DRAFT SUMMARY

STAKEHOLDER SCIENCE COMMITTEE MEETING

LAKE TAHOE WEST RESTORATION PARTNERSHIP

Tuesday, September 4, 9:00 am to 3:00 pm
Tahoe Regional Planning Agency

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 September 4, 2018, from 9:00am to 3:00pm at the Tahoe Regional Planning Agency (TRPA) in Stateline, Nevada. Meeting objectives were to: (1) Share project status updates and an updated timeline; (2) Share a long-term update on pile burning research and discuss the implications for treating riparian areas with conifer encroachment; (3) Show connections between LANDIS and other modeling, and preview the LANDIS-based modeling results that we will be looking at in October; and, (4) Share and discuss water quality (WEPP) modeling results and strategy for using LANDIS long-term outputs. Science Team members presented modeling updates and answered questions from Stakeholders. A briefing on TRPA's Environmental Improvement Program Threshold Update was also provided.

Contents

Action Items

1. **Evan** Ritzinger will post power-points to NFF website.
2. **Angela** will provide recommendations to the Design Team for defining functional diversity.
3. **Angela** will provide write up of method used to translate LANDIS outputs to CWHR classes.
4. **Nadia** will forward Christina the report from UC Davis on potential shifts in species ranges with climate change, and will check whether it is possible to share the GIS data.

Welcome, Agenda Review, and Introductions

Sarah Di Vittorio welcomed the group, led introductions and reviewed the agenda, and provided general updates as follows:

- The Design Team is moving forward the Landscape Restoration Strategy (LRS) Matrix. We will have a more polished version to share in October or November.
- Ms. Di Vittorio presented the attached timeline:
    - Modeling has taken longer than expected. Scenarios 1-4 have been run in LANDIS, with the plan being to develop a fifth LANDIS Scenario with more intermediary treatment pace/scale, rather than the "pin-the-corner" extremes tested in Scenarios 1-4. The Design Team is waiting for more results from Scenarios 1-4 before designing Scenario 5.
    - We are working on developing Ecosystem Management Decision Support (EMDS) inputs..
    - We now expect to complete the LRS in March 2019..

There were no interested party comments.

1. Update on pile burning study – long-term effects at select site

Matt Busse shared his findings from the Pile Burning Report, which may have relevance for the design of treatments in Lake Tahoe West (LTW), especially in Stream Environment Zones (SEZs). Performed roughly a decade ago, the 3 year-long study (funded through SNPLMA) examined different pile conditions across both public and private lands, and yielded some unanticipated results. The study observed pre-burn conditions and post-burning vegetation recovery and soil impacts (ex. movement of nutrients, erosion, litter cover, etc.). Highlighted findings included:

- This study suggests that soil damage from pile burns depends mainly on fuel size and soil moisture and can be minimal under the right conditions.
- Pile burning delivers a flush of nutrients to soils, but is primarily localized to the area of the piles.
- Heat pulses were only of concern when "large" wood (>7" diameter) was in the pile, otherwise soil damage from heat was localized and not of significant concern.
- The size of piles was less important than the amount of large diameter wood in piles.
- Moisture content appears to be the primary determinant of recovery.
- In general, there were very little detrimental effects of pile burning across the Basin. In most cases, old pile sites could not be found.
- Two examples of extreme results are detailed, below.
- High Meadows (wet site):
    - Pile burning in meadow with ~34% of land cover by piles. Couldn't remove material due to land ownership.
    - Scarring from intense heating was expected, but upon returning to the site in 2018, a robust presence of vegetation was observed.
    - Example of success story, even in a "worst-case" pile burning scenario.
- Spooner Lake (dry site):
    - Large piles (20' diameter and 12' tall, <5% land cover) with large pieces of wood.

    - High temperatures were reached, and the site did not revegetate. Not a lot of leaf litter post fire (primary vegetation was white fire).
    - An example of the "worst-case" results.
    - Still, no movement was observed of sediment towards water.

Discussion followed:

- Q: Was there a threshold of the amount of large diameter wood that causes scorching? Were there recommendations for pile sizes?
    - The study did not develop a specific threshold. Likely 40-50% of large wood in pile may cause a heat pulse. If large wood is cured, it usually will burn completely.
    - Given a fixed amount of fuel, it did not seem to matter if there were fewer larger piles or more abundant smaller piles.
    - Also, localized scorching of soils is not necessarily out of the range of natural variability.
- Should LTW try to push the boundaries of the current regulations allowing piles to cover only 30% of the ground or less in SEZs?
    - Probably do not need to – even if every tree is being thinned, we would still only need to cover about 30% of the ground with piles - space is the more the limiting factor.
- Q: Have report findings been delivered to the Lahontan Regional Water Quality Control Board (LRWQCB)?
    - It could help push regulatory boundaries - may not need to be raked or monitored for raking which would save on cost.
- Suggestion: Use more historical photographs to understand the dynamics of meadow encroachment (Google Earth goes back to 1940's).
    - Understand the amount of places where pile burning in SEZs would occur on the landscape, and then use that to help develop the Strategy.
- Q: How would an area be affected if wildfire happened?
    - Wildfire would cause uniform change and loss of soil quality - piles do not necessarily have the same effects of a high severity fire.
- Q: Does the current requirement for monitoring require nutrient study?
    - No, but monitoring for vegetation recovery is required. If vegetation does not recover raking of the pile sites must occur, or raking can just occur initially.
    - Site in the Lake Tahoe Basin Management Unit (LTBMU) have typically seen recovery within 1-2 years.
- Q: How do pile burns affect species composition?
    - FS has been tracking this intermittently – there is some evidence of small amounts of invasive species moving into sites post-burn.

2. Integrating landscape modeling with other models

Jonathan Long reviewed the various LTW modeling efforts, how they relate to one another, and provided a status update on on each modeling team. He noted there is a massive amount of data coming out of the models that needs to be organized and integrated. Model results are also being analyzed on different time scales. Design Teammembers have suggested summary outputs for LANDIS modeling, which Alec is working on.

- Water Quantity modeling is in progress and needs more time before results are ready to share.

- Economics modeling is examining impacts of fire risk on property values, and the cost of managing fires (suppression and wildfires managed for resource objectives), among other things.
    - The analysis will relate different levels of modeled fire intensity (~flame length) to property damage.
    - Q: Will modeling incorporate proximity of fires to property?
        - Economics modeling will use outputs from LANDIS, which are at a 1 hectare/pixel scale. If a pixel has property on it, the fire intensity in that pixel will be assessed.
- Air Quality modeling is in process (requires LANDIS outputs).
- Wildlife Habitat modeling is in process. Most of the modeling is complete, and outputs are being translated. (See below for more information.)
- Water Quality modeling is in the process of integrating LANDIS outputs.
    - Examining soil burn severity based on upon future fuel levels and expected loads from treatments through 2040.
- The two models for EMDS (decision and logic) are being developed. The Design Team is defining thresholds/targets for the indicators, and the Science Team is developing data flows from the models into the EMDS.

3. Wildlife habitat modeling

Angela White presented methods of the wildlife modeling, which uses LANDIS outputs to assess the impacts of treatments on wildlife through time. Keith Slauson's work will take a deeper dive on the old forest species, specifically.

Angela used the California Wildlife Habitat Relationships (CWHR) database as a starting point for understanding biodiversity/species relationships on the landscape. CWHR uses expert opinion of suitable habitat for species to predict fitness (low, medium, high) of habitat based on multiple factors (ex. forest structure). Effects of treatments on wildlife may be measured in multiple ways, one of which is "species richness," or number of species in a given unit area, often used as a proxy for biodiversity.

Though CWHR is not without its criticisms, the coarse scale of its predictions makes it an appropriate tool for the landscape-level analyses of LTW. LANDIS outputs did not always correlate with factors used in CWHR, so results were "crosswalked," with the CWHR factors to predict habitat in a similar manner. For example, LANDIS gives results in "biomass," which Angela converted to a representation of forest structure with the help of EcObject and LANDIS species composition figures.

Where possible, the model brings in actual data from studies in the Basin to examine the effects of treatments, fire, roads, disturbance regimes, etc. Essential elements of habitat such as large trees may also be added in. In addition, habitat suitability incorporates the "patchiness" of a given habitat to determine if the habitat is of an adequate size to host a species, with customized thresholds developed for each. Some of the metrics used to indicate overall suitability across the landscape include: total habitat, number of patches, min/max patch size, average patch size, and variability. So far, effects of fuels reduction treatments on biodiversity appear complex. Preliminary results need further examination.

Finally, Mr. Slauson presented hypothetical results examples for his analysis, which will allow for the tracking of suitable habitat (# of territories, average suitability, etc.) over time to examine trends in each of the Scenarios.

Discussion followed:

- Q: Were modeled CWHR representations tested against the existing the CWHR data?
    - Yes, the model is not perfect, but neither is CWHR – they are different representations.
    - Results were never going to completely reflect CWHR. There were some components of CWHR that weren't done for the model (ex. Aspen seral class).
- Q: How were representations assigned "low, medium, and high"?
    - Representations were assigned classifications using the same system as CWHR.
- Q: What do classifications mean for density of a species (ex. Northern flying squirrel)?
    - Density of Northern flying squirrels is moderate; numbers are based on trapping data.
- Q: Is modeling being done for both species and functional group?
    - Yes, but the functional diversity piece is still being developed.
    - The analysis will look at the number of species across the landscape – and can be broken up into different categories (ex. prey species). The primary concern is redundancy built into the system rather than overall density.
    - The definition of functional diversity within LTW still needs to be developed. There are many ways species can be grouped – it depends on Stakeholders and team member opinion.
        - **ACTION ITEM**: Angela will provide recommendations to the Design Team for defining functional diversity.
- Q: What percentage of species are data available for?
    - ~50%, mostly birds and small mammals.
    - Any modifications and assumptions will be explicit.
- Suggestion: Be explicit about how "suitability" is defined – include in a summary of modeling process and assumptions.
- Suggestion: Decay effects (of treatment/disturbance) are not currently taken into account. Utilize literature to account for lag effects as best as possible.
- Q: The west shore is a primary corridor for connecting martens across Sierra - will the wildlife modeling include a connectivity analysis?
    - The analysis is focusing on territories and suitability first. If there is capacity, a connectivity analysis will be done. At the least, there will be a simplified, coarse scale analysis.
- Suggestion: Metrics for acceptable trends (rather than points) should be developed in order to preclude change as more results come in.
    - Thresholds/targets are developed in EMDS.
    - There are numerous possible viewpoints of ranges (regulatory/policy, social, ecological, etc.), all of which could be used to help come up with the brackets of acceptability.
        - Could combine best for regulatory vs. social vs. ecological perspectives, though weighting would be difficult.
    - Ranges of acceptable values are being developed for EMDS. EMDS will require teams to make calls as to what is good or bad.

        - Ex. Functional groups: No policy direction – would be more of professional judgement (how many is good, moderate, and bad). Angela and others could come up with proposals in these situations.
        - Suggestion: Above/below the "current level" is often a useful metric for establishing thresholds.
- Suggestion: Line graphs of variables could help to visualize results across time steps in EMDS.
- Suggestion: There needs to be a way to compare across resource values.
    - Ex. If minimum criteria are met in two different resource values, how much does if the criteria are met more in one than another? How much does a failure to meet different criteria matter? Why?
    - The Science Team and Design Team are currently working on developing thresholds, ranges, and logic model relationships.
        - Suggestion: Keep Stakeholder Science Committee up to date on this process.
            - Teams are currently developing ranges, focusing first on priority indicators. Rangerswill be tied to ranges for resilience values in the Landscape Resilience Assessment (LRA) if possible
    - Progress will be shared at next Stakeholder meeting in October.
- **ACTION ITEM**: Evan will post Powerpoint presentations to NFF website.
- **ACTION ITEM**: Angela will provide write up of method used to translate LANDIS outputs to CWHR classes.

