscape modeling and economics analysis for the Lake Tahoe West project; (2) Build understanding of the decision model component of the Ecosystem Management Decision Support (EMDS) tool, how it is structured, and its role in the Lake Tahoe West process, and prepare participants to engage in an online weighting exercise for the decision model; and (3) Share the draft EMDS logic model, including criteria, targets, and overall structure/hierarchy.

Contents

Welcome, Agenda Review, and Introductions

Sarah Di Vittorio opened the meeting by reviewing the meeting agenda and leading introductions. Stakeholders reviewed general business items:

- Modeling results should be wrapped up by the end of the year. January will be spent writing the Strategy.
- The Core Team, Design Team, and Environmental Review Team have been working on preparatory steps and an approach to Environmental Documentation/Planning, which will be ready to share in late winter / early spring of 2019.
- **AGREEMENT**: Stakeholders approved Stakeholder Meeting Summaries for July, August, September, and October, with a few minor corrections:
    - October 22 should be October 2.
    - Change “Heavenly Valley” to “High Meadows” in September Meeting Summary.

- The February Stakeholder meeting conflicts with a wildlife workshop, and may need to be rescheduled.

1. Ecosystem Management Decision Support (EMDS) Part A:

Eric Abelson performed an introductory review of the Ecosystem Management Decision Support (EMDS) tool, followed with a presentation on the two main components of EMDS, the Logic Model and the Decision Model.

- The overall goal of EMDS is to collaboratively provide defensible and transparent guidance (not an "answer") to help weigh costs and benefits of different management scenarios (the four management scenarios we are modeling in Lake Tahoe West).
- Representing LTW data in the EMDS is a challenge because of the extensive amount of data. There are over 800 analyses (and many more sub-analyses) from 100 years of data, with 4 management scenarios, and over 20 landscape attributes.
- EMDS synthesizes these many factors into single platform, and allows one to view and compare scenario performance over time.

Logic Model
The goal of the Logic Model is to assess the landscape's condition in each modeling Scenario using variables that inform our understanding of landscape conditions. To do this, the Logic Model takes each model output, for each scenario and at each timestep, and assigns a ranking of -1 to 1 (not at all resilient to highly resilient). The modeler may define these rankings using discrete or continuous functional descriptions.

Forest Schafer presented a draft version of the LTW Logic Model:

- Proposition: "The landscape is resilient."
- Primary dependencies: Functional Fire, Upland Vegetation Health, WUI Fire, Carbon, Water Quality, Wildlife Conservation and Air Quality (along with many sub-dependencies).
- De-facto weighting: if there are three sub-dependencies, each receives a 1/3 weight.
- Functional Fire sub-dependencies:
    - Landscape Burned %
        - Low/No Severity, Moderate Severity, High Severity.
    - High Severity Patches
- Upland Vegetation Health sub-dependencies:
    - Forests
        - Seral composition (Early, Mid-, and Late) and species composition. Each species has a range of values for resilience specific to each seral class.
    - Shrubs
    - Large Tree Abundance
- WUI Fire sub-dependencies:

    - Defense Zone
        - Moderate severity fire and high severity fire.
    - Threat Zone
        - Moderate severity fire and high severity fire.
            - More tolerance for some level of moderate and high severity fire than in Defense Zone.
- Carbon sub-dependencies:
    - Carbon Sequestration
- Water Quality sub-dependencies:
    - Fine Sediment
        - In Progress.
    - Phosphorus Load
        - In Progress.
- Wildlife Conservation sub-dependencies:
    - Ecological Function
        - Insectivores, Herbivores, Seed/Spore Dispersers, Scavengers, Decomposers, Soil Aerators.
            - Uses a ratio of the current species on the landscape.
    - Species Richness
    - Species Diversity
        - Early Seral, Mid-Seral, Late Seral.
    - Apex Predators
        - Spotted Owl, Northern Goshawk, Early Seral.
- Air Quality:
    - Smoke Duration
        - Moderate Impact Days, High Impact Days, Extreme Impact Days.
            - Takes minimum resilience value of each of the three categories.

