



Sierra Nevada Adaptive Management Project Annual Meeting Notes

US Fish & Wildlife Service Office, 2800 Cottage Way, Room C-1001- C-1002, Sacramento, CA
October 21st, 2010, 10:00 to 3:00 pm

In Attendance:

Reg Barret, UC Science Team
Vince Berigan, UC Science Team
Sam Blanchard, UC Berkeley
Sue Britting, Sierra Forest Legacy
John Buckley, Central Sierra Environmental Resource Center
Esther Burkett, CA Dept. of Fish & Game
Pete Cafferata, CalFire
Mike Chapel, US Forest Service, Region 5
Brandon Collins, US Forest Service, PSW
Casey Collins, US Fish & Wildlife Service
Robert Dean, Calavaeras County Water District
Mike De Lasaux, UC Cooperative Extension
Ron Eng, CDFA
Gary Estes, CA Extreme Precipitation Symposium
Rebecca Ferkovich, CalFire
Shasta Ferranto, UC Science Team
Todd Ferrara, CA Nat. Resources Agency
Pat Flebbe, US Forest Service, Region 5
Pamela Flick, Defenders of Wildlife
Danny Fry, UC Science Team
Rick Gruen, Placer County RCD
Rocky Gutierrez, UC Science Team
Dan Jiron, US Forest Service, Region 5
Ann Huber, UC Science Team
Lynn Huntsinger, UC Science Team
Kim Ingram, UC Science Team
Addie Jacobson, Ebbetts Pass Forest Watch
Marek Jakubowski, UC Science Team
Marilyn Jasper, Sierra Club - Placer County
Jeremiah Karuzas, US Fish & Wildlife Service

Chris Keithly, CalFire
Maggi Kelly, UC Science Team
Bill Kinney, CA Energy Commission
Lacey Kiriakou, UC Merced
Mark Kleinman, Resources Legacy Fund
Susie Kocher, UC Science Team
Cathy Koos Breazeal, Amador FSC
Shufei Lei, UC Berkeley
Anne Lombardo, UC Science Team
Diane Macfarlane, US Forest Service, Region 5
Pat Manley, US Forest Service, PSW
Dave Martin, US Forest Service, Bass Lake
Tiffany Meyer, CalFire
Susan Moore, US Fish & Wildlife Service
Lindsey Myers, Central Sierra Environmental Resource Center
Dave Passovoy, CalFire
Tony Rodarte, US Forest Service, American River
Kim Rodrigues, UC Science Team
Ashley Rood, Environmental Defense Fund
Vance Russell, National Forest Foundation
Richard Rypinski
Phil Saksa, UC Science Team
Karina Silvas, Sierra Forest Legacy
Kim Squires, US Fish & Wildlife Service
Frank Stewart, Quincy Library Group, CA SFC
Peter Stine, US Forest Service, PSW
Scott Stephens, UC Science Team
Adriana Sulak, UC Science Team
Rick Sweitzer, UC Science Team
Dan Teater, US Forest Service

Sarah Tomskey, US Forest Service
Crawford Tuttle, CalFire
Dana Walsh, US Forest Service
Angela White, US Forest Service, PSW
Deb Whitman, US Forest Service
Sheila Whitmore, UC Science Team
Don Yasuda, US Forest Service, Region 5

On the Web:

Greg Schroer, US Forest Service
Marc Meyer, US Forest Service PSW
Victor Lyon, US Forest Service
Lorna Dobrovolny, CA Dept. Fish and Game

I. INTRODUCTION: Kim Rodrigues welcomed everyone to the meeting. The desired outcome of the morning session was to present an overview of the research conducted so far by the University of California Science Team in the past year. The goal for the afternoon was to provide facilitated, one-on-one interaction among members of the Science Team, public, and agency staff.

John Battles introduced the Sierra Nevada Adaptive Management Project (SNAMP) project. He discussed an overview of the origins of the project, including the multi-agency motivation that led to the project's initiation and scope. He also reviewed the SNAMP timeline, where the project is in the adaptive management process, the study sites, and some of SNAMP's key agreements and guiding documents. John emphasized that SNAMP is a chance to make an impact on improving the scientific understanding of the Sierra, with public involvement throughout the SNAMP project.

II. IMPLEMENTATION UPDATE

Sugar Pine Project - Dave Martin, District Ranger of the Bass Lake Ranger District, gave an update on the Sugar Pine Project. The Sugar Pine contract was awarded to Sierra Pacific Industries (SPI) to complete treatments by October 2012. There are two separate contracts, one for biomass and log removal and the other for mastication work. Work will start next year. The district will try to get them to finish in a year but Dave doubts it can be completed in less than two years.

Bass Lake is preparing the environmental documents for the Fish Camp Project. Bass Lake's projects are prioritized to manage for the risk of catastrophic fire in the wildland urban interface along Highway 41 corridor.

Last Chance Project – Tony Rodarte, Vegetation Management Officer, American River Ranger District, gave an update on the status of the Last Chance Integrated Vegetation Management Project. The contract was awarded in September. Underburning will begin this fall with a target of 200 acres, and will be completed next year. Logging and hazardous fuels removal will begin next spring.

Question: Are we sure the projects will be implemented by 2012 considering current lumber prices?
Answer: Yes, that is the goal. Dave Martin believes that Sierra Pacific Industries can get the Sugar Pine project done.

III. OVERVIEW OF RESEARCH: Each science team gave a PowerPoint presentation with an overview of their research in the past year (these are posted at <http://snamp.cnr.berkeley.edu/> along with the 2010 Annual Report).