4. Water Quality Modeling

Mariana Dobre presented Water Quality modeling results and "WEPP Cloud" to Stakeholders. WEPP Cloud is an online interface for interacting with the modeling results. Results are organized into different scenarios: current conditions & management, wildfire – current condition, wildfire – future condition, etc. Modeling has been done for current conditions & management and wildfire – current condition. In addition, modeling was run for uniform disturbance across the landscape (fire, thinning, etc.).

WEPP Cloud offers a variety of possibilities for viewing and manipulating outputs. For example, variables like canopy cover are modifiable. Results may be separated by watershed or hillslope to view runoff, sediment loads, phosphorus concentrations, etc. Channels may be delineated and different management types selected to observe effects. WEPP Cloud also allows the user to change the modeled climate, including the following options: Cligen (stochastic), PRISM Modified (Cligen but models whole watershed), Daymet (observed, 1980-2006), CMIPS (Future, experimental), Single storm (Cligen), and Observed climate database.

Fire effects are modeled using data from recent fires in area (specifically, the King, Emerald, and Angora Fires) to train model. Effects of a fire on soil burn severity were examined across the entire Lake Tahoe Basin. Factors such as: vegetation, topographic indexes, soil properties, and fuels data were used. The model is connected to LANDIS via fuels data, which allows it to predict the effects of wildfire in the future (the accuracy of model is ~80%).

Discussion followed:

- Q: Are all Water Quality modeling results going to be used in EMDS?

    - There are 20 watersheds examined individually, but a weighted average may be a possibility.
- Suggestion: Prioritize the problem areas – which areas burn highest, generate the most sediment, etc. - and develop strategy for those areas.
- Suggestion: Need a goal for water quality – is it to avoid a decrease? Something more?
    - The Economics team is using the figures to develop avoidance costs for decreasing sediment loads.
- Suggestion: Potentially expand the 20 examined watersheds to more, or to the whole Basin.
- Q: How will this relate to a possible roads analysis and roads workshop?
    - Literature suggests roads, in addition to fire, are one of the primary causes of erosion - WEPP has the ability to model roads. In some cases, however, roads have been trapping sediment after fires.
    - The roads analysis is a planned assessment of potential impacts for opening up "ghost roads" and the effects of existing roads in the Basin.
    - Treatment scenarios are not expected to have a significant impact on overall erosion, but it will be possible to add in other treatments.
- Q: What is the connection of this roads analysis to existing road research and thresholds?
    - This analysis examines only Forest Service roads, not urban roads.
- Q: Were there any publications planned from the "steep slopes demo"?
    - Matt Potts, from the Economics Team, was planning to do some analysis.
    - A White paper exists from a previous steep slopes demo - follow up with Susie Kocher if interested.

5. Updates and Question/Answers on LANDIS modeling outputs

Alec Kretchun provided an update on LANDIS, followed by Q&A:

- We are working with Jonathan and other resource area teams, making data connections.
- We have interfaced with every team to make connections between the LANDIS outputs and their models.
- We have run almost all of the replicates; all posted to the shared work space (Box).
- We are working through specifics of summarization; how to visualize all of the outputs in a way that is meaningful.
- All in all, we are working with a massive amount of data; Ross (Forest Service GIS) and others are helping with the analysis/visualization, and we are making progress on that.
- Question: What is the approach to analyzing Carbon?
    - Nadia:
        - We are finding that there are not large differences between the scenarios in terms of total carbon (C sequestration). We are looking more closely at the outputs to try to understand what the differences are, but they seem to be subtle at first blush.
        - It is hard to say what our ideal target is for carbon storage. We'd like more large trees on the landscape, but we also want to represent all seral stages on the landscape (younger seral stages have fewer big trees and therefore less carbon). We don't know what'sthe right amount of carbon.
        - So we might want to look at other objectives first and get some agreement about how to obtain those, and see what that does to carbon levels, rather than starting from an assumption/desire for a particular carbon target.

- Alec: We are looking at total ecosystem and live carbon. We have visualized some of the carbon removal events (fuels consumed by fire). The economics team is also looking at carbon effects of fuel treatments.

6. Environmental Improvement Program Threshold Update

Christina Restaino provided an update on the Environmental Improvement Program (EIP) Thresholds update effort, followed by discussion.

- Christina has incorporated feedback since we last discussed this in July.
- TRPA is slowing down update the process; focusing on updating the system structure of the thresholds. Christina is not going into detail on that system structure today.
- Christina provided a presentation on the update process, including the following points:
    - Current thresholds cover:
        - Common vegetation
        - Late seral and old growth forest ecosystems
        - Uncommon plant communities
        - Sensitive plants
        - For the update, TRPA is focusing on first two (Common vegetation and Late seral and old growth forest ecosystems) as most broadly representative of forest health
    - Christina is seeking input today on how the forest health thresholds should address:
        - 1) Vegetation composition
        - 2) Vegetation structure (seral stage)
        - 3) Resilience to fire and other disturbances
- 1) Vegetation composition
    - Not clear how they came up with previous targets/percentages.
    - Christina wants to shift from TRPA associations to CWHR (California Wildlife Habitat Relationships) database. Currently TRPA associations are cross-walked to CWHR, but CWHR is more comprehensive and already crosswalks to other relevant databases.
        - CWHR didn't exist when thresholds were developed; TRPA used eVeg.
    - Christina is working to bring these up to date based on best available science, and make them able to be evaluated using existing data
    - Q: How often is CWHR updated?
        - Depends on the underlying data. CWHR is generated from LiDAR or other vegetation layer. In the basin it has been updated recently every few years (but expensive).
        - The algorithm makes certain assumptions (in translating to EcObject) that are important to understand.
    - A question for stakeholders is: How do we set targets for abundance of associations? Is it appropriate to do so?
        - Climate change – unpredictability makes this more difficult. We want native species but should expect amount/relative abundance to shift over time.
        - Suggestion: look at research out of UC Davis showing potential shifts in species ranges.
            - **ACTION ITEM: Nadia** will forward Christina the report from UC Davis on potential shifts in species ranges with climate change, and will check whether it is possible to share the GIS data.

- Discussion
    - Switching to CWHR would make associations more meaningful; more useful and consistent with what others are doing.
    - LandFire doesn't seem right – representations show too much red fir, lots of cushion plant. Not accurate.
    - Suggestion: consider using CNPS classification – more rigorous from botanical perspective.
        - May be hard to get that robust but worth considering. Might better show impacts of climate change on the current associations. Higher resolution.
- 2) Vegetation Structure (Seral Stage)
    - Question for stakeholders: What do people think about proposed percentages?
        - 40-50% seems about right for mid-seral, but there is an artificial cut between open and closed canopy.
        - Early seral numbers seem about right
        - Christina noted that a range provides more flexibility; if you are aiming for 50% ok to be at 49% (e.g., range 45-50%).
            - Suggestion:
                - You can also evaluate based on how close you are to the target. So 49% is better than 40% if your target is 50%. And it's ok to go over the target that will show up in low numbers in the other seral stages
                - There are also other ways to evaluate habitat quality (more than just how much of a seral stage is there, but how good that habitat is)
    - In general, changing a threshold allows us to re-evaluate plans and ordinances to make sure we aren't doing things that make it difficult for us to attain our thresholds.
        - Also makes it easier to monitor; line up better with existing monitoring efforts.
    - Discussion
        - Thresholds should promote moving earlier seral stages to later (not regressing).
        - Suggestion: You could consider setting targets for rates of change toward seral stages.
            - Response: It hard to set targets for that; not sure what the rate would be. There is no guidance in the scientific literature for a rate of change.
- 3) Resilience to Disturbance
    - Christina: Some have suggested it is problematic to set targets for a desired amount of fire. It makes for unrealistic/unachievable targets; we may get policy mandates that say "no prescribed fire" for example. It may therefore be more appropriate to have thresholds about probability of high severity fire (and evaluate those using probability models).
        - Also it is inappropriate for thresholds to dictate how managers reach targets for forest health. Not appropriate to tell managers how much fire they must use to reach a target, for example.
    - Discussion:
        - But there is a distinction between fire as tool and fire as an ecological process. As a process, fire helps tune the landscape. Can't get same outcomes from all-mechanical thinning. Fire is not just a tool.

- Maybe best to say: we want natural range of variation in severity of fire. How people get there is up to them.
- The reservation is in setting a target for the amount of fire on the landscape (how many acres to burn per year e.g.), since there are things that impact that that are out of our control. But can thresholds recognize that fire is a natural process and that more fire on the landscape mimicking that natural process is desirable in general? Maybe there is a way for thresholds to call for trending toward more fire on the landscape, without specifying a number.
- Thresholds are about setting desired condition of the forest; not how you get there.
- Can there be two parts to the standard: speak affirmatively to the role of fire in shaping forests, instead of only focusing on limiting high-severity outcomes. Embrace fire as process that minimizes high severity and provides benefit of low and moderate severity.

Meeting Attendees

Organizing and Participating Agencies

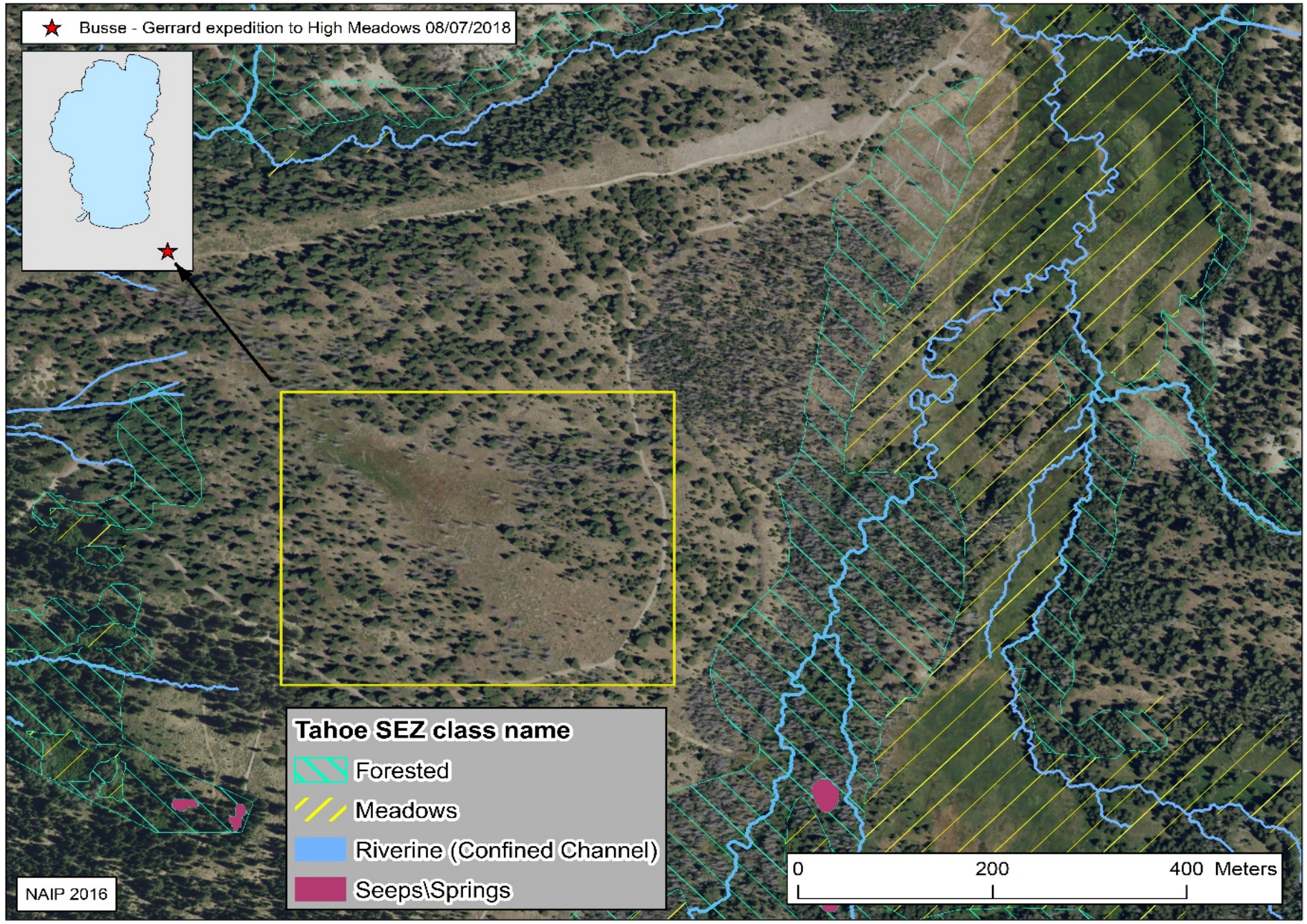
CSP – California State Parks
CTC – California Tahoe Conservancy
NFF – National Forest Foundation
TFFT – Tahoe Fire and Fuels Team
TRPA – Tahoe Regional Planning Agency
USFS LTBMU – U.S. Forest Service Lake Tahoe Basin Management Unit
USFS PSW – U.S. Forest Service Pacific Southwest Research Station
USFS PNW - U.S. Forest Service Pacific Northwest Research Station