<u>Questions/comments:</u>

- Q: Are all relationships utilizing unions? Are there any “kill-switches”?
    - All relationships utilize unions, except one.
    - Other approaches may be explored (ex. defined weighting vs. de-facto weighting).
- Q: Does “Functional Fire” include Defense and Threat Zones?
    - Yes, it includes all zones.
    - It could cancel out some of the negative implications of the ‘WUI Fire’ results, depending on where the fire is.
- Q: Are No Fire and Low Severity Fire lumped together in “Functional Fire”?
    - Yes. They are lumped together because LANDIS cannot distinguish between areas left unburned/burned within a pixel.
- Q: What is the distinction between Late Seral and Large Tree Abundance in “Upland Vegetation Health”?
    - Shrubs and Large Tree Abundance were two of the LANDIS outputs.

    - Seral Stage was an addition.
        - The Science and Design Team are not sure what the Shrub and Large Tree Abundance data will look like - they may or may not be included. If not, just Seral Stage will be used.
    - There may be significant overlap. At the same time, there may be some areas that are classified as Early Seral, but still have some large trees.
- The Design Team is still developing the logic model curves.
- **ACTION ITEM**: **The Design Team** will explore the relations between seral stage, shrub, and large tree abundance in LANDIS outputs/EMDS.

Temporal Analysis

- Preliminary Result: Climate change has more of an effect than land management. Shorter time frames for some variables could be advantageous for determining the impact of land management strategies. Adaptive management will occur.
- We are working through the modeling results to understand which factors are most influenced by different scenarios. At first blush the scenarios often do not seem to vary greatly, but when we dive into the data we start to find some important differences.

Questions/comments:

- Q: What is the ideal timeframe for analyzing variables?
    - We are using decadal time steps to observe trends. Simply observing results at the beginning and end of the overall 100-year modeling timeframe was less informative for strategy development.
    - Focusing in on Year 30 – 50 allows us to observe noticeable differences between scenarios, with climatic influences starting to have an effect. Meanwhile, we have more confidence in results at Year 30-50 than at Year 100 – environmental stochasticity is less of a factor, climate model is more accurate.
- Q: When do we start to lose confidence in LANDIS projections?
    - We cannot say because there is no way to compare the projected results with actual data. In general we have more confidence closer to time 0 and less confidence closer to time 100.
    - Could run the analysis under multiple climate projects to determine when changes begin to occur.

2. EMDS Part B

Decision Model

Eric Abelson presented an overview of the Decision Model, which will evaluate variables and relationships to facilitate decision-making. It does this through a multi-criteria decision analysis (MCDA) to incorporate non-biophysical metrics (ex. economics) with Logic Model results. Specifically, the Decision Model uses “pair-wise” comparisons to weight variables by priority. The Decision Model then takes values for each criteria (i.e. metric values) and weights, and identifies how well each alternative (e.g. management scenario) meets our needs. EMDS will

not make the decision for us, but is rather a tool for evaluating model outputs and Stakeholder input when developing the Strategy.

The current draft Decision Model includes three main categories for evaluating effectiveness of management strategies: community values, environmental quality, and operations.

The next steps for developing the Decision Model are:

- Finalize the hierarchy and the criteria for the Decision Model.
- Weight/prioritize criteria.
    - Stakeholders will receive an online survey for weighting variables.
- Assemble feedback (EMDS team).
- Identify areas for further discussion.

