UC Science Team updates for SNAMP 2014 Fourth Quarter (Q4)

Main project findings and work accomplished since Annual report on November 5, 2014

~January 20, 2015~

Project Integration and Management (PIM) Team

Integration

In addition to the financial, administrative, and logistical support that PIM provides to the UCST, we also are responsible for leading the SNAMP integration component that will result in the final integrated assessment. During the 4th quarter of 2014, we continued to coordinate science team interaction to ensure the flow of integration products between teams.

We also drafted and revised a manuscript based on the PIM talk at the ESA Annual meeting.

UCST Coordination

PIM continues to plan and budget for successful project completion in mid-2015.

- Administration: assisting science teams with budget reporting, maintaining SNAMP publications list, and maintaining bSpace archive and secondary UCST archive.
- Logistics: coordinating monthly UCST conference calls and other interteam communication.
- Keeping track of adherence to SNAMP and UC science team agreements (e.g., neutrality, data-sharing agreements).
- Helping teams to follow integration timeline and maintain consistent spatial products.
- Coordinating UCST team sections for Annual report in November 2014.
- Organizing UCST meeting to complete integrated analysis in February 2015.
- Created list of SNAMP products and non-UCST data uses, reviewed and added to by USCT, for final report.

Communication with MOU Partners (MOUP) and stakeholders

- Participated in 2014 Annual meeting webinar in November 2014.
- Communicated with MOUP regarding UCST progress towards project completion.

- Coordinated with MOUP on scheduling a MOUP 2014 Q4/2015 Q1 meeting.
- Helped coordinate scheduling of SNAMP final meeting with PPT and MOUP.
- Notified MOUP about recently published UCST scientific publications.
- Communicated with MOUP regarding journal article(s) developed from ESA session.

California Spotted Owl Team

Worked on during October-January

1) The Owl Team has finished analyzing the effects of fire and SPLATs on owl habitat and demographic rates on the Last Chance Study Area. We used the new fire modeling output produced by the FFEH Team in December that was based upon conditions (weather, ignition starting point) during an actual fire that occurred in the area in 2001 (Star Fire). We are now working on writing this chapter for the final SNAMP report with the goal of publishing it in the peer-reviewed literature.

2) Two papers ("science products") that we referred to in the 2014 Annual report from November have now appeared in print. The updated citations are:

   Tempel, D. J., R. J. Gutierrez, S. Whitmore, M. Reetz, W. Berigan, R. Stoelting, M. E. Seamans, and M. Z. Peery. 2014. Effects of forest management on California Spotted Owls: Implications for reducing wildfire risk in fire-prone forests. Ecological Applications 24(8): 2089–2106.

   Stoelting, R., R. J. Gutiérrez, W. L. Kendall, and M. Z. Peery. 2015. Life history trade-offs and reproductive cycles in Spotted Owls. The Auk 132(1): 46–64.

Fire and Forest Ecosystem Health (FFEH) Team

4Q 2014 Activities:

- Analyzing data and writing the final report is ongoing.

- Currently, we are gathering the necessary weather variables for the fire modeling analysis at Sugar Pine. Since there are no big, recent wildfires near Sugar Pine to use as a guide, we consulted with the good folks at the FS Bass Lake office for advice on ignition locations and weather. They have been very helpful.

- We have started building the tree lists for the fire modeling and forest growth analysis for Sugar Pine. Given the challenges in producing Last Chance fire modeling and forest growth outputs useful for the other teams, we will work more closely with them on the Sugar Pine analysis. Merging the treatment polygons from the FS with the veg map has

been finalized. Splitting some of the veg map polygons was needed so that they can be assigned a single treatment type. For Sugar Pine, the splitting procedure added approximately 107 polygons.

Spatial Team

Q4 2014

The Spatial Team is focused on the challenges associated with analyzing lidar for post-treatment in both sites and extending coverage to assist with the Owl Team's Eldorado area.

Vegetation mapping
We developed a new strategy using both multispectral aerial imagery and lidar data to map vegetation over large scales. Our approach included the use of a Bayesian Information Criterion algorithm to automatically determine the optimized number of vegetation groups within mixed-conifer forests in two study areas, and an unsupervised classification technique and post-hoc analysis to map the vegetation. The results suggest that each obtained vegetation group has its unique vegetation structure characteristics or vegetation species composition. The overall accuracy and kappa coefficient of the vegetation mapping results are over 78% and 0.64 for both study sites. We have finished the first draft.

Forest metrics calculation
At the plot level, the following forest-related variables have been calculated at pixel size of 20m:
· Canopy Max and Mean Height, Diameter at Breast Height, Height to Live Canopy Base, Canopy Bulk Density, Canopy Base Height, Canopy Cover, Leaf area index, Individual Trees - Location, height and crown size of all trees in each study area.

The following ground-based variables can be calculated at pixel size of 1m and larger from the DEM:
· Slope (%)
· Aspect (degrees)
· Elevation (m)
All completed products are available at the SNAMP data server at https://snamp.ucmerced.edu/.