Stakeholder Science Committee Members

1. Jennifer Quashnick
2. Sue Britting
3. Jeff Brown
4. Matt Freitas
5. Zach Bradford
6. Maria Mircheva (at 1:30p)

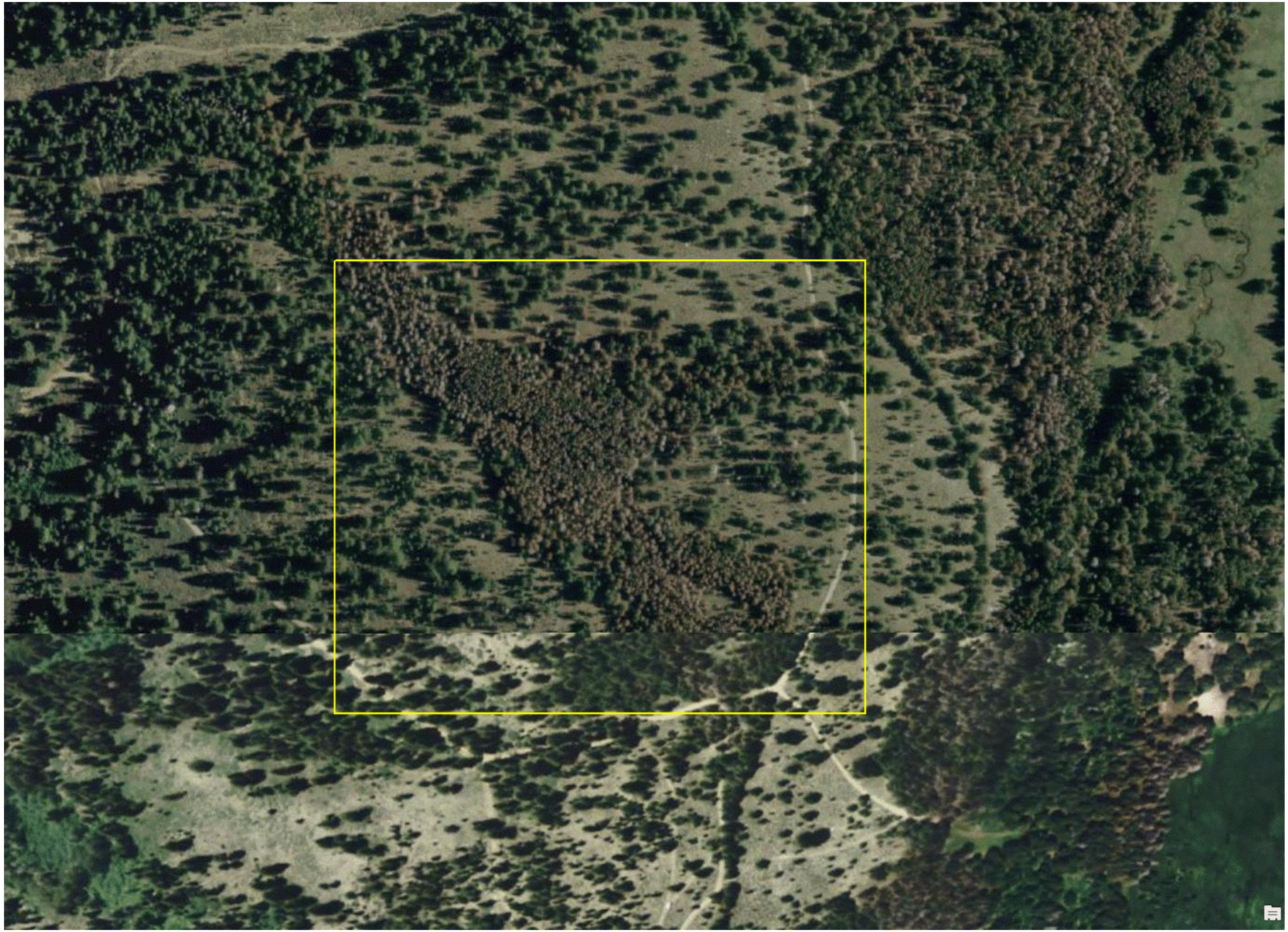
Staff

7. Silver Hartman, CSP
8. Svetlana Yegorova, CSP
9. Jason Vasques, CTC
10. Nadia Tase, TFFT
11. Evan Ritzinger, NFF
12. Sarah Di Vittorio, NFF
13. Christina Restaino, TRPA
14. Brian Garrett, USFS LTBMU
15. Stephanie Coppeto, USFS LTBMU
16. Jonathan Long, USFS PSW
17. Angela White, USFS PSW
18. Keith Slauson, USFS PSW
19. Matt Busse, USFS PSW (for 1 hour)
20. Ross Gerrard, USFS PSW (for 1 hour)


Busse - Gerrard expedition to High Meadows 08/07/2018
Tahoe SEZ class name
Forested
Meadows
Riverine (Confined Channel)
Seeps\Springs
NAIP 2016
0
200
400 Meters

