SNAMP Spatial Team meeting notes

May 16th – O'neals, Minarets High School AND May 17th –Foresthill Veterans Hall, 9 to noon

In attendance:

Oakhurst

Steve Brink, California Forestry Assoc.
Sue Britting, Sierra Forest Legacy
Bob Dean, Calaveras Co. Water District
Pamela Flick, Defenders of Wildlife
Cory Gibson, local resident
Qinghua Guo, UC Merced
Jeannie Habben, Central Sierra Watershed Committee
Paul Hardwick, Seq. Kings Canyon NP
Anne Lombardo, UC Cooperative Extension
Sara Morrison, CA Dept. of Fish & Game
Mary Motola, Picayune Rancheria
Charlotte Peters, CA Dept. of Fish & Game
Caitlin Porter - Minarets high school
Mark Smith, USFS retired
Julianne Stewart, Southern Cal. Edison
Liz Van Wagtendonk, Sierra Nevada Cons.
Corine Wilson, Minarets Community
Minarets High School ag classes

Foresthill

Nathan Amboy – US Forest Service
Chris Brown – Placer County
Jennifer Byous – Placer County
Marie Davis – Placer Co. Water Agency
Matt Dunnahoe – Placer County RCD
Chris Fischer – USFS, American River RD
Tyler Harkness – Foresthill Fire Dept.
Jeff Glazer – Salix Consulting
Peter Hopkinson – UC Berkeley
Kim Ingram – UC Cooperative Extension
Kelly Larvie - Calfire
Tiffany Meyer – Calfire
Carlos Ramirez – USFS Regional Office
David Rizzardo – CA DWR
Richard Rypinski – unaffiliated
Brett Storey – Placer County
Edmund Sullivan – Placer County

Both:

Sam Blanchard, UC Berkeley
Jacob Flanagan - UC Merced
Marek Jakubowski - UC Berkeley
Maggi Kelly, UC Berkeley
Shufei Lei, UC Berkeley

Dr. Maggi Kelly, University of California, Berkeley, co-principle investigator of the SNAMP spatial team, introduced herself and several graduate students. She gave a brief introduction to the Sierra Nevada Adaptive Management Project (SNAMP). The goal of the meeting was to

inform stakeholders about SNAMP spatial team activities and increase knowledge of how spatial data are integrated across the project.

Next she showed a PowerPoint presentation on Lidar basics and how Lidar is being used in SNAMP (the presentation is available on line at http://snamp.cnr.berkeley.edu/events/may-17-2012-northern-site-lidar-workshop).

Lidar forms include discrete and wave-form and can be collected from airplanes or from the ground. Aerial lidar is currently being used in many different ecological applications but especially for characterizing ground topography, the 3D structure and function of vegetation canopies, forest stand structure and attributes, and carbon stocking and biomass. Ground-based lidar systems are hemispherical scanning laser range finders that fire millions of laser pulses and records detailed structural information at a range of up to 200 meters. Data can be used to derive: canopy height, basal area and stem density, vertical foliage distribution, and leaf area index.

Lidar is based on the small differences in time it takes a laser shot from a plane to bounce back from the surface of the earth and forest. The Spatial Team uses these small time differences create a 3-D image. The density of Lidar coverage can be affected by the elevation it is flown at, increasing with proximity to the ground. The cost of Lidar can be affected by the density of the terrain being flown. Accuracy to quantify layers of the forest decreases as it passes towards the floor of the forest, as more and more of the light pulses have already been intercepted and returned.

SNAMP collected pre-treatment data using discrete Lidar (collecting 6 to 9 points per square meter) in 2007 (Sugar Pine) and 2008 (Last Chance) through a contract with the National Center for Airborne Laser Mapping (NCALM) Both surveys used an Optech GEMINI Airborne Laser Terrain Mapper (ALTM) mounted in a twin-engine Cessna Skymaster. The Team has used this data to produce a digital elevation model (DEM), digital terrain and digital surface models, maximum tree height, canopy cover, height to live canopy base, diameter at breast height, and leaf area index (LAI). Field crews have collected similar parameters (Height, DBH, Species, vigor (class), Crown class, HTLCB; Shrub Species, % cover, Height; Fuel, LAI, canopy cover, coarse woody debris, Ladder fuel measurements) allowing for ground-truthing of the data.