Fire and Forest Ecosystem Health Team – Dr. John Battles of UC Berkeley presented the forest health research approach and status of completed work. Dr. Scott Stephens of UC Berkeley gave an overview of the status of the fire modeling. Simulations are completed for Last Chance. Fire history analysis continues at both sites. Scott reviewed the methods and findings of the Last Chance modeling, which is *in press* at Forest Science. They are finding that simulations are not creating big enough fires; they tend to underestimate the rate of spread so are working on that. Calibrations of models are done with real fires – the 2001 Star fire and the 2005 American River Complex fire. There appears to be little difference between modeled fire effects in fuel treatments with thinnings that involve 12”, 20” or 30” tree diameter limits as far as surface fire spread is concerned. It is crown fire potential where diameter breast height (DBH) and tree canopy cover limits may have the most impact. The team is working on that model now. There are also other factors to consider like how to pay for the treatment without the lumber value of larger trees.

The research priority for the upcoming year is to continue the modeling work on Sugar Pine, with the goal of integrating the remote sensing data (Lidar), which has been a challenge so far. They plan to change their focus on the remote sensing integration from the fireshed scale to the smaller watersheds to see if that helps develop stronger relationships between the field data and the Lidar derived parameters.

Question: With the Last Chance fire modeling, why did you assume that there would be no follow up treatments in your projections over the time of conditional burn probability?

Answer: It gives a horizon as to when you need to start thinking about treating the area again. The model shows that treatments are effective at reducing the risk of fire for 20-25 years.

Question: Was the fire weather modeled at 95th percentile fire weather conditions?

Answer: Yes.

Water Quality and Quantity Team – Dr. Roger Bales of UC Merced gave an overview of the Water Team research, hypotheses, status of the Water Team research, and summary of baseline data collected on water quantity and quality at each site. He gave a conceptual overview of the hydrologic modeling, the parameters they will use, and status of the modeling work. The next steps are to install weirs, scour pans, and automatic water samplers. On the modeling front, they will be working on the modeling results and calibrations.

Public Participation Team – Drs. Maggi Kelly and Lynn Huntsinger, of UC Berkeley, gave an overview of the Public Participation Team’s work, including the public outreach activities, the website, and the main aspects of the public participation research, including “best practices” to help management agencies implement adaptive management. Maggi showed that SNAMP website users come from all over the world and shared results of a SNAMP online survey that shows why and how people use the website. Lynn presented figures on SNAMP public outreach, including total numbers of people contacted through outreach efforts over the course of the project. Questions in the online survey asked how people perceive the social effects of SNAMP. Most agree the UC Science Team is neutral, and that they are learning new things through broad discussion. More than half agree that trust of the USFS is increasing and relationships are improving.

Spatial Team – Dr. Maggi Kelly presented the work of the Spatial Team. Much of the work of the team is on the Lidar data, but they also work with other remote sensing products and GIS. She gave an overview of the Lidar parameters and using Lidar to visualize the forest. The Spatial Team is working in many different ways with each of the science teams to extrapolate results to a common spatial scale. Maggi showed examples that demonstrated how this upscaling will work. The team is thinking about the post-treatment Lidar flight, and continues to look for additional funding sources to acquire Lidar data for the larger SNAMP wildlife study areas. Next steps for the Spatial Team include analysis of Lidar for vegetation structure, Leaf Area Index, and habitat variables important to wildlife.

Pacific Fisher Team - Dr. Rick Sweitzer gave an overview of the fisher study and its current findings. The Fisher Team has the best data on causes of mortality for fisher in the country due to the aerial telemetry available to the team. Predation is a much larger cause of death for fisher in the SNAMP study area than road kill, which is the second leading cause of death. The team is also identifying source and sink areas within the study area, dispersal, habitat use, population parameters and limiting factors. They plan to evaluate the effects of fuels treatments on fisher habitat use, survival, and fecundity. Rick mentioned the fisher kit rescue.

Question: As female survival has dropped significantly this year, at what point would that trigger an Integration Team meeting to discuss any actions? The SNAMP Fisher Team themselves suggested adult female mortality as a management indicator. The next Fisher Team IT is next July, which seems too far away to discuss this concern.

Answer: The Fisher and Public Participation Teams said they would explore this idea and hoped to have a meeting planned for soon after the fisher data is ready in March.

Spotted Owl Team - Dr. Rocky Gutierrez gave an overview of the Owl Team research and preliminary findings. Their preliminary results (many territories have not been treated yet) show no discernable difference between treated and untreated territories in spotted owl annual rate of survival, territory occupancy (proportion of territories occupied), and reproductive rate. The Owl Team has also completed a peer-reviewed manuscript testing a hypothesis suggested by a SNAMP stakeholder that spotted owls selectively choose nest sites closer to edges of forest stands. Their analysis did not find any evidence to support that hypothesis. The Owl Team would like Lidar data for their entire study area. They currently only have Lidar for the Last Chance project area.

Question: How did you define “forest edge” in your analysis, besides the end of trees?

We defined forest edge in two ways: 1) a hard edge (such as a brush field), and 2) a change to a different forest type. We analyzed patterns of nest site locations in both scenarios.

Question: The adaptive management circle is weakest on its left side (the steps that identify how management will adapt to the scientific results), and trust issues remain between the public and the Forest Service because these steps have not been identified. What exactly will the adaptive management decision support structure look like? How will the data be processed and result in changes to management actions?

Answer: This is something that does need more clarification as the project progresses. It has been raised as a concern since the beginning of SNAMP.

III. BREAK OUT SESSIONS: Each science team hosted a tabling session for all those in attendance who wanted to ask questions or give suggestions about SNAMP research. Notes of each session are listed below.