Before and after forest thinning change detection
This study used canopy height model (CHM) and canopy cover (CC) products derived from multi-temporal airborne Lidar data to monitor the forest change following implementation of landscape-scale forest fuel treatment (FFT) projects. Our approach involved the combination of a pixel-wise thresholding method and an object-of-interest segmentation method. We also investigated forest change through the use of normalized difference vegetation index (NDVI) and standardized principle component analysis (PCA) from multi-temporal high resolution aerial imagery. The same FFT detection routine was applied to compare the capability of Lidar data and aerial imagery for FFT detection. Our results demonstrate that the FFT detection using Lidar derived CC products produced both the highest total accuracy and kappa coefficient, and was

more robust at identifying areas with light FFTs. The accuracy using Lidar derived CHM products was significantly lower than that of the result using Lidar derived CC, but was still slightly higher than using aerial imagery. FFT detection results using NDVI and standardized PCA using multi-temporal aerial imagery produced almost identical total accuracy and kappa coefficient. Both methods showed relatively limited capacity to detect light FFT areas, and had higher false detection rate (recognized untreated areas as treated areas) compared to the methods using Lidar derived parameters.

Aboveground biomass (AGB) estimation
We compared a range of airborne lidar-derived volume metrics (e.g., stem volume, crown volume under convex hull, and crown volume under CHM) to estimate AGB. In addition, we evaluated the effect of horizontal crown overlap on the accuracy of AGB estimation by using a hybrid method that combined marker-controlled watershed segmentation and point cloud segmentation algorithms. Our results show that: (1) when the horizontal crown over-lap issue was not addressed, models based on point cloud segmentation outperformed models based on marker-controlled watershed segmentation; models using stem volume estimated AGB more accurately than models using crown volume under convex hull and crown volume under CHM. (2) Once the horizontal crown overlap issue was taken into consideration, the model using crown volume under CHM yielded a more accurate estimation of AGB.

Lidar visualization work
Based on the individual tree detection method described above, we reconstruct the forest using a ray-tracing algorithm. Parameters are used to reconstruct the forest include tree height, height to live crown, location of individual trees, and high resolution DEM. We then compare the simulated landscape with the photo taken at the same site, and the result shows that there is great similarity between them.

Publications
Tao, S., Li, L., Q. Guo, L. Li, B. Xue, M. Kelly, W. Li, G. Xu, and Y. Su. 2014. Airborne Lidar-derived volume metrics for aboveground biomass estimation: A comparative assessment for conifer stands. Agriculture and Forest Management 198–199: 24–3.

Science Briefs
A SNAMP Science Brief for the above paper is posted on the SNAMP website:
http://snamp.cnr.berkeley.edu/news/2015/jan/14/snamp-pub-29-airborne-lidar-derived-volume/

Public Participation Team (PPT)

Outreach

The PPT Outreach Team hosted the SNAMP annual meeting by webinar on November 6, 2014, for 40 people.

We gave SNAMP presentations to:

- Kiwanis Club in Oakhurst – October 14, 2014, to 20 people
- Placer County Supervisor Jennifer Montgomery – October 28, 2014
- Mariposa Resource Conservation District –November 5, 2014, to 9 people
- Calvin Crest Outdoor Education School – November 11, 2014, to 8 people
- CA Native Plant Society, Sacramento Chapter – November 12, 2014, to 43 people
- Amador Fire Safe Council – November 19, 2014, to 16 people
- Placer County Ag Commission – December 8, 2014, to 16 people.

We conducted the follow-up facilitation/collaboration training workshops in:

- Tahoe – October 15, 2014, for 16 people
- Marysville – November 13, 2014, for 14 people.

We are reworking the facilitation/collaboration training workbook into a condensed format that focuses on 'How to have a successful collaborative process' and less on facilitation for spring 2015 workshops. And we are maintaining the UC Collaborative Tools site for CAM trainings – on-going.

We wrote articles and stories about SNAMP:

- The Fall 2014 SNAMP Newsletter Vol. 7 No. 2 - IT Meeting Wrap up focusing on UCST updates and integration: http://snamp.cnr.berkeley.edu/news/2014/nov/6/snamp-newsletter-vol-7-no-2-it-meeting-wrap/.
- The Fall 2014 Yosemite Gateway Partnership quarterly newsletter: *Local Forest Study Wrapping Up 8-Years of Research*, October 2014.
- The UC Green blog "*The effects of density and high severity fire on individual tree and forest health*", November 10, 2014: http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=15867.
- Worked with Kellie Flanagan from Sierra Online to write an article on grow site cleanup: http://www.sierranewsonline.com/index.php?option=com_k2&view=item&id=4619:pot-grow-cleanup&Itemid=578, December 1, 2014.
- Worked with Jeannette Warnert to write a UC ANR News blog about illegal grow site cleanup, "*Rat poison used in marijuana grows harming wildlife*": http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=16257 – December 16, 2014.
- Wrote a science brief on SNAMP Publication #34: "*Beyond reducing fire hazard: fuel treatment impacts on overstory tree survival*" for the forest team: http://snamp.cnr.berkeley.edu/news/2015/jan/6/snamp-pub-34-beyond-reducing-fire-hazard/.
- Wrote and posted a science brief on SNAMP Publication #35 "*Life-history tradeoffs and reproductive cycles in Spotted Owls*" for the Owl team: http://snamp.cnr.berkeley.edu/news/2014/dec/8/snamp-pub-35-life-history-tradeoffs/.