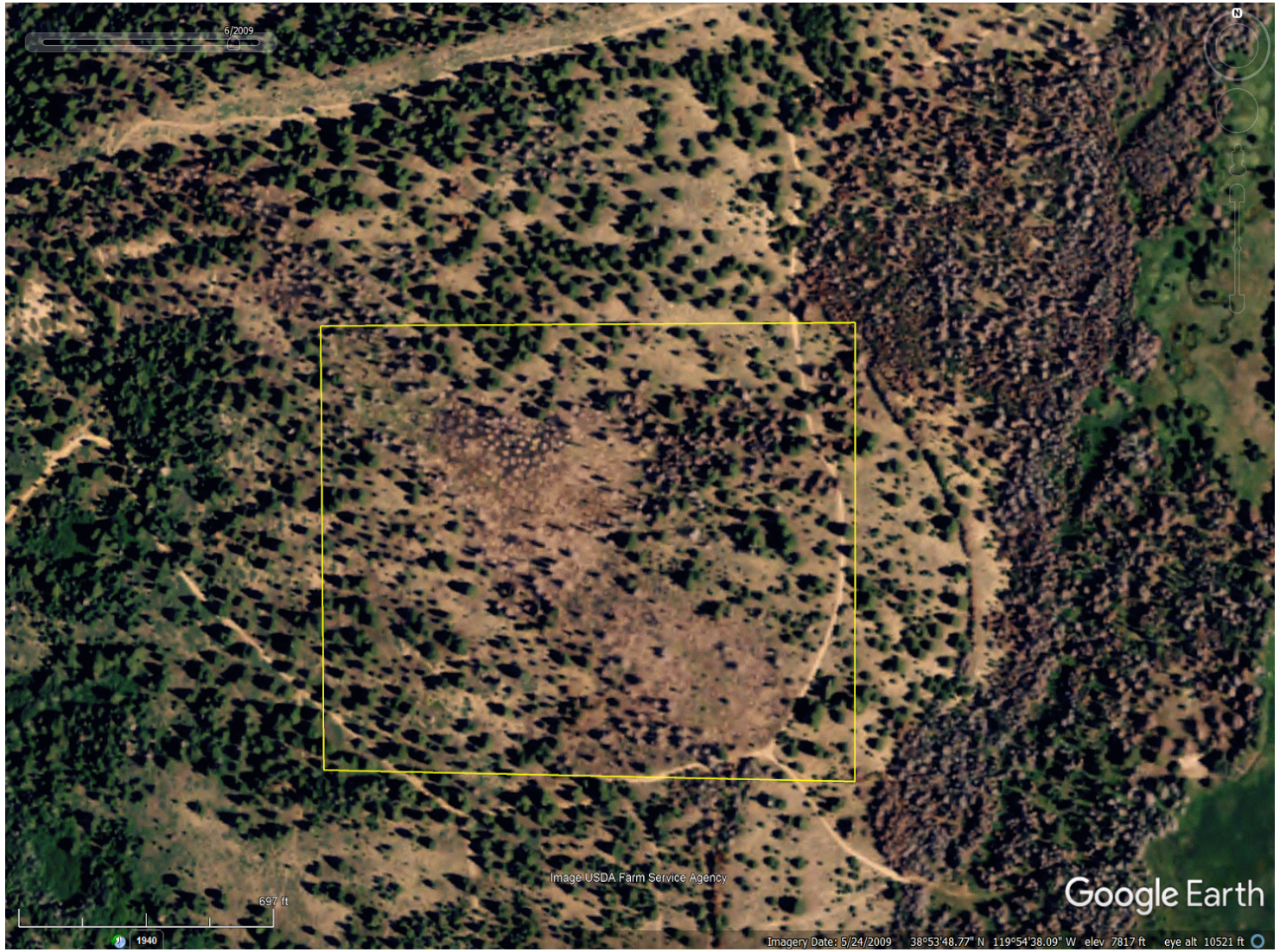
High Meadows - 1940

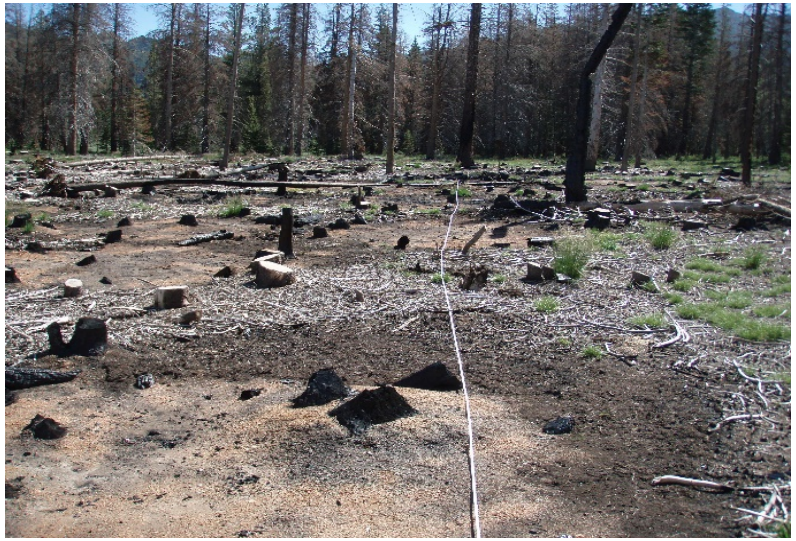
1969

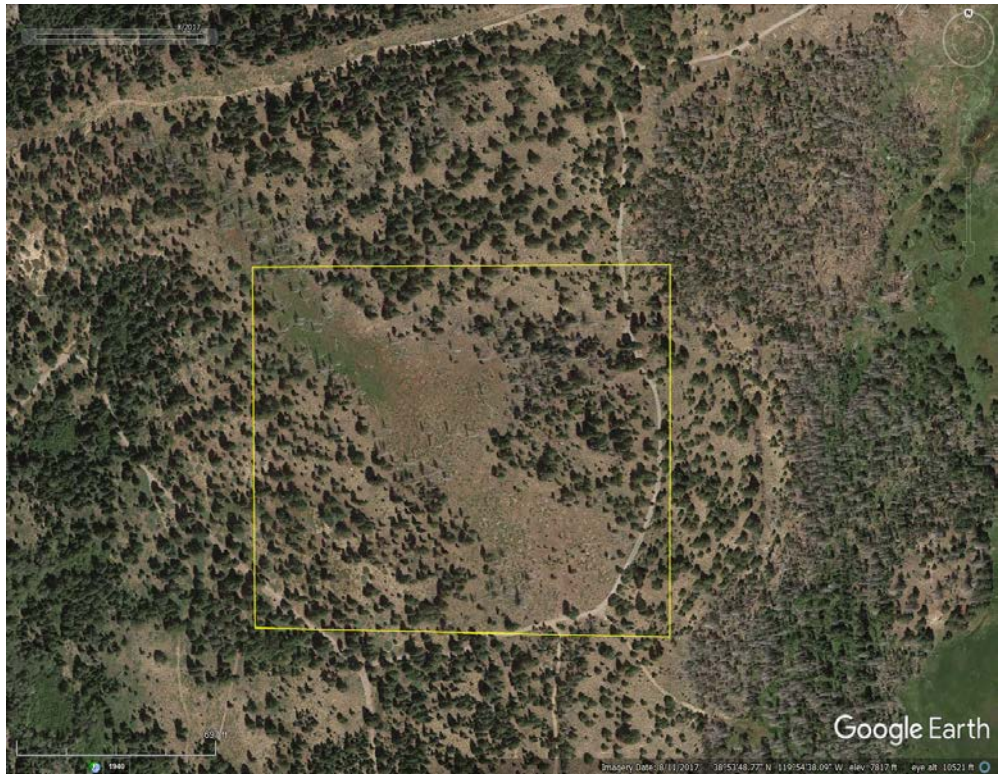


2008

Piled and burned in 2009







2018

<u>Summary</u>

Worst-case scenario for potential effects of pile burning on site resources

Soil damage was short-lived (impressive recovery)

Curious side-by-side comparison of treated and untreated pine stands

Do these observations translate to other sites?

9 years after pile burning near Spooner Lake

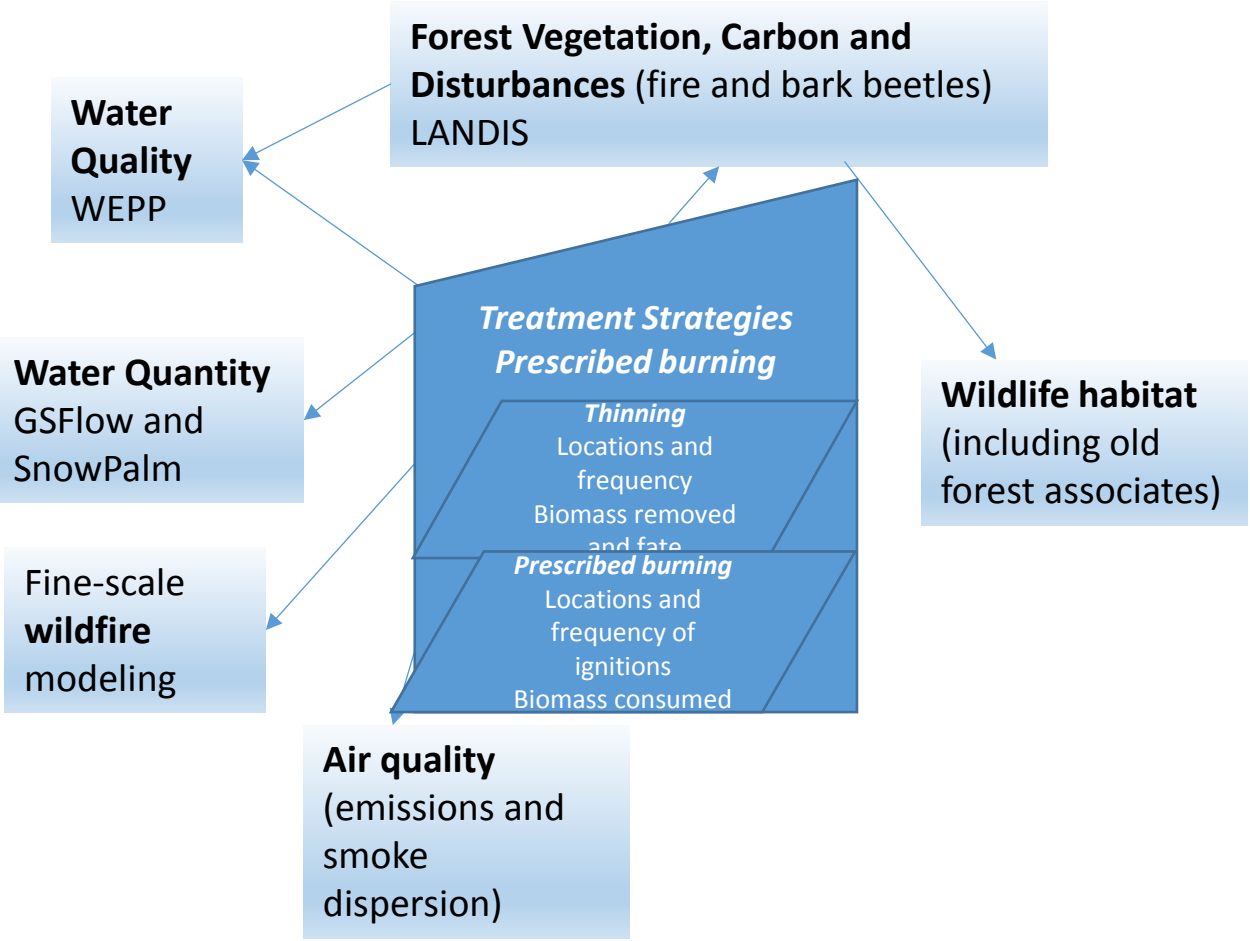
Lake Tahoe West Modeling Integration

Update 9/4/2018

Schedule

- Overview of modeling and plans for integrating results based upon LANDIS outputs for 100 years under 4 management scenarios (Jonathan)
  - Economics modeling
  - EMDS/Decision support
  - Emissions
  - Wildlife modeling (Angela)
- Water quality modeling (Mariana)
  - Non-LANDIS results
  - Plans for use of LANDIS outputs
- Q&A and updates (Alec)

Lake Tahoe West Science Integration: Inputs to Models including LANDIS outputs



Modeling Components

Modeling topic	Relationship to Scenarios	Temporal Extent?
Landscape dynamics	Direct	Full century, decadal increments
vegetation	Direct	Full century, decadal increments
carbon	Direct	Full century, decadal increments
disturbances/removals (fire, insects, harvest)	Direct	Full century, decadal increments
Wildlife	Direct	Full century, decadal increments
Air – Emissions	Direct	Full century, decadal increments
Smoke impacts (dispersion)	Direct	Snapshot events circa 2040
Water Quality – WEPP	Direct	Expected loads from treatments through 2040, expected impacts from wildfires circa 2040
Water Quality - Roads	No (current system with various management options considered (e.g., use of BMPs, opening ghost or legacy roads)	Current
Water Quantity	Partial--representing different levels of thinning (light/heavy) , no fire	Current
Fine-Scale Fire	Partial--representing different levels of thinning (hand thin to 14", mechanical up to 30") and extreme versus moderate wildfire, no prescribed fire	Current
Economics	Direct	Full century, annual? increments
Decision Support (EMDS)	Direct	Full century, decadal increments

Status of Modeling Elements

Modeling topic	Status
Landscape dynamics	10 Replicates for 4 scenarios being synthesized into GIS layers, performance measures, and outputs for other modeling
vegetation	Will explain crosswalk to CWHR today
carbon	Analysis in process
disturbances/removals (fire, insects, harvest)	Analysis in process
Wildlife	Will explain which measures will be used today
Air – Emissions	Analysis in process
Smoke impacts (dispersion)	Data conversion in process
Water Quality – WEPP	Will explain non-LANDIS outputs today and plans for LANDIS integration
Water Quality - Roads	Workshop scheduled September 18
Water Quantity	Analysis in process
Fine-Scale Fire	Presentation of results scheduled October 2
Economics	Analysis in process
Decision Support (EMDS)	Design team working on logic model

Issues for Data Integration

- How to use information across 10 replicates
  - Average results or model different paths?
- How to address time scale
  - Some analyses will examine full century of trends
  - Others will focus on 2040 as key period for evaluating effects of alternative strategies

Summary Metrics Requested by IADT (partial list)

- Area treated (thinning, Rx fire, wildfire)
- Frequency of disturbance (thinning, wildfire)
- Biomass (or carbon) removed by treatment type and by disturbance type
- Biomass (or carbon): live, dead, harvested
  - By shrubs, forest seral stage
- Vegetation
  - CWHR classes
  - Large trees

Economics

- Using annual LANDIS outputs across all replicates for each scenario
- Expected before next month:
  - Preliminary timber revenue
  - Management costs
  - Fire probabilities (based on frequency of burns across replicates)
- Expected later
  - Property values using Zillow data

Economics, continued

- Including cost estimates for wildfires managed for resource objectives in the Sierra Nevada (from Marc Meyer, R5 Ecology Program) as well as suppression fires
- Relating different levels of modeled fire intensity (~flame length) to property damage
  - *Note that fire modeling in developed areas is not precise since it does not model structures, ember showers, and other important dynamics*

Decision Support

- Science team processing LANDIS outputs into EMDS
- Design team working to suggest values for logic model
- Non-modeled values will be represented in the decision model

Air Quality

- Data conversions in process (maps of fires and details about emissions)
  - Considers flaming and smoldering combustion
- Wildfire smoke dispersion modeling in progress
  - Snapshots using representative wildfires circa 2040

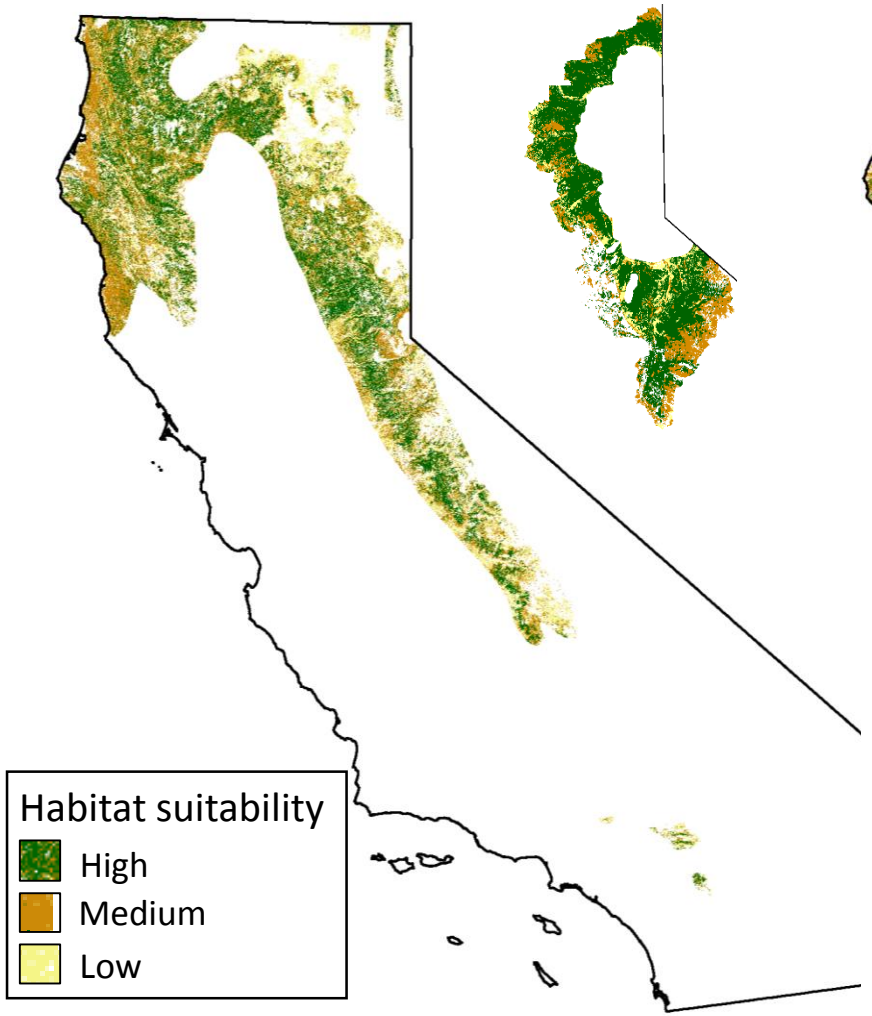
Wildlife Habitat (Angela White)