Questions/comments:

- Q: Could the survey be distributed to a broader audience (i.e. the general public)?
    - The Interagency Design Team (IADT) will also be surveyed, however, EMDS was intended to be a tool to reflect Stakeholder priorities and prepare teams for future discussion of potential sticking points. Stakeholders were selected to represent the public and interested parties, while sending out the survey to the general public could bias the results.
        - The public may need more information first – it could be confusing.
        - It might not work with the timeline, hopefully to have results in early December.
        - It could be considered a form of "public comment," if there are objections down the line.
            - Would not be able to bring public in for consensus (would not know who they are).
    - **ACTION ITEM**: **The EMDS Sub-group** will discuss and determine who should be invited to participate in the online weighting exercise.
- Q: Are there examples for how operational feasibility will be evaluated?
    - Operational feasibility is still being defined, but it will include: economics, equipment, staff abilities, etc. It will also take into account further input from the Executives.
- Q: Will the survey break out what "health and safety" and "social values" are?
    - The survey will include a primer on what the different categories are.
- Suggestion: It would be helpful to know the affiliation of who is responding (stakeholders, design team, public, etc.).
- Suggestion: It would be helpful if the survey starts from the "bottom-up" to familiarize people with what is in each category.
- Suggestion: Send presentation/information about the role of the survey to Stakeholders.
- Suggestion: Send an Outlook meeting reminder for the survey deadline. There needs to be as much Stakeholder input as possible.

3. Landscape Restoration Strategy Goals and Objectives

Tim Holland reviewed previous findings from the Economics modeling and presented new outputs.

The Economics Team is working with the LANDIS Team to evaluate each of the four Scenarios: (S1) Suppression Only; (S2) Wildland Urban Interface (WUI) focus; (S3) Mechanical biomass removal focus; and (S4) Fire treatment focus, across a range of costs and benefits:

- Costs of harvest, thinning, and Rx fire
- Revenue from timber harvested (as an offset to some management costs)
- Fire suppression costs (accidental & lightning)
- Health impacts from smoke of different fire intensities & frequencies
- Impacts on property values
- Water quality and water yield

Previous findings and status

- Timber harvest revenues are relatively small compared to the investment necessary for treatment.
- Examined transportation costs using a raster of all roads in the Basin and assumptions regarding travel speeds and costs.
- Waiting on smoke modeling outputs to examine the health impacts/benefits of treatment using BenMap.
- Began using LANDIS outputs to predict wildlife habitat values.

New outputs

Management costs (presented by Tim Holland):

- In-progress, preliminary results available for most pieces.
- Forest Management Net Cost calculations utilize LANDIS data at pixel level to combine treatment costs with predicted harvest revenues/costs (see slides for further detail):

$$Net\ Cost_s = \sum_{i=1}^{N}\sum_{t=1}^{T}\frac{1}{(1+r)^t}\left[Revenue_{s,i,t} - Management_{s,i,t} - Transport_{s,i,t} - Suppression_{s,i,t}\right]$$

- There are 5 potential harvest/thinning treatments based on slope/type: hand, ground based cut-to-length (CTL), ground based whole-tree (WT), helicopter WT, cable-yarded WT.
- Stand and harvest characteristics were estimated using the following variables:
    - Stand: Trees per acre in different size classes, biomass distribution, and species composition.
    - Harvest information: Biomass removed and technology used.

    - Removal effort: GIS-derived information on yarding distance and slope from each stand.
- Hand thinning represents about ¾ of treatments, while ground based mechanical represents most of the remainder (CTL and WT).
- Harvest Cost
    - Scenario 3 is approximately 3 times the cost of Scenarios 2 and 4.
    - Still need to adjust for increased costs in Basin – use relative values only.

Questions/comments:

- Q: How was it determined where to use hand treatments?
    - Anything beyond 1000ft from a road and over 30% slopes.

- Q: Do prescribed fire costs include pile burns?
    - Prescribed fire costs do not include pile burns.
    - Suggestion: Include pile burn cost in hand thinning costs.

- Q: Are costs for the Basin or just LTW?
    - Management costs are for the Basin as a whole, but will be calculated for the LTW area specifically.

Fire Suppression Cost (presented by Tim Holland)

- High severity fire (from most to least): S3, S4, S2, S1.
- Wildfire suppression and managed wildfire costs (from most to least): S1, S2, S3, S4.
- Have Basin specific data for fire suppression costs, but not for Rx fire or managed wildfire.
- **ACTION ITEM**: **The Economics Team** will follow up with Svetlana and Brian for Basin-specific data regarding prescribed fire and managed wildfire costs.