SPLAT Study Site Implementation Break Out Session:

USFS: District Rangers: Dave Martin from the Bass Lake District and Tony Rodarte from the American River District (filling in for Chris Fisher)

Participants: John Battles and Ann Huber, Gary Estes, Dan Jiron, Vance Russell, Lacey Kiriahou
Facilitator: Kim Rodrigues

Question: What has been the impact of data from the UCST thus far on USFS treatments?

Answer: The USFS is required to use best available “science” when designing and analyzing treatments. The data has been shared between UC and the districts, but the information is not yet peer-reviewed science. Still, some of the data, such as fisher den trees, needed to be considered in NEPA. This was debated at regional office but the District Ranger felt strongly about this and ultimately the den tree data was used for planning the treatment. Active adaptive management requires sharing data as soon as possible.

Question: Is the adult female fisher survival decrease a “trigger” to adapting management by the USFS?

Answer: No. It is too early to determine if the fisher mortality represents a “trigger”. The synthesis of data over time and the peer-review process are required to provide relevant science to be used by managers. After treatments are implemented and review is done – then the standards and guidelines can be updated accordingly to guide future management. The Forest Plan Revisions could also be informed through SNAMP information, results and recommendations. The District Rangers prefer to use an Environmental Impact Statement to disclose what is not known and address uncertainties.

SNAMP Neutrality Statement Break Out Session:

UC Science Team: John Battles and Ann Huber

Participants: Sue Britting, Dave Martin, Tony Rodarte

Facilitator: Kim Rodrigues

The group discussed concerns about fisher mortality in the SNAMP study area. Sierra Forest Legacy has concerns about the scope and scale and pace of treatments in fisher territory, especially given the high female mortality rates noted and the near proximity to the source area for fishers near Fish Camp. This needs to be defined and tested to develop trust in the full process. Discussion about landscape level treatments that everyone can agree on to obtain healthy, resilient forests is needed. Areas of agreement should be prioritized for future treatments – such as overstocked plantations rather than seeking treatments in sensitive areas.

Sue Britting said there is strong support SNAMP as it frames adaptive management for the USFS for the future. The process is the key to success – early engagement of the public and the need to clarify the decision-making process that will close the loop and keep people engaged. Raw data should be carefully considered, even if not peer reviewed. Sue noted that Sierra Forest Legacy did not litigate SNAMP fuels treatment projects because the treatments basically followed 2001

Framework guidance. As the fisher study area for SNAMP includes other treatments, those may be litigated.

Action Item: Ann Huber will update the SNAMP neutrality statement to note that peer reviewed data will be shared throughout the SNAMP effort and not simply at the end of the cycle.

Public Participation Team Break Out session:

UCST: Maggi Kelly, Lynn Huntsinger, Shufei Lei

Participants: Not recorded

Facilitator: 1st session Lynn Huntsinger, 2nd session Maggi Kelly

Question: How will you track the USFS use of data generated by SNAMP? How will you be able to close the adaptive management loop?

Answer: We need to work towards an agreement that the USFS will inform us of how and when SNAMP data is used for management decisions so that we can track it. We have made a commitment to at least track what happens on the left side of the adaptive management cycle.

Question: How do you think about public communication and public consultation via the web versus public participation via integration team meetings and field trips?

Answer: The web is an excellent support tool and has been very well received and frequently used. However, it does not replace face-to-face discussion and field trips. It is part of a complex of outreach strategies. We need to continue to use all methods and help them to work together.

Question: What are your plans for future evaluation? Who will do it? When and how?

Answer: We have the option of conducting a major survey to evaluate SNAMP, but need one and a half to two years lead time. What population would be sampled (participants? Local communities?) and what would we ask about? Should we put our energies into something like this, or into case study comparisons with other adaptive management projects? We will discuss this at the next PPT integration team meeting.

Action Item: The UCST, led by PPT, will develop an agreement with the USFS about how to track use of SNAMP data in management decisions.

Action Item: Methods for SNAMP evaluation will be put on the agenda for the next PPT Integration Team meeting.

Water Team Break Out Session:

UCST: Roger Bales, Martha Conklin, Phil Saska

Facilitator: Adriana Sulak

Participants: Pete Cafferata, Robert Dean, Pat Flebbe, Rick Gruen, Dan Teater, Deb Whitman Gary Estes, Addie Jacobson, Lacey Kiriakou, Lindsey Myers, Frank Stewart

Question: Can you explain more about the culvert weirs you are installing?

Answer: The culvert weirs will be low flow, temporary installations. During the 1st week in November, the team will be at the southern site to install a culvert weir in the southern site at Big Sandy which has the most underflow. Then all three will be installed next summer. This will allow for better monitoring at the low flows to see any changes in discharge. They are needed because the

stream banks change around the current water level monitors at low flows. The new monitors will back up high flow information with more data and provide for cross-validation. The Water Team's hypothesis is that most of the sediment moving is generated in-stream.

The team is currently working on weirs with other researchers from the Agricultural Research Service in Boise, Idaho. Costs have spiraled up to about \$90,000. The team had a breakthrough yesterday with the Merced Irrigation District agreeing to provide a project engineer, which should bring down bid costs for the weir at Big Sandy Creek on the southern site. They were planning on using concrete, but now thinking about using mainly steel as it is cheaper. The USFS has agreed to take ownership of the weir once built so it will be a permanent structure.

Question: Are these weirs creating aquatic animal barriers? Is the USFS willing to create a barrier?
Answer: Yes, the Water Team and Forest Service biologists have looked at the small amount of habitat available upstream of the culverts and said it was ok.