- Overall approach
  - Factors considered in modeling (CWHR, treatments, fires, urbanization, roads)
  - CHWR classification crosswalk
  - Large trees metric

Water Quality (Mariana Dobre)

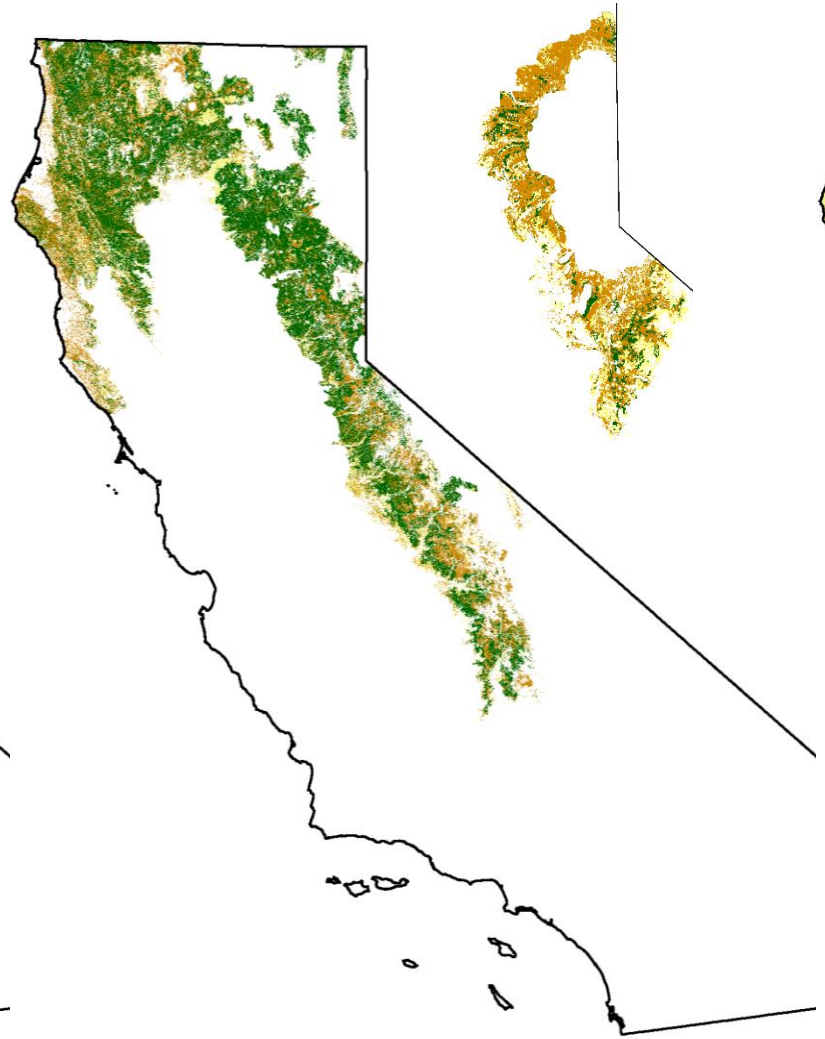
- Present results from WEPP assuming uniform treatments or fire effects
- Discuss plans for LANDIS output integration to represent alternative scenarios:
  - Modeling soil burn severity based upon future fuel levels (in 2040)
  - Modeling expected loads from treatments through 2040
  - Options for accounting for climate change (future climate variant option in WEPP)

Sooty grouse



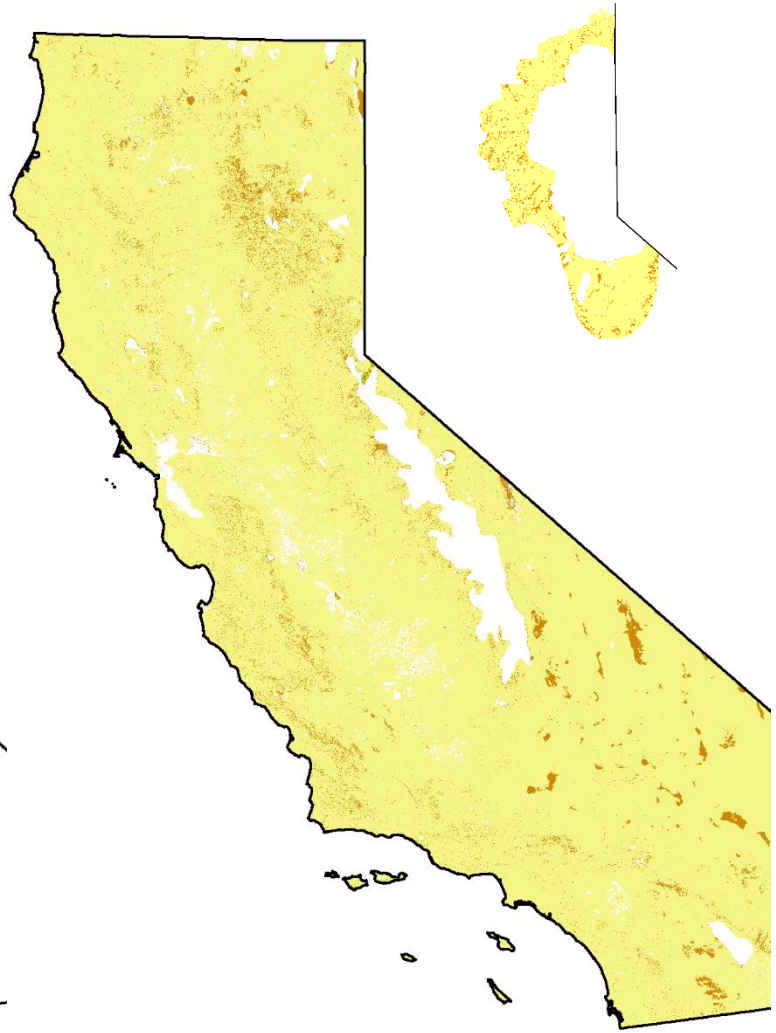
Range: restricted
Suitability CA: patchy
Suitability LTBMU: high

Northern flying squirrel

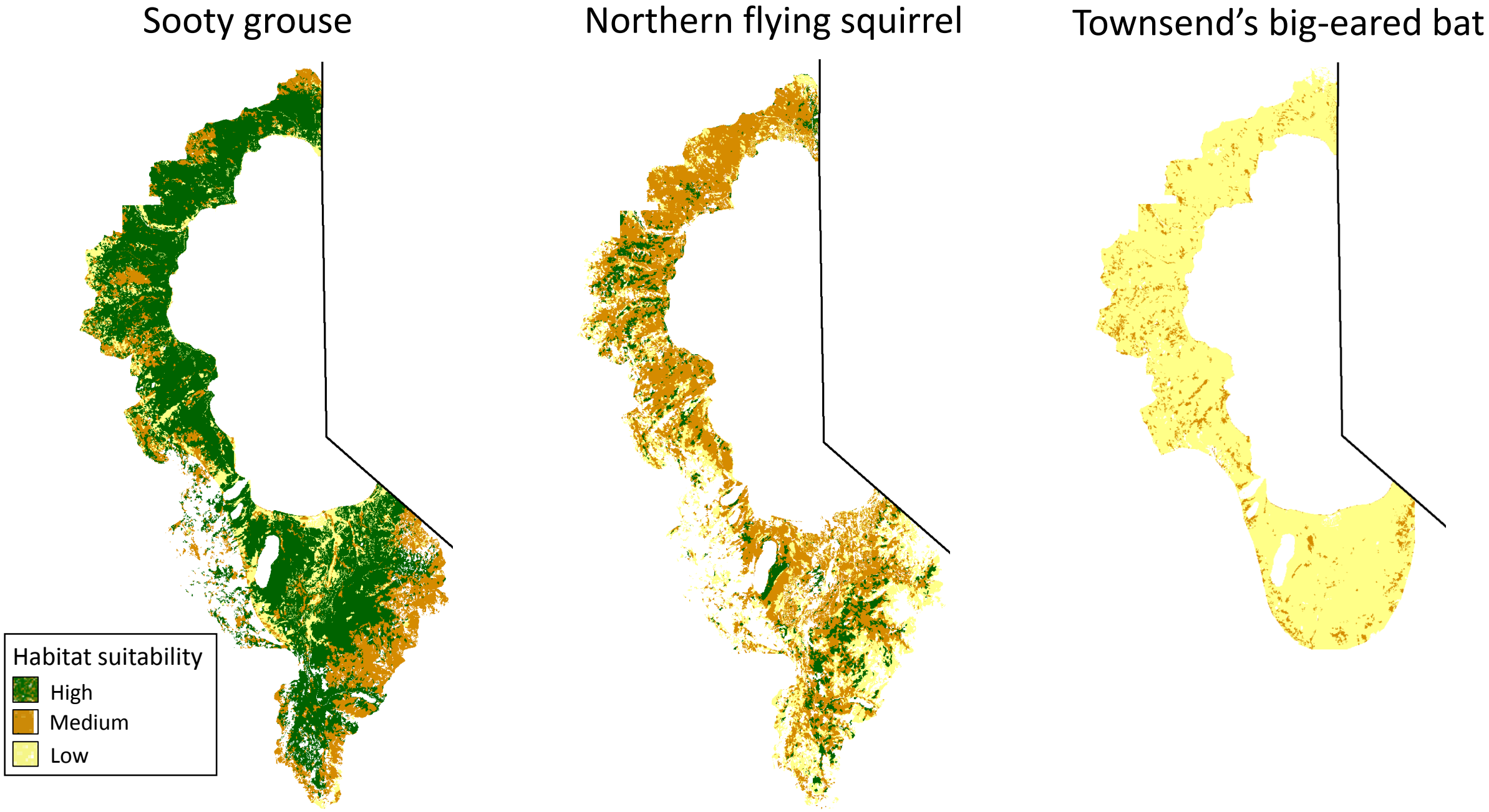


Range: restricted
Suitability CA: high to moderate
Suitability LTBMU: patchy high