Questions/comments:

- Q: Why is Scenario 4 (S4) the lowest in wildfire suppression costs?
    - Likely a product of how it was set up in LANDIS.
    - Suggestion: Would be useful to have a write-up of how Scenarios were input into LANDIS.
        - Design Team will discuss at its next meeting.
- Q: Do wildfire suppression costs include post-fire/restoration costs?
    - Post-fire/restoration costs are not included. Post-fire impacts are taken into account in health and property analyses. Restoration costs would likely different for managed fire, high severity, etc.

Property Value and Wildfire Risk (presented by Sam Evans):

- A wildfire risk map was developed using fire occurrence outputs from LANDIS, measured as a probability that a pixel will burn between 2010 and 2040 and separated by severity.

- Wildfire risk spatial layer was intersected with data on residential and commercial property locations in the Basin.
- Property Value data were sourced from El Dorado and Placer County Assessors' Office, compiled by Zillow.
    - Caveat: ~25% of the observations were removed because no address was provided. Therefore, data are likely underestimating the amount of value in a given pixel.
- Med/High Fire risk (most to least): S1, S2, S3, S4
- High Fire risk (most to least): S1, S2, S4, S3

Questions/comments:

- Q: How is fire risk defined?
    - A given pixel "burned" if it had an over 50% likelihood of burning. Severity was based on flame length.
    - Suggestion: "Fire severity" should be "fire intensity."
    - Suggestion: Conduct the analysis with 25% and 75% likelihood of burning as well.

- Q: Why was the timeline limited to 30 years?
    - Modeling is more accurate, and new property locations/values cannot be predicted (though vacant lots were counted - could be somewhat of a proxy).

Modeling updates (presented by Jonathan Long; see slides):

- Climate variants:
    - "Moderate" = RCP 4.5 model, described as "optimistic;" "High" = RCP 8.5 model, described as the "current trajectory"
    - Results:
        - Fire return interval, average fire size and total area burned annually increases significantly over time for all scenarios in "High" vs. "Moderate."
        - More fire in high elevations in "high" climate.
        - Fire return interval is highest in S4.
- Fire:
    - Examines area burned by fire intensity prescribed fire by Scenario and by management zone over time.
    - Results (LTW area; also available by LTW WUI only):
        - High intensity fire (least to most): S3>S4>S2>S1
        - Medium intensity fire (least to most) S4>S1≈S2≈S3
        - Low intensity fire (least to most): S1>S2>S3>S4
    - Suggestion: Fire metrics should not choose a single year, but average across a given decade.
- Vegetation:
    - Examines seral stage, biomass, deadwood, and vegetation type (species) by Scenario over time, and by management zone.

    - Results:
        - Biomass increases of time for all Scenario (moderate climate).
        - Notable increase in sierra mixed conifer, white fir, and shrub vegetation types, among others. Decrease in Jeffery pine and red fir.
        - All Scenarios trend toward late seral, with only slight differences between Scenarios (S3 trends the most toward late seral).
- Treatments:
    - Examines treatment type by Scenario over time.
    - Results:
        - S3>S4 (including prescribed fire)>S2>S1
- Emissions/Air Quality:
    - The analysis will take emissions outputs (PM2.5) from LANDIS, model conveyance to downwind communities using a smoke dispersion model, and use the size and vulnerability of those communities to quantify impacts to health.
    - Currently working with emissions data and modeling dispersion. A preliminary smoke dispersion output is available.
    - Results (still need to model dispersion):
        - Most moderate emissions days are in S1 and S2. No high emissions in nay Scenario.
- Carbon:
    - Examines Total Carbon and Soil Carbon by Scenario and by management zone over time.
    - Results:
        - Total Carbon (most to least): S1>S2>S4>S3
        - Soil Carbon (most to least): S1>S2>S4>S3
        - Total Carbon increases through time for all Scenarios.
        - Highest in WUI Threat Zone, lowest in Wilderness
- Water Quality:
    - Examines stream nitrogen by Scenario and by management zone over time.
    - Results:
        - Stream Nitrogen (least to most): S3>S2>S4>S1
        - Highest in Wilderness, lowest in WUI Defense Zone.
- Water Quantity:
    - Adrian Harpold can provide results for small-scale model runs in the Rubicon watershed, but the modeling still needs to be expanded to the other watersheds (Ward, General, Blackwood, etc.).
    - Aside from LTW, Mr. Harpold is also working on a more detailed analysis regarding the optimal location of treatments for water quantity.
- Overall, some pieces are ready for review, but others need additional work.
- Jonathan can provide summary tables for all figures presented. Open to adjustment.
- Key lessons so far:
    - Over long periods, climatic trends dominate management influence for fire and vegetation.