Question: What's your funding source? Is the Sierra Nevada Conservancy (SNC) contributing funding?

Answer: The source is the California Department of Water Resources. No, the SNC is not funding the SNAMP Water Team, though the researchers are doing related work with them. The project, which could complement SNAMP, is in the Onion Creek Experimental Forest on the Truckee Ranger River District on the north fork of American River. The site has been set aside as a research area, but has institutional constraints that may take a while to work through. Sierra Pacific Industries (SPI) and individual land owners surround the site. They have a planning grant and will finish the white paper in the spring. The research into treatment effects can only take place if the treatments can be implemented, and paying for that is a challenge too.

Question: What about scheduling issues? Will you get the pre-treatment monitoring done before treatments happen?

Answer: We have shown that the data in the control and treatment areas track each other well. We now need to improve the models' accuracy through parameterization. That is why we are using data from the King's River Experimental Watershed (KREW) as well. However, we are struggling for money on that project since it needs another person to keep things going. The National Science Foundation made it clear that the USFS portion of the project should be paid by the USFS. The USFS is trying to do the treatments but there are a lot of controversial issues. These need to be implemented to see if treatments have any effect. It is a difficult balancing act.

Question: How does the modeling of forest growth shown in Dr. Stephen's presentation use water information?

Answer: The modeling that Scott Stephens did was based on forest re-growth without a water limitation. The water team is struggling with how to couple the forest growth and water modeling. If water data is added in the model, then it is possible to simulate forest growth using it. However, the forest team is not convinced they will get a better result. In principle, soil moisture should be important. There needs to be more parameterization than can be done with the SNAMP data alone. KREW data needs to be incorporated.

Question: Are you going to monitor large fires? What happens if a fire goes through the study site?

Answer: Yes, if they happen in our study areas. The Kings River project is supposed to have controlled burns, but no fires through those watersheds yet. The American River Complex Fire in 2008 was on the next ridge over so did not affect the SNAMP study site.

Question: Did the water team look at organic soil content?

Answer: No, but the assumption is that it is low. Roger did not see this with Tea Kettle and Malcolm North's data. The main correlation he saw is with slope.

Answer: Has any vandalism occurred on the meteorological data stations?

Answer: Not since one was shot out at Fresno Dome. One met station is near a campground with lots of traffic, the other is really remote – it's the in-between that's a problem. It looks like one wire got burned by someone near a campsite, there has been a little problem with rodents and bear damage at the northern site. Adding radio wireless to one of the sites should help.

Question: Regarding information on hydrology, have you had any conversations with the California river water forecast centers?

Answer: Yes, Roger has been to their meetings and talks to them about once a year. They have had a few conversations about protocol. They have their own through the National Oceanic and Atmospheric Administration (NOAA) while SNAMP's has been worked out with DWR and others. The Water Team does not want to be limited by what the federal agency is committed to. The important question is 'what is the rain/snow transition for a given storm?' The water team hasn't tried to harvest the data for the North Fork yet. That information should be on the Hydrometeorology Testbed (HMT) website for the last few years. Phil will look to see if the data is useable. It looks like the HMT has a line item in the NOAA budget so should be able to continue.

Question: Roger made a presentation to the Quincy Library Group in Plumas County. One of their concerns, as for all counties in the Sierra dominated by federal lands, is finding a way for water coming off federal lands to generate revenue so that the counties can get more funding and be able to reinvest in watershed restoration. Frank Stewart suggested developing water science in more areas to get the data needed to implement this water funding strategy.

Answer: Roger believes that UC, including SNAMP, has developed the technologies that will help with the needed verification. The Kings River Experimental Watershed is also crucial to that effort. The Sierra Nevada Conservancy has a project on this as well. Broader work could be funded through the Integrated Regional Water Management Planning process and / or the \$10 million in currently proposed water bond for infrastructure.

Mike Chapel added that SNAMP is only studying the effects of the treatments in two project areas, not elsewhere yet because of the cost. The USFS is moving in this direction but hasn't put research money towards it yet. Mike thinks there would be broad interest but the problem is who would pay for it. There is a need to convince people, who are the users of the water in metropolitan areas that they might find it in their financial interest to help the USFS to manage the watershed. It is very hard to convince people of this right now. The USFS has partnered with the Department of Water Resources (DWR) to help write a forest part of California water plan. DWR is beginning to do the next iteration and this would be good for them to hear.

Question: If the USFS treats the land in different ways, will there be more water?

Answer: It is hard to demonstrate that. There has to be enough revenue to conduct vegetation treatments that maintain the evapo-transpiration at the desired rate. This would be a much more managed landscape – like a European forest rather than a western American forest. Gary Estes added that research done in the 1980s in Colorado showed that where they treated the forest, more snow got to the ground which produced more run off. Even now, snow depth sensors show twice the amount of snow in the open than under the trees (the canopy needs to be open to get snow on the ground but there needs to be enough shading to keep it there). Martha Conklin added that decreasing leaf area index would cause earlier snowmelt and so longer dryer summers. There is a tradeoff – between shading and melt.

Question: Will Lidar look at crown cover and spacing?

Answer: Yes, and they will come up with a protocol to use in other places.

Question: How does your project address climate change?

Answer: The SNAMP project was not designed to do that. The researchers are involved with a project at the KREW that is designed to answer climate change questions.

Spotted Owl Breakout Session

UC Science Team: Rocky Gutiérrez, Sheila Whitmore, William Vince Berigan,

Participants: John Buckley, Mike De Lasaux, Marilyn Jasper, Tiffany Meyer, Lindsey Myers, Craig Thomas, Dana Walsh, Don Yasuda

Facilitator: Kim Ingram

Question: Can you talk more about edge effects and forest fragmentation on owls?