Special projects included:

- Communicating with the Wildlife Vehicle Collision group.
- Selling 90 fisher calendars for outreach/awareness purposes during the fall season.

- Assisting with cleanup of four illegal marijuana grow sites in fisher territory – November 6 and 7, 2014.
- Presenting a plaque of appreciation to Dave Martin at the Madera Board of Supervisors Meeting: http://snamp.cnr.berkeley.edu/videos/ – December 9, 2014.
- Attending the Ca. Fish & Wildlife's Pacific fisher endangered species listing meeting – December 3, 2014.

Finally, we are scheduling final outreach presentations through April 2015 and the final SNAMP public meeting in May/June.

Assessment

- Archiving SNAMP materials – on going
- Analysis of 2010 & 2014 online surveys, first, learning and final interviews and observational data – on going
- Program evaluation matrix refinement – on going
- Analyzed final interviews for integration and submitted PPT integration contribution
- Drafting final report chapter
    - Extensive analysis of results regarding forest health, learning and building relationships.
- Shufei Lei's UC Berkeley dissertation completed: "*Mapping Webs of Information, Conversation, and Social Connections: Evaluating the Mechanics of Collaborative Adaptive Management in the Sierra Nevada Forests*", December 2014.
- Lei, S and M. Kelly. *Evaluating collaborative adaptive management in Sierra Nevada forests by exploring public meeting dialogues using self-organizing maps*. Society and Natural Resources. This manuscript on visualizing the notes from public meetings was accepted in December 2014.
- Submitted the manuscript on tracking information products in SNAMP to peer-reviewed journal in October 2014
- Revising the manuscript on analyzing the SNAMP social network to peer-reviewed journal for resubmission
- Continued citations tracking: Total number of citations for all publications is 264.

Web

- Maintained and updated regularly
- Sent out Web Updates on a quarterly basis
- Maintained server health and backed up data
- Updated SNAMP Facebook page regularly
- Made recorded webinars accessible on the website

Fisher Team

- The fourth quarter of 2014 was a busy time for the SNAMP fisher project. Fieldwork continued under the USFS Sugar Pine effort. Sixteen fishers were captured during that period, including eight new individuals. Year 8 camera surveys in the Key Watershed area were initiated, and over 450 aerial telemetry locations were collected on 16 collared fishers. No mortalities were collected during this period; however, necropsies on several previously collected fisher carcasses raised the number of direct rodenticide poisoning cases to six.

- Fisher project personnel took part in a week-long November marijuana garden clean-up effort organized by the High Sierra Volunteer Trail Crew. This effort involved staff from six organizations as well as volunteers and resulted in the reclamation of 13 grow sites on USFS lands and the removal of approximately 3.5 tons of garbage, 14.8 miles of irrigation tubing, and 6.5 kg of toxicants. Several of the sites cleaned were within the SNAMP Key Watershed area.

- An initial draft of the SNAMP Fisher final report was completed, including summaries of field efforts, demographic and habitat use analyses, as well as information on focused ecological topics such as culvert use by fishers and niche overlap with sympatric species.

Water Team

4th Quarter Updates (2014)

Data Analysis

- QA/QC of WY 2013 data is complete, and the final data report has been sent to DWR. All water data will be turned over to the Department of Water Resources.

Water Quality Analysis

- A manuscript on bedload movement from scour pan data is in progress. Results show stream beds within the catchments tend to be stable over the long term, but disturbance and recovery cycles exist on yearly and weekly/monthly scales that seem to correspond to high background snowmelt flows of the annual hydrograph and to high flows associated with individual storm/melt events. Channel beds appear to act as a conveyor belt, moving sediment downstream with successive events, providing temporary storage for the sediment rather than acting as a sediment source or sink. Troubleshooting of scour pan data has been successful, producing data on timing of channel bed movement, as well as semi-quantitative data on amount of material moving.

- Final QA/QC of water chemistry data is being completed with detailed analysis to follow.

Hydrologic Modeling

- The headwater basins in Last Chance are parameterized in RHESSys with the pre-treatment vegetation map, including both overstory and understory layers. The fireshed models are using the same parameters but will be calibrated with the MODIS Snow Covered Area for snowpack at the larger scale. The modeling for Sugar Pine will also be completed using the same process with the pre-treatment vegetation map for that site.