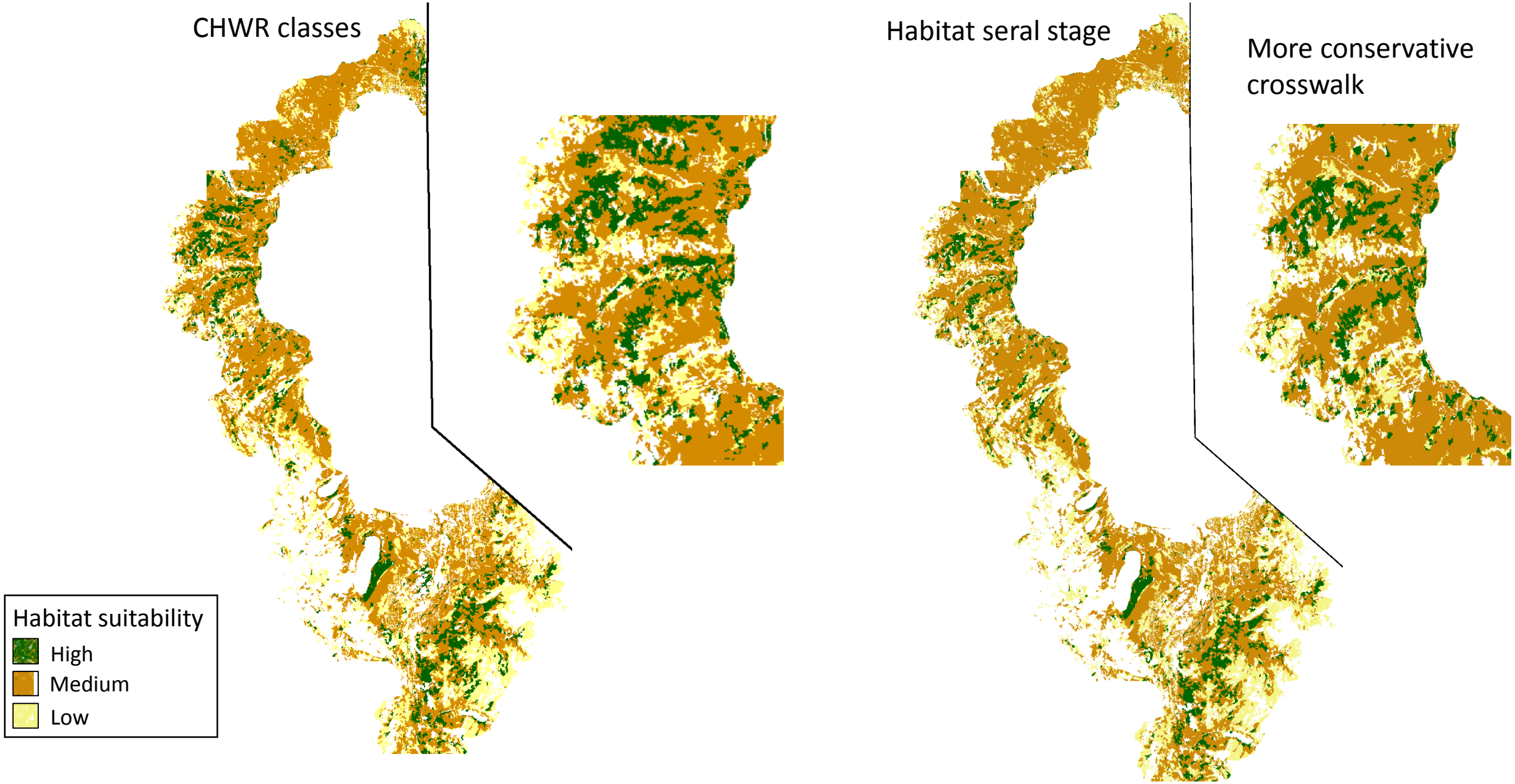
Townsend's big-eared bat



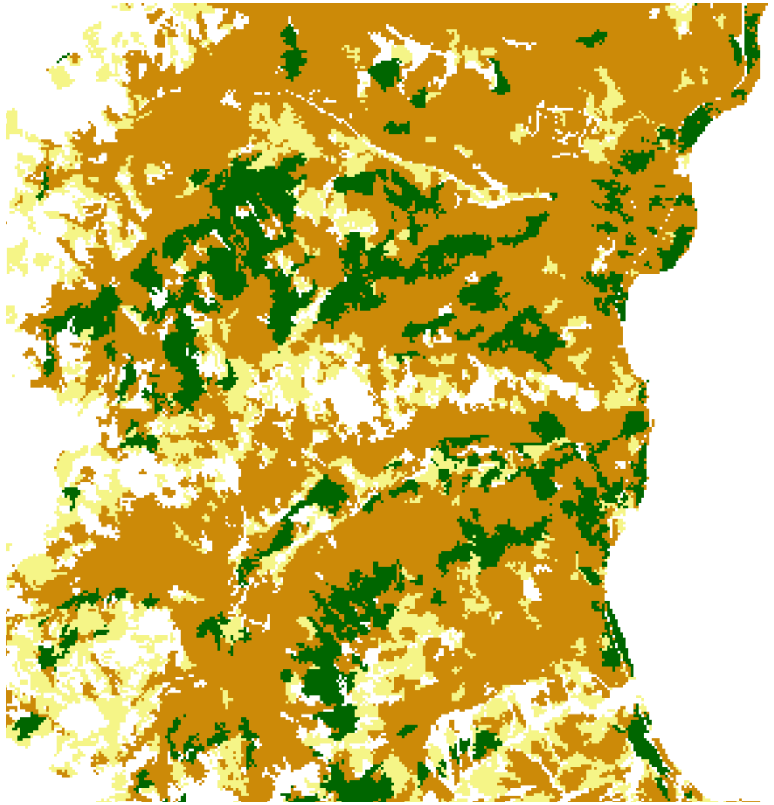
Range: ubiquitous
Suitability CA: low
Suitability LTBMU: patchy moderate

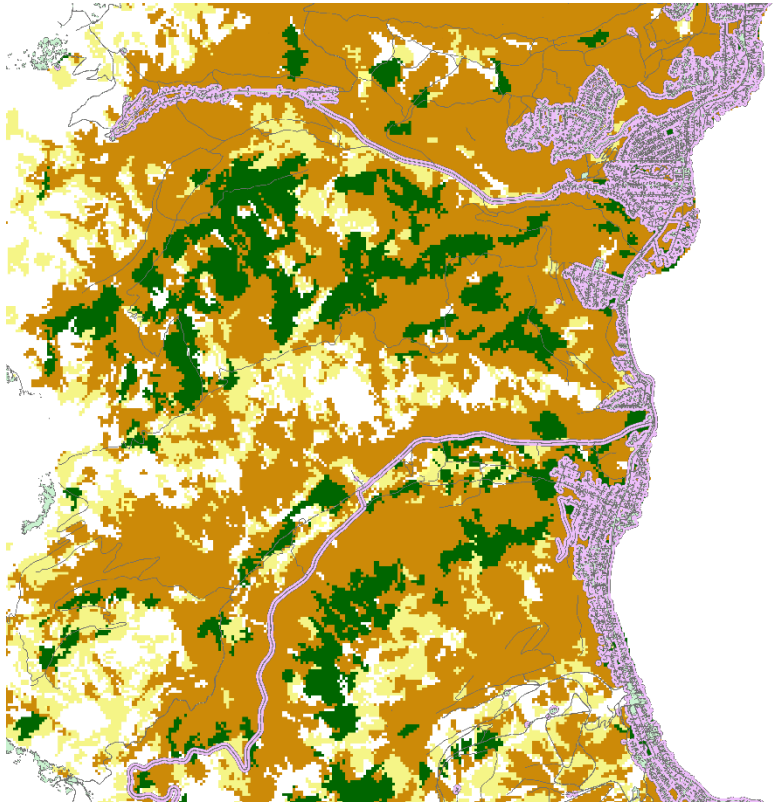

Sooty grouse
Northern flying squirrel
Townsend's big-eared bat
Habitat suitability
High
Medium
Low

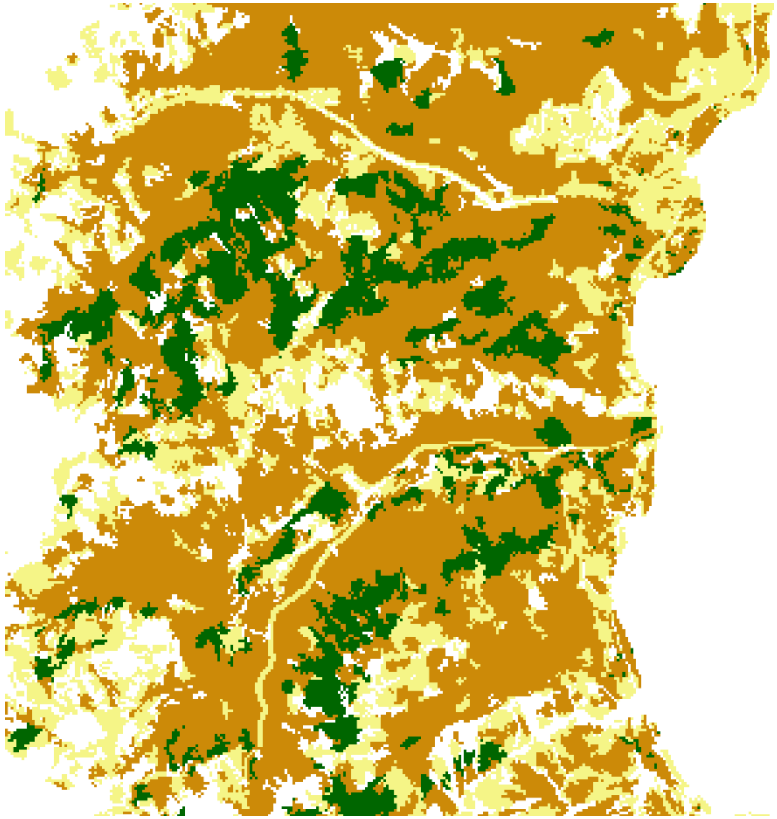
Northern flying squirrel habitat crosswalk



Habitat suitability (seral class) -/+ Habitat modifier = Habitat suitability informed