Answer: In general, it is thought that forest fragmentation is detrimental to owls, but this is obscured by the fact that owls use a broader array of forest types for foraging than for roosting or nesting. Thus, many scientists consider the owl a habitat specialist that uses particular forests disproportionately to their availability. Owls use a broad variety of forest structure, but are almost always associated with forests having high structural complexity for nesting and roosting. Owls on the Eldorado study area nest further from forest edges than would be expected by chance. The Owl Team is using Lidar data to identify residual trees.

Question: Can you explain more about the maps shown in the morning presentation that show the distribution of owls at Last Chance and on the Eldorado?

Answer: Owls space themselves as a function of habitat quality and presence of other owls (territorial behavior leads to exclusive use of areas), which result in large spacing among nest sites and centers of activity. The gaps or lack of owls on the Last Chance site could be due to the presence of unsuitable habitat (e.g. high elevation, rocky areas with few trees). The Last Chance study area and Eldorado study area are completely surveyed within their boundaries every year and we are confident that we locate all (or an extremely high percentage) of the owls within these study areas. The scattered territories depicted on maps that are outside of the Last Chance and Eldorado study areas are a part of our regional study area. The immediate area around the regional sites is surveyed to locate birds but the area between regional sites is not surveyed systematically. The regional study area does not show a true distribution of owls, but it allows us to increase the overall sample size for our study.

Question: Why aren't you using radio telemetry to track owls, as the Fisher Team is?

Answer: We chose not to use radio telemetry because of the expense and logistics of monitoring them. Moreover, it would be difficult to recapture the owls to replace transmitters annually when their batteries fail.

Question: Do treatments cause high stress levels in owls?

Answer: Basic operating procedures for low- to moderate-disturbance activities such as trail maintenance probably would not affect owl stress levels. However, large logging events/disturbances may raise the stress levels in owls. We measure this by estimating metabolites of corticosterone in fecal samples. It is important to realize that stress levels are higher in breeding owls than non-breeding owls regardless of the owls' proximity to roads, noises or other 'stress' factors. Also the methods used to handle and store fecal samples can affect stress hormone levels.

Question: What affects owl survival, reproduction and occupancy rates?

Answer: Survival rates depend on factors such as winter weather, food availability, and the availability of suitable habitat. Reproductive rates (on average about 40 % of pairs produce young in a given year) seem to be correlated with temporal factors such as weather conditions. There is limited evidence that occupancy rates may be affected by reproduction. Even small declines in adult survival have a strong effect on the overall owl population trajectories.

Question: What makes good foraging habitat?

Answer: We know much more about nesting habitat than we do about foraging habitat. Without using telemetry, it is hard to identify quality foraging habitat.

Question: What kind of treatments in owl Protected Activity Centers would benefit owls?

Answer: If one were to consider reducing fire risk in PACs, it would be prudent to use a cautious approach. For example, low-intensity fires probably have little negative effect on owl occupancy. Thus, one might consider using controlled burning in a staged approach. First, study how treatments adjacent to PACs affect owl occupancy, reproduction and survival. If the results show no negative response by owls, then design an experiment with treatments within PACs that are reduced in intensity from the original treatment design. We are not advocating or suggesting experiments in PACs at this time, rather we are responding to a hypothetical question about how one might consider such experiments. The owl telemetry study showed that the percentage of canopy cover did not drop much (~17%) from treatments, but there was a much larger effect on surface and ladder fuels. Thus, the stand structure changed dramatically even though the canopy cover did not. However, a stand with few big trees could have a greater drop in canopy cover. It would depend on the stand structure.

Question: How are covariates used as a way to assess impacts to owls?

Answer: When assessing a response of owls to treatments such as occupancy, one can use various measures of the treatment effects, which we call covariates. For example, one can consider a treatment as a categorical variable (treated or not treated), a continuous variable (how much area was treated), or something that measures condition of the territory or the degree to which the treatment affected the stand (e.g., tree density). The Owl Team will use these covariates when constructing and running their models to assess SPLAT effects on owls.

Question: Can long term data be used to calculate home /roost ranges?

Answer: This question is currently examined by William Berigan.

Question: Does Lidar have an effect on the owls?

Answer: It is unlikely because the wavelength of light used in Lidar is not visible.

Fisher Team Session: UCST: Rick Sweitzer, Reg Barrett

Facilitator: Ann Lombardo

Attending: John Buckley, Esther Burkett, Pamela Flick, Marilyn Jasper, Diane MacFarlane, Peter Stine

Question: How many fisher kits died this year, based on what you know about how many adult female fishers died during the spring and summer?

Answer: We recorded an unusually high number of deaths among adult females in the study area in spring and summer 2010. Six adult females that had produced kits died from late April to September. The combined number of kits produced by these female fishers was 13. Since the mothers died before the kits were old enough to survive on their own, a total of 6 adult females and 13 kits were lost to the population (N = 19).

Question: How does the Fisher Team find the dens?

Answer: We use several key features of fisher behavior to help find den trees. If we find an adult female fisher in the same tree for 2-3 days during the denning season, it's likely that tree is a den tree because fishers do not usually reuse the same den trees over consecutive nights. Fisher kits are poorly developed when they are born, and so are unable to stay warm without the presence of their mother in the den cavity. The old saying that "the coldest hour is just before dawn" is true, and female fishers must stay in the den tree during the morning hours to keep their kits warm, especially during the first month of the denning season. Den trees are identified using a combination of early morning telemetry flights followed by tracking to the coordinates obtained from the airplane. Once a possible den tree is identified, 2 to 3 cameras are placed around it. Early morning walk-ins to the tree are done to determine if the female is repeatedly present in the tree. Camera images are reviewed for evidence that the female fisher is repeatedly going up and down the tree.