The Spatial Team lidar data is being used to drive fire behavior models (including FlamMap and Farsite) and hydrology models; characterize the forest in order to understand wildlife habitat; better visualize the forest; and to characterize down logs in burn areas. Lidar data has also been used to locate and describe individual trees across a landscape to help understand Pacific fisher or California spotted owl behavior and so help describe the potential impact of treatments; the Spatial team used forest inventory and cover data for 30 den trees in 10 meter increments out to 50 meters, looking for commonalities they are calling fisher likeability. Big trees, which have

time to produce cavities, slope and canopy cover are all traits that are important to fisher in their den choices. A paper from the Spatial Team on this topic has just been accepted in "Forest Ecology and Management".

Findings so far have included:

- *Fuel and fire models* - lidar can be used to map broad fuel classes, and many of the direct measures needed for fire behavior modeling.
- *Individual tree detection* - the point cloud can be mined to map individual trees. These data are useful in many other studies.
- *Owl habitat* - despite small sample size, lidar can map important habitat features in the areas surrounding owl nesting trees.
- *Fisher habitat* - lidar can characterize denning trees and forest habitat in ways that optical remote sensing cannot. Still need to broaden this analysis to cover landscape.
- *Visualization* – lidar is a fast and powerful tool to look at the virtual forest from a more realistic perspective than point clouds alone.

Question: What is the horizontal and vertical accuracy?
Answer: Horizontal accuracy is 10 cm and vertical is 5 to 10 cm.

Question: Are lidar products/data available for others?
Answer: Yes, raw data and products.

Question: What is the cost for flying lidar?
Answer: SNAMP flew two areas with a cost between $68,000 and $75,000 which does not include data processing and analysis which is quite time consuming.

Question: At the implementation field trip, it was mentioned that project completion dates could become an issue with when to fly the second round of lidar, is this still a concern?
Answer: Yes, in that you want to fly when the implementation is complete before snow falls and the trees have dropped a majority of leaves.

Question: Re. crown base height, I am surprised that the accuracy is so high. Are you?
Answer: No. In analyzing the data, you can see a gap between the ground and canopy. You are basically looking at top heavy points versus lower points**.**

Question: How accurate is Lidar at measuring canopy crown bulk density?
Answer: Not very. It needs better accuracy for use in fire modeling, especially predicting as crown fires are a weakness of the models.

Question: How heavy is ground based lidar?

Answer: A ground-based lidar instrument weighs approximately 15 to 20 pounds.

Question: Is proximity to gaps in forest canopy being considered in the fisher/lidar work?
Answer: Not for this current paper, but it could be in the future.

Question: For individual trees, can you identify tree species?
Answer: It is not possible yet to identify tree species. Hardwoods are more difficult than conifers when pulling out individual trees in models. Lucky for us, SNAMP is predominately mixed conifer forests.

Question: What is the basal area map accuracy?
Answer: We did not map basal area with lidar. For a list of the lidar products, please see: *http://snamp.cnr.berkeley.edu/documents/452/.*

Question: What is the cost to fly hyper-spectral?
Answer: We have one estimate that suggests it might cost $300,000 per month to fly and maintain such an instrument. Carlos Ramirez, USFS, is looking into acquiring these data in conjunction with water projects.

Question: Are there any plans to evaluate lidar products with existing Forest Service vegetation map products, such as the FIA data and/or E-Veg?
Answer: This is a great suggestion, and we will look into it.

Question: Are there any plans to coordinate with JPL scientists on lidar?
Answer: This is a great suggestion, and we will look into it.

Question: There are some upcoming stewardship programs for PG&E lands. There might be some opportunities for funding lidar work.
Answer: This is a great suggestion.

Question: Have you considered coordinating with the Dinke Creek project in lidar acquisition?
Answer: Yes, we are working with Carlos Ramirez, USFS, and there might be some synergies between the projects that we can take advantage of.