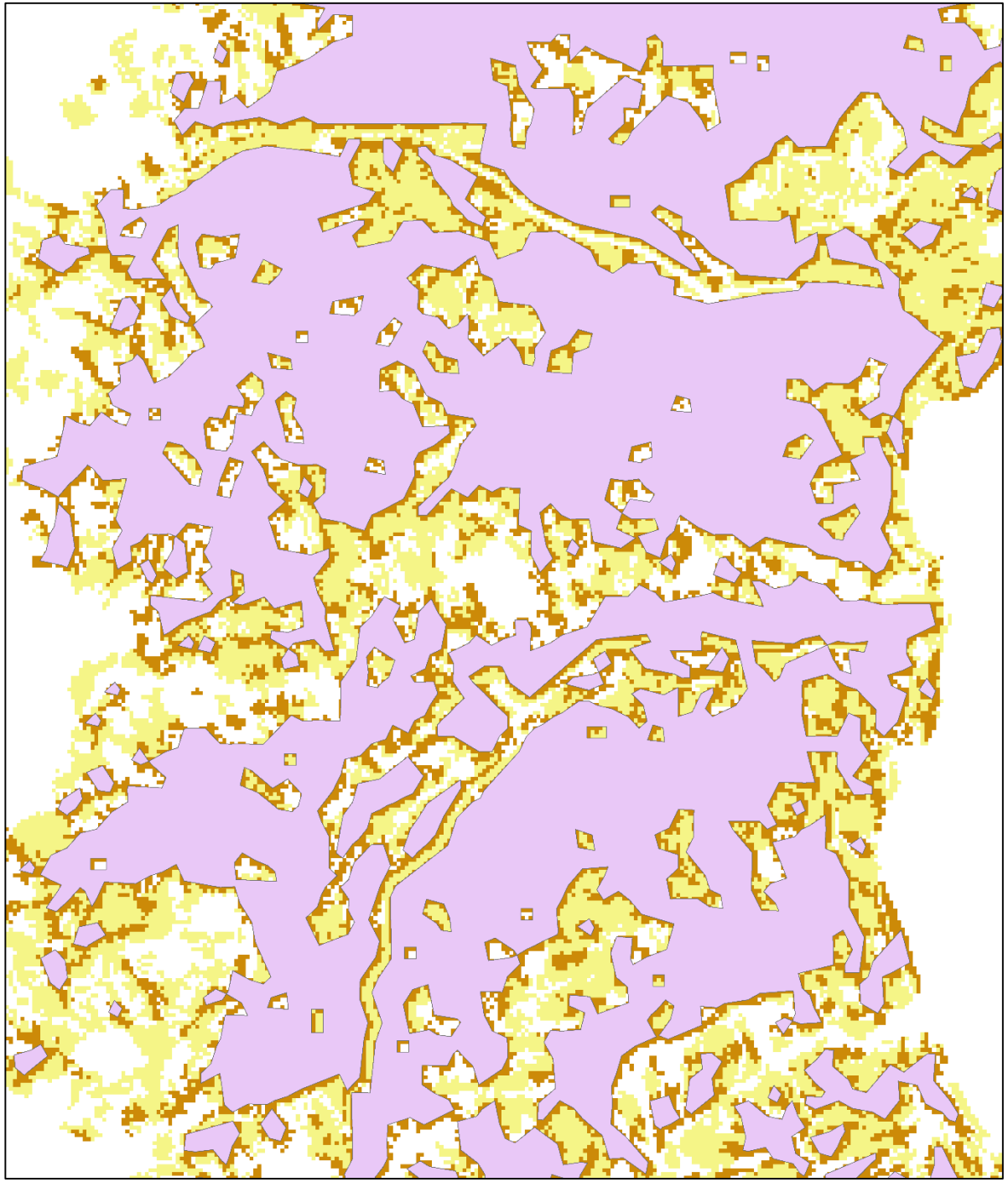


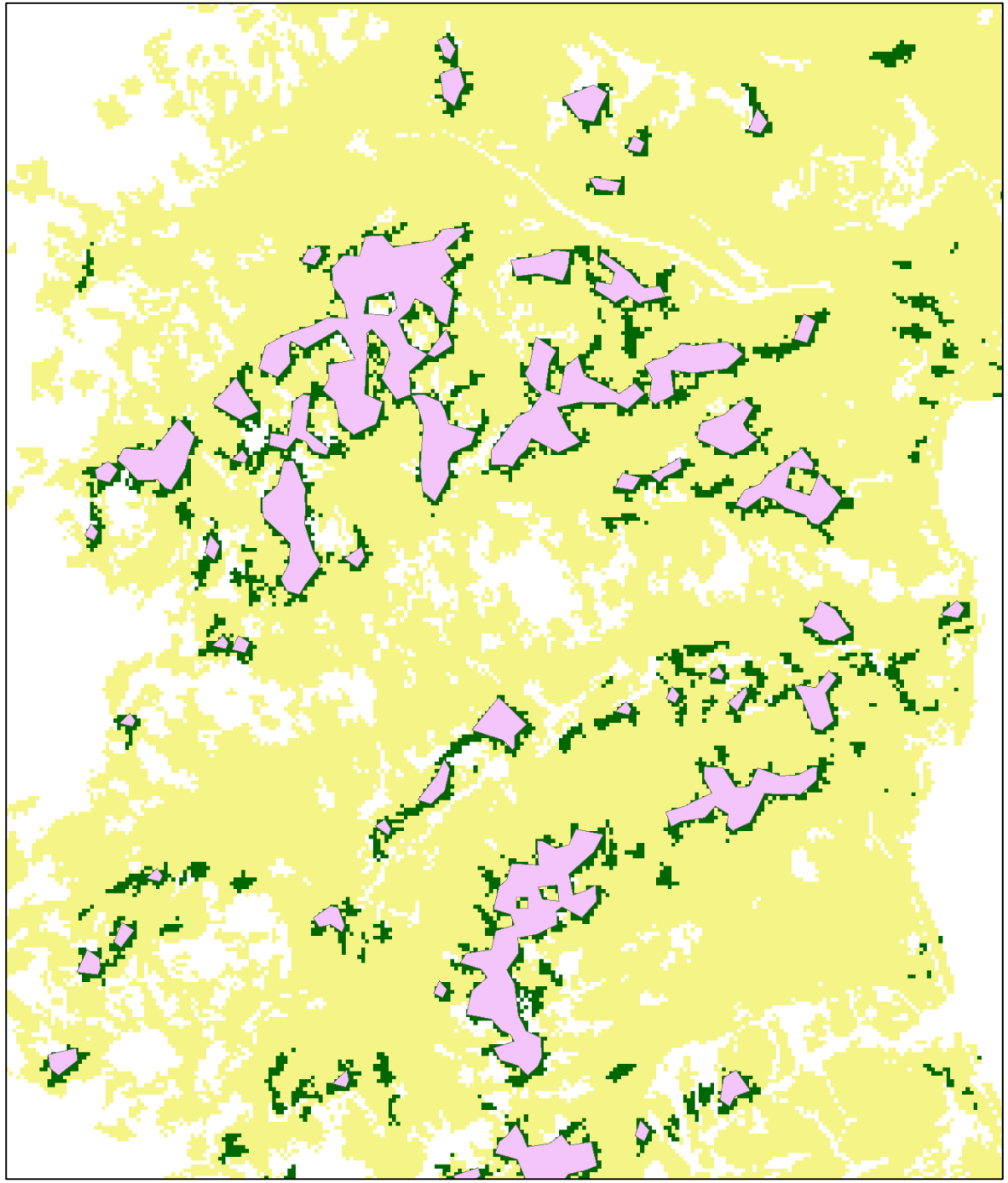


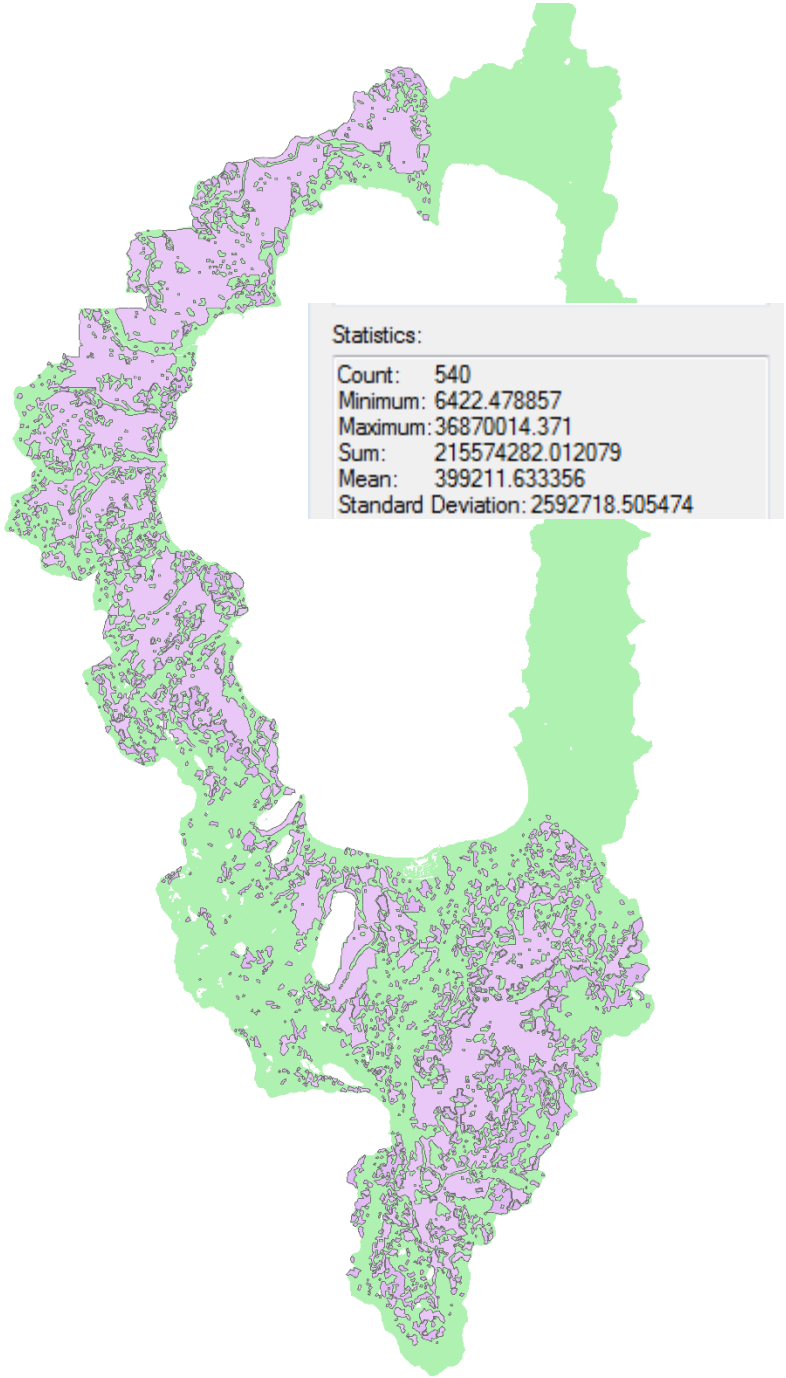


Empirical data collected in the LTBMU on species-species responses to habitat alteration/disturbance from urbanization, fire/fire severity and fuels treatment will be used to modify habitat suitability class.

In addition, habitat elements known to be essential to certain species (e.g. shrubs in understory, distance to riparian zone, snags, big trees and coarse woody debris) can be output by Landis and used in a similar fashion