Question: Is it possible that den trees are chosen for a southern exposure to help keep the kits warm in the early months?

Answer: Yes, we think this might be the case. We are currently measuring the height, size and aspect of den trees to determine if fishers select cavities so the sun will help keep kits warm.

Question: Why do they move den trees up to five times?

Answer: They move kits for two reasons. First, as the kits grow they need more space. Some cavities may not be large enough when kits grow to near adult size. Second, we now have ample data indicating that female fishers are killed by other forest carnivores, and the longer the kits stay in one tree, the more likely they will be detected by the mother's movements around the den tree and odors associated with the buildup of feces and urine produced by the kits.

Question: What about the source areas make them so productive? Do we have a sense of this yet?

Answer: These areas will likely have a better mix of habitat features preferred by fishers, and abundant food and water. Our analyses will focus on describing the habitat conditions associated with the two possible population source areas in our study area.

Question: When can we begin to draw conclusions from the mortality data?

Answer: Our data indicate that predation, roadkill and disease are the three most common causes of death for fishers in the study area. Numerically, predation is the most important and this likely will not change as more data accumulate. A number of key questions remain on this topic, including whether the population can sustain a relatively high level of “natural” (predation) mortality in combination with two human-related mortality factors (roadkill and disease). We do not know if the level of predation being experienced by fishers is typical of what it was before forest management altered habitat conditions. A number of questions have arisen on this topic, including whether bobcat numbers have increased, and if bobcats are now better able to find, chase down, and kill fishers in the brushy areas and younger-aged forests on the landscape. We hope that one of our collaborators will be able to capture and radio-collar bobcats in the research area so we can begin to evaluate these possibilities. Also, we don’t know where the diseases that are affecting fishers originate, or how often disease events occur in the study area.

Question: Is there concern for bear-hunting dogs transmitting disease to fisher?

Answer: No, we have no good evidence that the diseases that fishers are exposed to in the Sierra National Forest originate solely or primarily from domestic dogs used to hunt black bears. We are using genetic analyses to identify the source of canine distemper in the area, which may be endemic among wild carnivores (gray fox, raccoon, coyotes, bobcats, skunks, etc.) or transmitted to them by unvaccinated dogs and cats. All recovered fisher carcasses are being tested for evidence of exposure to rodenticides. There was a rodenticide-linked death of a male fisher last year, but several other animals that died for other reasons had also been exposed to rodenticides. Illegal marijuana cultivation within the Sierra National Forest uses large quantities of rodenticide to deter rodents and other herbivores from consuming young marijuana plants. It is important to understand that the occasional use of over the counter rodenticides by property owners may be innocuous, and much less of a problem for fishers than the rodenticides being used in the forest by illegal pot farmers.

Question: What, if anything can be done about road mortalities?

Answer: We hope to learn if there is a pattern in roadkill locations with respect to topography, habitats, and straight versus curvy sections of highway. This information will be useful for putting up signs to alert motorists to slow down and watch for wildlife. Anae Otto (Bass Lake District wildlife biologist) is working with others (including Dianne MacFarlane) to generate funding for two to three wildlife underpasses, which may help reduce the frequency of roadkill fisher deaths. The team will be using analytical models to evaluate how mortality factors influence population-level growth/decline.

Question: Is there any evidence of predation near den trees?

Answer: Yes, we have camera images verifying that bobcats are regularly finding den trees and occasionally killing kits and adult female near or at the base of den trees.

Question: What is the prey base for fishers?

Answer: Douglas and gray squirrels are the main source of food for fishers during the winter when ground squirrels, chipmunks and reptiles are in hibernation. This accentuates the need to know more about the local acorn masting habits and cycles as they help support the squirrel population. An effort to involve local schools to track acorn production over the years is underway. There is some evidence that ground squirrels are moving upslope with climate changes. Rabbits are quite rare in the study area. There are so many factors to consider it shows the value of a long term study. The lack of the porcupine is a large loss for the fisher in terms of prey since they do not hibernate. Reg has suggested use of a small piece of salt block at bait stations to see if porcupine could be sighted.

Question: How have volunteers been involved in the project?

Answer: SNAMP fisher has had an active volunteer program in the past, with one to two volunteers assisting the project during the fall, spring, and summer seasons. Experience and coursework in wildlife biology is required. Volunteer opportunities are posted on the Texas A&M Job Board. The team is hoping that administrative difficulties can be overcome, and the program can be restarted.

Question: At what point would we be comfortable summarizing and sharing what we know in order to get information on the fisher to decision makers? Could we send a summary to those making decisions affecting the fisher or perhaps present it at a seminar for wildlife biologists in the Sierra?

Answer: The best and most appropriate avenue for sharing research results that are relevant for management prior to completion of the overall SNAMP research is by publishing some of the data in the peer-reviewed literature. The team is working on four papers and will summarize relevant information for the management agencies as soon as data and results have been vetted by the scientific community. Research briefs will be created for all peer-reviewed papers to facilitate sharing the information with those working under tight time constraints. A presentation to wildlife biologist would be possible too.

Action item: Rick will share volunteer postings with those interested.