Question: Could you produce a map the shows the probability for fisher habitat and home range in space and time, so that future treatments might be evaluated with respect to this?
Answer: We continue to work with the Fisher team in developing a fisher habitat suitability model.

After the presentations and questions and answers, those assembled broke into smaller groups to have the opportunity to talk with the students and explore the Lidar data on computers set up in the room. There were also pinned up maps and a table with SNAMP newsletters, research papers and other handouts.

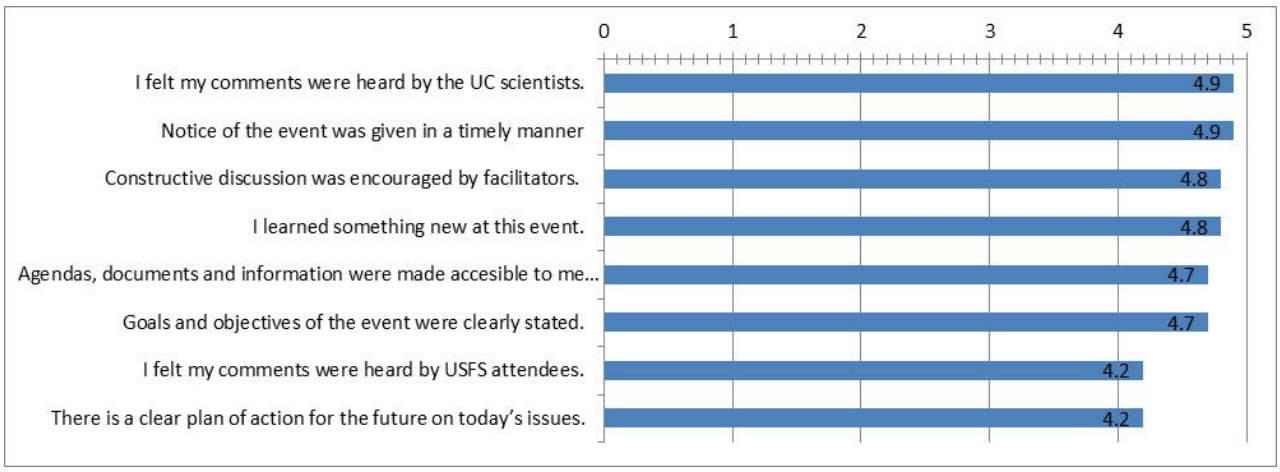
Discussion at the southern workshop touched on coordination of lidar data collection across agencies and difficulties with lidar data collection considering the SNAMP timeline.

Coordination: It may be possible to get more Lidar coverage by combining data collection efforts. This may also save on costs if it avoids the expense of fitting and relocating the plane for each effort. The SNAMP, the USFS (for Dinkey Creek and the El Dorado), Sequoia National Park and others may be able to do a joint data collection effort.

Timing: The SNAMP study plan calls for Lidar to be collected after the Sugar Pine fuel treatments are done, however to fit into SNAMP's funding timeline, this would have to be in Fall 2012. The entire project was designed to be funded for seven years, including pre- and post-treatment data collection. However, delays have reduced the amount of post-project data collection that can be done. Local USFS fuel projects typically take three to ten years to complete. Cedar Valley, the previous project to Sugar Pine was started in 2005 and is only now finishing, 7 years later. Increasing SNAMP's timeline would be one strategy if funding could be located. Otherwise there is the potential that the SNAMP's main research question about the effects of fuels treatments may not be adequately answered.

Evaluation/Wrap Up

Participants expressed gratitude for Maggi and her team for the great Lidar work they are doing and how well they made it easy to understand. A total of 36 written evaluations were received at both sites. Participants were given the choice to 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, or 5 = Strongly Agree. They strongly agreed that their comments were heard by the UC scientists, Constructive discussion was encouraged by facilitators and that they learned something new at this event. They agreed that there is a clear plan of action for the future on today's issues.



When asked what was the most interesting or useful thing you learned today, they mentioned the simple to understand explanations of how lidar works, how it has been used in SNAMP, and all the progress that has been made on developing applications for the technology, especially how the forest parameters can be constructed. They also especially appreciated the opportunity for hands on interaction with the data.