- There is considerable momentum in the system (large trees and "late seral" vegetation will expand under any management scenario).
- Current runs of LANDIS modify fire intensity more than area burned, except under Scenario 4, which results in more burning.
    - It is important to consider metrics based on fire intensity.
- Consider which modeling results are more important and representative, and which are rougher approximations.
- Results pertaining to vegetation communities, canopy cover, tree density, and seral stage, are all best considered at the broad landscape scale, not in specific locations.
- Current runs of LANDIS represent some management influences in ways that do not replicate actual practices (e.g. "managed wildfire," removal of dead wood under treatments).
    - In future, parameters may be adjusted to evaluate environmental effects of a preferred strategy.
- Preliminary water quality results suggest that upland soil losses may be strongly associated with certain soil units (soil type and slope combinations).
    - Net effect of treatment still needs analysis.
    - This result might suggest opportunities to lower expected loads by avoiding treatment in the most erodible areas.
        - For discussion at the next Stakeholder meeting.

Questions/comments:

- Q: Is there a regulatory cut-off in air quality metrics?
    - Dispersion still needs to be factored in. Once this is taken into account, values will be observed and classifications will be designed.
- There could be an overlap between prescribed fire activities and air quality thresholds.
- Suggestion: Change "high" in emissions table.

Action Items & Agreements

Action Items:

1. **The Design Team will** explore the relations between seral stage, shrub, and large tree abundance in LANDIS outputs/EMDS.
2. **The EMDS Sub-group** will discuss and determine who should be invited to participate in the online weighting exercise.
3. **The Economics Team** will follow up with Svetlana and Brian for Basin-specific data regarding prescribed fire and managed wildfire costs.

Agreement

1. **AGREEMENT**: Stakeholder approved Stakeholder Meeting Summaries for July, August, September, and October.

Meeting Attendees

Organizing and Participating Agencies

CSP – California State Parks
CTC – California Tahoe Conservancy
MC – Mills College
NCSU – North Carolina State University
NFF – National Forest Foundation
TFFT – Tahoe Fire and Fuels Team
TRPA – Tahoe Regional Planning Agency
UCB – University of California, Berkeley
USFS LTBMU – U.S. Forest Service Lake Tahoe Basin Management Unit
USFS PSW – U.S. Forest Service Pacific Southwest Research Station
USFS PNW - U.S. Forest Service Pacific Northwest Research Station

Stakeholder Science and Community Committee Members

1. Jennifer Quashnick
2. Roland Shaw
3. Jeff Brown

Staff

4. Jen Greenberg, CTC
5. Whitney Brennan, CTC
6. Silver Hartman, CSP
7. Charles Maxwell, NCSU
8. Sarah Di Vittorio, NFF
9. Evan Ritzinger, NFF
10. Forest Schafer, TFFT
11. Stephanie Coppeto, USFS LTBMU
12. Scott Conway, USFS LTBMU
13. Brian Garrett, USFS LTBMU
14. Shana Gross, USFS LTBMU
15. Keith Reynolds, USFS PNW
16. Eric Abelson, USFS PSW
17. Jonathan Long, USFS PSW
18. Pat Manley, USFS PSW
19. Tim Holland, UCB (at 1pm)
20. Sam Evans, MC