Fire and Forest Health Session UCST: Scott Stephens, Brandon Collins, Danny Fry

Facilitator: Susie Kocher

In attendance: Sue Britting, Pete Cafferata, Pat Flebbe, Addie Jacobsen, Daniel Jiron, Pat Manley, Dave Passovoy, Vance Russel, Richard Rypinski, Karina Silvas, Frank Steart, Scott Stephens, Craig Thomas, Sarah Tomskey, Dana Walsh, Angela White, Deb Whitman, Don Yasuda

Question: Could you give us more details on how the models work?

Answer: Dr. Brandon Collins explained that Flammap uses weather information as a fixed condition, i.e., weather doesn't fluctuate diurnally as it would during a real fire. They modeled a random ignition start and growth during a four hour "blow up" condition. The model was calibrated using actual behavior from two nearby fires, Starr in 2001 and American River Complex in 2008. The underestimation of actual fire effects from models mentioned in the presentation was due to underestimation in the model calibration phase. The post treatment modeling is done using Forest Vegetation Simulator (FVS) based on information in the district's silvicultural report. Modeling is best at detecting differences from surface fire, not crown fire spread as Flammap doesn't model crown fire spread in the way the team used it with a two meter flame length cut off. Scott added that the surface and ladder fuels are the most important to fire behavior.

Question: Why did you not model the follow up treatments that are sure to be done on the SPLATs in Last Chance?

Answer: Treatment specifics are not in district silvicultural reports. The USFS doesn't establish the maintenance methods or schedule in these reports.

Question: Is it the lack of treatment maintenance that reduces effectiveness in 30 years as shown in your slides?

Answer: Brandon said that based on results from another study, even with maintenance, the treatment fire behavior effect is reduced, because the areas around the edges of the treatments that were not treated, continue to grow and compromise the treatment areas. This is because the initial treatments targeted areas of most fuels, while in 30 years, other areas will pose the highest risk.

Question: Has treatment effectiveness modeling been done at Sugar Pine?

Answer: No, not yet. The Forest Team may take a different approach with this in the south because they have Lidar data available. It may be an opportunity to compare methods with and without Lidar. Still, Lidar use for fuels modeling is problematic because the surface fuels, which are the most important for fire behavior, are not captured well by Lidar.

Question: You found that the diameter of trees removed was not that important for fire behavior. What is the implication for forest management? Don't your results suggest that a lot more work could be done with hand thinning?

Answer: Brandon said there is an operational difference with removal of different diameter trees that is not captured by the modeling results. The team assumed that the surface fuel conditions were the same regardless of the tree diameter removal limit. However, when removing trees only up to 12 inches in diameter, managers do not have the ability to use tractors to pile up slash and it is probably too expensive to pile it all by hand. So, its unlikely surface fuels would be the same under different tree diameter limit scenarios. Scott said that though hand thinning only smaller diameter trees might be effective at diminishing fire behavior, it would be very difficult from an operational perspective as it is 10 to 20 times more expensive.

Question: Is Last Chance actually testing SPLATs? Isn't Finney now advocating for treating most susceptible areas first?

Answer: Brandon said that Last Chance is testing SPLAT theory, though the treatment does not look like the textbook Finney SPLATs. Local knowledge was used to customize the concept for local conditions. The study area has no specific wind direction, so the treatment has been designed to slow wind coming from two or three different directions. It doesn't look like a classic Finney SPLAT arrangement because of the specific constraints out there on the landscape. But it still works. Finney does now have a more sophisticated optimization model in development. Scott added that the Last Chance treatment was not just about fire behavior but also tried to improve resiliency by treating plantations, and enhancing wildlife.

Question: Can you say that the SPLAT strategy is effective if only 30% of an area is treated?

Answer: Scott said it is a question of scale. It may work at a fireshed scale, but once the treatment is completed, what then? Do you do another treatment elsewhere and abandon the first? Or do a rotation of treatments?

Question: How does this fuel modeling work fit into other ongoing collaborative processes?

Answer: Scott said he thought this type of modeling could be useful for biomass initiatives and could help inform decisions. It can help explain effectiveness of treatments. It could also help with understanding issues of water supply. However, one problem is that the model is not biologically based; it's still just a physical model.

Question: How do strategically placed fuels treatments fit into the region's restoration direction that calls for treating 500,000 acres a year in the Sierra?

Answer: There was discussion within the group as to what can be considered restoration. Defensible fuel profile zones (DFPZs) are another landscape area treatment being implemented. They reduce crown closure and allow an area along roads to act as an anchor point to attack a fire and so are part of the infrastructure protecting communities. However, they are probably not "restoration" as they are not restoring fire resilient tree species. One of Scott's students is studying 25 year old defensible fuel profile zones and finding that they are very stable. There is no evidence that they are recruiting new shade intolerant species. This is also a problem for very light fuels treatments (with small diameter limits) that don't remove enough trees to create openings for shade intolerant species to regenerate. On the other hand, a problem with SPLATs is that treatment areas are disconnected and so hard to use in a coordinated fashion for fire fighting. It will require an increase in the pace and scale of treatments, including wildland fire use, to be able to treat 500,000 acres per year.

Spatial Team Session:

UCST: Qinghua Guo, Marek Jakubowski, Sam Blanchard

Facilitator: Shasta Ferranto

In attendance: Bob Dean, Kelly Harvie, Pat Manley, Angela White

Question: What scale of data is available?

Answer: Most of the products produced from SNAMP Lidar are at 20 by 20 meter resolution. This resolution was chosen to best meet the needs of different science teams. The individual tree product is not based on pixels, so it does not have a pixel resolution; it's based on locating individual trees. The DEM product has a resolution of 1 by 1 meter.

Question: Can you detect dead trees?