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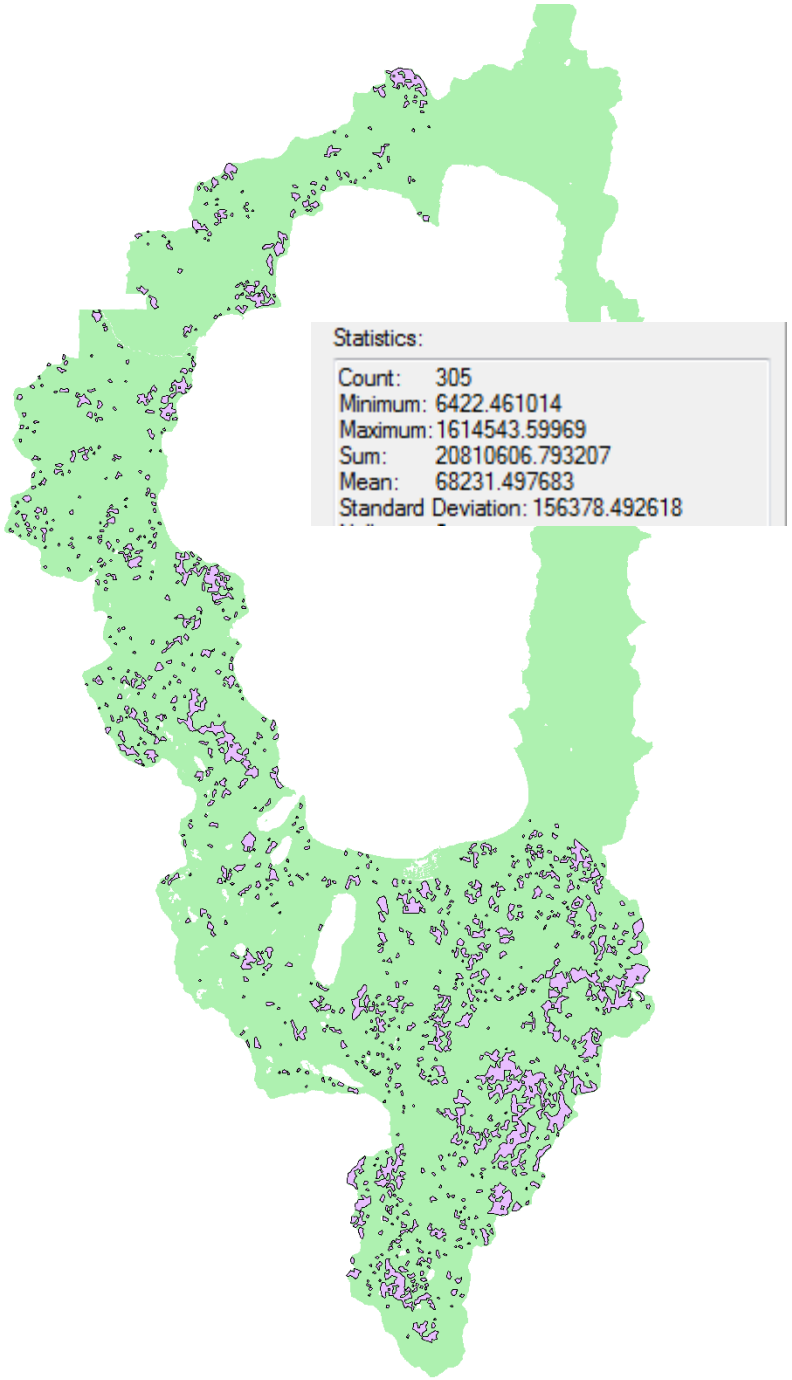
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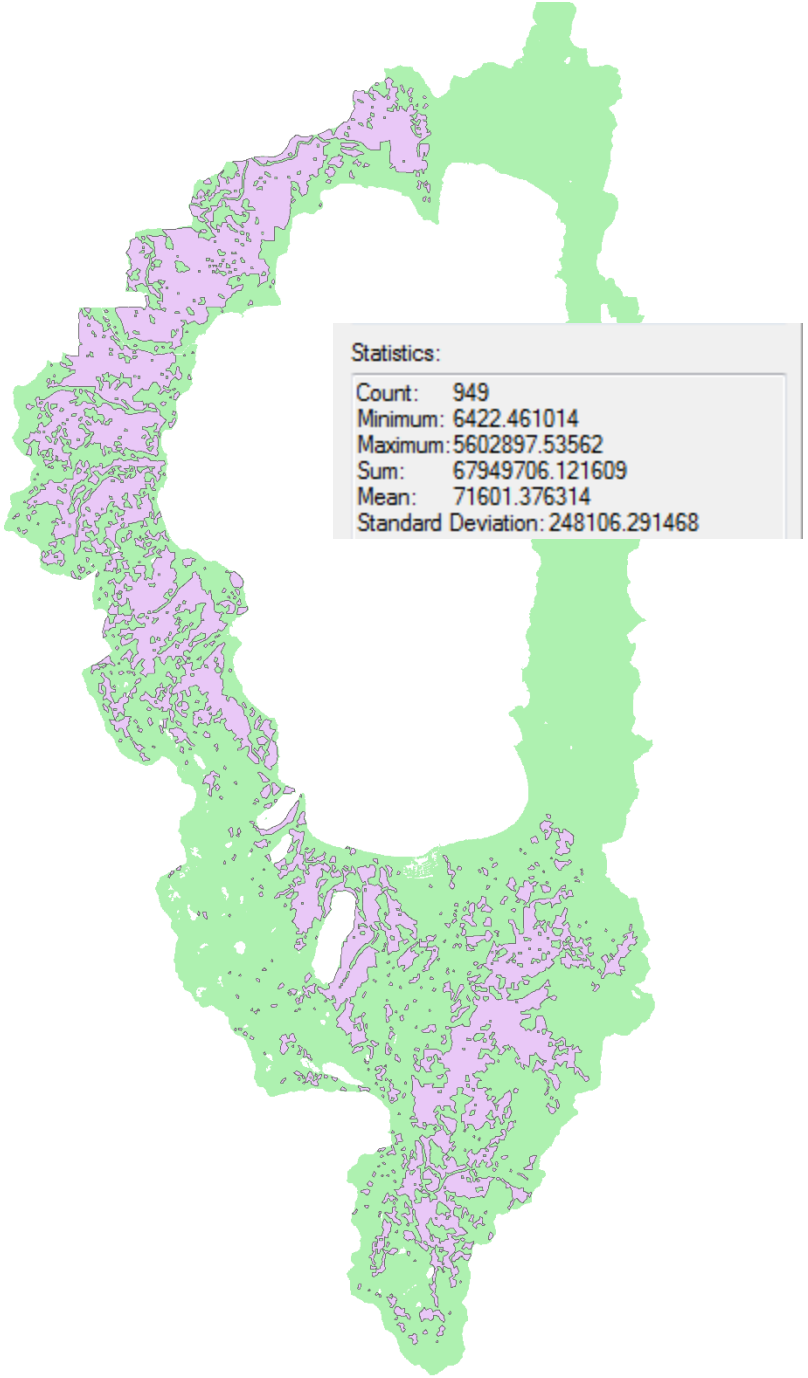
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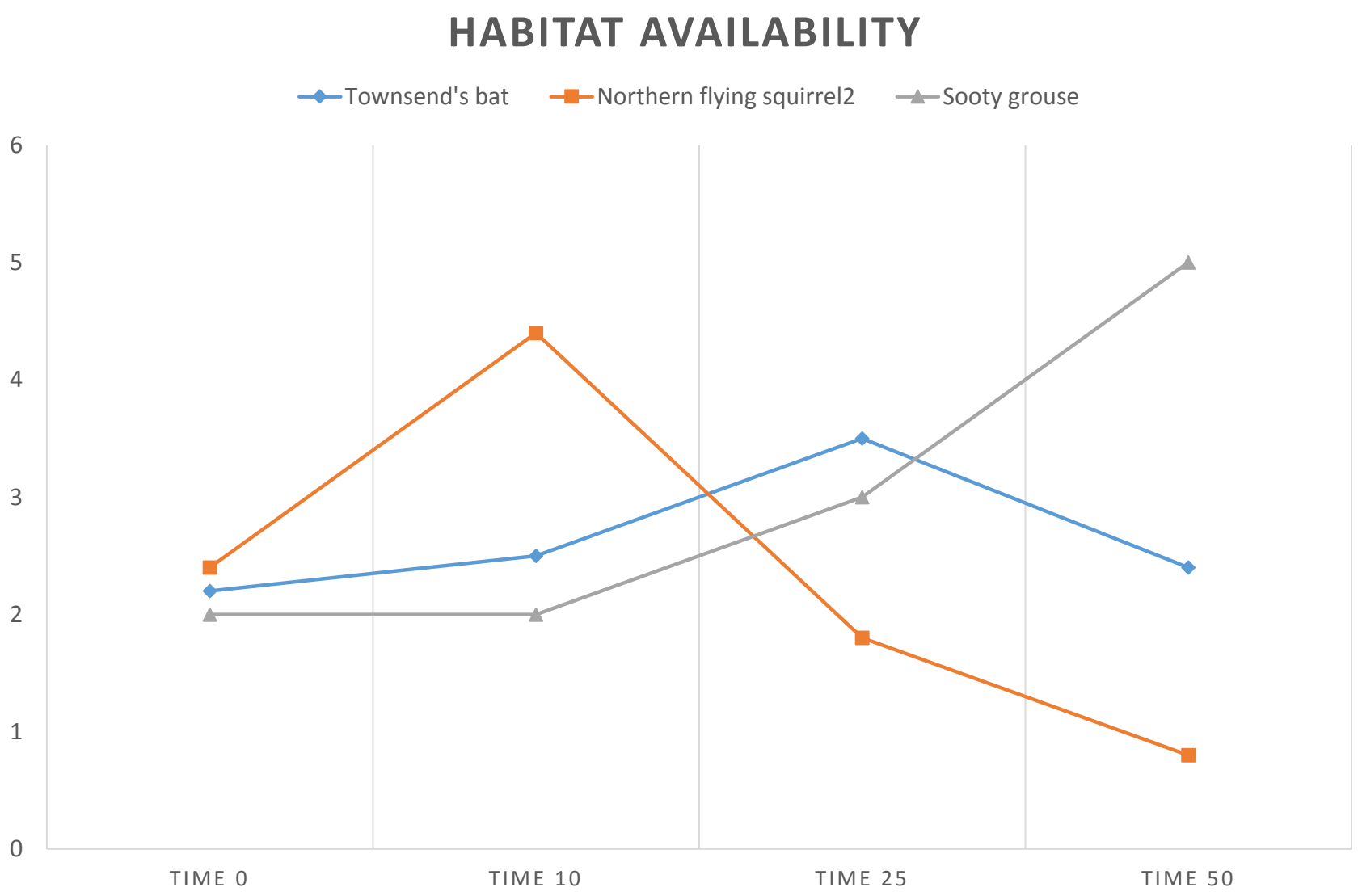
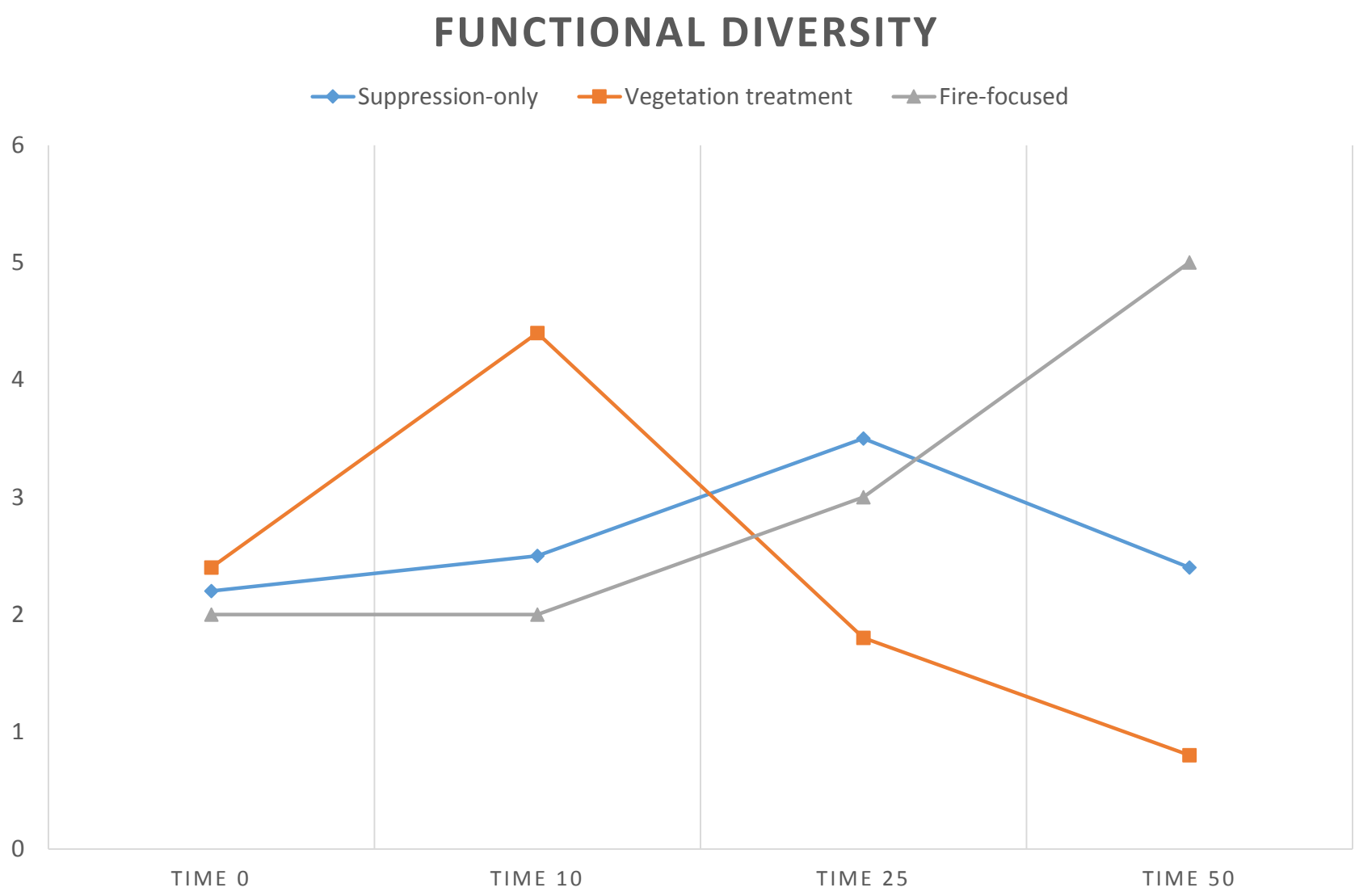

HABITAT AVAILABILITY
Townsend's bat
Northern flying squirrel2
Sooty grouse
6
5
4
3
2
1
0
TIME 0
TIME 10
TIME 25
TIME 50


FUNCTIONAL DIVERSITY
Suppression-only
Vegetation treatment
Fire-focused
6
5
4
3
2
1
0
TIME 0
TIME 10
TIME 25
TIME 50