Answer: Yes, we can detect snags and logs. If there is no canopy cover detected then we call it a dead snag. Logs can be detected by their shape.

Question: Can you detect tree species?

Answer: Yes, we can differentiate between tree species by the shape of the tree from the Lidar point clouds. Integrating Lidar and high spatial resolution images shows promise in tree species detection too.

Question: Can we identify shrub species?

Answer: It's difficult to detect shrub species because they're typically below one meter. The best way to do this would probably be with wave-form lidar data.

Question: Would combining Lidar data with satellite imagery help to do this?

Answer: Yes, that's an active research area. We can combine Lidar with satellite imagery. However, there is an issue with georeferencing because both datasets have high spatial resolution. One must geo-reference them to under a sub-meter accuracy in order to fully merge them together for image analysis. However, this remains a challenging research question.

Question: Vertical complexity would be a very useful indicator for wildlife. How can we measure vertical complexity with Lidar?

Answer: This is an active research question. We can get this from Lidar with a multiple hit index. In the past, landscape metrics have been two dimensional. Now with Lidar we have the capability to make three dimensional landscape metrics.

Question: Is there a minimum height for Lidar data?

Answer: Below one meter we can't differentiate from bare earth – variation could be topographic. Wave form lidar is a new technology that has the potential to detect objects below one meter in height because it gets continuous returns instead of multiple returns. There is a trade-off when you use wave-form Lidar, however. You get so many points you have to sacrifice spatial resolution. When choosing the type of Lidar data you have to make a decision about which is more important for your research – accuracy below one meter or spatial resolution.

Question: How can Lidar be used for water quantity information?

Answer: The Water Team will be using products from the Lidar data as inputs for their models. We can also get snow depth from Lidar for the entire watershed. This is more useful than Modis data which only provides snow coverage, not snow depth. We can also use Lidar to look at the impact of biomass removal on water.

Question: What is the flight swath?

Answer: The flight swath depends on the flight height, topography and instruments. For SNAMP, the average flight swath was about 500 meters across.

Question: What is the cost of Lidar?

Answer: The cost for SNAMP Lidar data was about \$60,000 for 100 km², not including the data analysis. The cost increase is not linear. One important expense is the initial cost of getting the plane to the research area. Data analysis is still quite expensive, but it would be much cheaper if analysis could be automated. Lidar is still cutting edge, but eventually it will be easier to analyze.

Question: Is California going to fly Lidar for the entire state? Would this be useful data?

Answer: There is no state wide Lidar data for California yet. States that have the state wide data have a Lidar resolution that is too coarse (e.g. 1 point per square meter) for vegetation analysis. A solution would be to combine forces of all of the interested parties and agencies to get better resolution data for the entire state for a range of applications.

IV. SESSION SYNTHESIS AND EVALUATION: After the breakout session, facilitators for each group reported the main discussion themes to the whole group. The issues that were discussed will be used by the UC Science Team to guide further public involvement opportunities in the next year. Next steps:

- Treatment implementation and field trips

- Public Participation Integration Team meeting in February 2011
- Fisher Integration Team meeting to discuss low adult female fisher survival

Meeting evaluation: Participants commented that the meeting location was good (easy parking) as was the food. The summaries by the science team were good and the meeting was on time. There was appreciation for posting materials like the annual report on the website ahead of time. The meeting could have been improved by allowing more time for questions in the general morning session.

In addition, 37 participants of the meeting filled out a paper evaluation form (out of 66 in attendance). Their ratings of the meetings and additional comments are listed below.

<i>Question</i>	<i>strongly agree</i>	<i>agree</i>	<i>neutral</i>	<i>dis-agree</i>	<i>strongly disagree</i>	<i>NA</i>
Notice of this event was given in a timely manner.	84%	3%	0%	0%	5%	8%
The agenda and related documents were made accessible to me for meeting preparation.	62%	16%	8%	3%	3%	8%
I was aware of the web conference/ call-in option.	62%	8%	14%	0%	8%	8%
The goals and objectives of this event were clearly stated.	68%	16%	5%	0%	5%	5%
The implementation update by the US Forest Service was clear and concise.	57%	24%	5%	3%	5%	5%
The facilitated, round table discussions were effective	59%	19%	11%	5%	3%	3%
Public participation was encouraged and I felt my comments were heard.	74%	11%	0%	6%	0%	9%
The 'report back' session captured my round table discussion	55%	24%	12%	3%	0%	6%
Recommendations/actions for next steps were clearly outlined	42%	12%	27%	9%	0%	9%
The goals and objectives of the meeting were met.	67%	21%	3%	0%	6%	3%
There was adequate time for questions and answers	36%	24%	24%	15%	0%	0%
The event was well organized	82%	12%	0%	0%	6%	0%
I learned something new at this event.	79%	12%	3%	3%	3%	0%

Additional written comments:

General:

- Great job!
- Good networking opportunity, well run
- A very worthwhile meeting. I left knowing much that I didn't know when I arrived.
- Well done!

Format:

- Not enough time for interaction with researchers
- Not enough time in the morning for Q & A
- Starting an hour earlier and having more time for full group Q & A would be ideal

Venue:

- Location great, more coffee...
- Disagree on meeting location - Cottage Way is not a great place to ride a bike to. Something more central in Sacramento would be nicer.
- Real coffee please, better (quiet) breakout areas
- Venue was a bit small, Thank you for sign on door!
- Tight seating

Content:

- The water team had a slide early in their presentation that was a model of what they are studying. This type of diagram clarifies relationship (assumed or known) and highlights focus of study/
- Fisher presentation was too long.