SNAMP Science Team Updates

- Project integration – John Battles & Zack Peery
- Fire and Forest Ecosystem Health – Scott Stephens
- Wildlife (Owl and Fisher Teams) – Rocky Gutiérrez and Rick Sweitzer
- Spatial Team – Maggi Kelly
- Water Team – Roger Bales and Martha Conklin

LUNCH BREAK

- Public Participation Team – Lynn Huntsinger, Kim Rodrigues, Maggi Kelly

SNAMP Science Team: Spatial

Spatial Team Goals

- Developed to assist in the GIS and remote sensing technology for all teams

Spatial Team Activities

- Lidar Data Acquisition and Processing – New Lidar!
- Link with the other teams’ field campaign
- Develop and maintain digital library
SNAMP SPATIAL TEAM: Outreach Highlights - 2012

American Society for Photogrammetric Engineering and Remote Sensing Annual Meeting. April 2012
- Lidar in support of adaptive management in Sierra Nevada forests. Annual Meeting, ASPRS. Sacramento, CA

Lidar Workshops
- May 16 and 17 2012, Oakhurst and Foresthill
- June 2012, Forest Service, Mare Island

Spatial Team Publications

Newly Published Papers
- Jakubowski, et al. Tradeoffs between lidar pulse density and forest measurement accuracy. Accepted to Remote Sensing of Environment
Research Priorities for Coming Year

- NEW LIDAR ANALYSIS!
  - Change products
  - Waveform data

- CONTINUING WORK:
  - Plot-level vegetation type mapping of both sites
  - Extend biomass results and create wall-to-wall maps of biomass estimates (with uncertainty (RMSE)).
  - Continue fisher results to include some key variables: distance to gaps, heterogeneity, etc.
  - Fisher home range characterization.

SNAMP SPATIAL TEAM: Research Highlights - 2012

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.

Lidar pulse density: many of our important metrics can be mapped using 1 pulse/m².

Vegetation mapping: using lidar + imagery to map veg.

Owl habitat: lidar can map important habitat features in the areas surrounding nest trees.

Fisher habitat: lidar can characterize denning trees and forest habitat in ways that optical remote sensing cannot.

Biomass: Can use regional allometric equations and lidar- and individual tree-based metrics to estimate biomass.

Visualization: fast and powerful tool to look at the virtual forest from a realistic perspective.
Key Research: Lidar and SNAMP: Integration

- **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.
- **Vegetation mapping**: using lidar + imagery to map vegetation.
- **Fuel and fire models**: lidar can be used to map broad fuel classes, and many of the direct measures needed for fire behavior modeling.
- **Lidar pulse density**: many of our important metrics can be mapped using 1 pulse/m². Individual tree work needs higher density.
- **Visualization**: fast and powerful tool to look at the virtual forest from a more realistic perspective than point clouds alone.

Lidar and Wildlife Habitat

Can we look at the area surrounding trees selected by wildlife for nesting or denning to understand something about selection? Are there differences between these trees and the background forest?

Examples of area surrounding 2 fisher den trees: Jacob Flanagan
What are the factors that distinguish fisher den trees from non-den trees?

10m: Large trees, steep slope (78.6%)
20m: Higher structure complexity, slope (86.2%)
30m: Higher structure complexity, slope (83.9%)
40m: Higher structure complexity, Steep Slope (76.8%)
50m: Large trees, Canopy closure (82.1%)

New work modeling fisher habitat

We used all locations from 2007 to 2012 (n = 7,469)

Lidar Variables (20 m):
- DEM, Max Height, LAI, Canopy cover, DBH, Bulk Density, HTLCB,

Climate Variables:
- Precipitation, Temperature (Maximum, Minimum, Mean) for January, April, July, October

Ecological Niche Algorithm:
- Maximum Entropy
Vegetation Mapping

Sugar Pine site

Preliminary Vegetation Mapping

Process:

INPUTS

- Remote sensing
- NAIP imagery (color)
- Lidar (structure)
- Plot network
  - Clustering from field data

METHOD

We are using a Machine Learning algorithm, that "learns" from the clustering in the field data based on plot grid (284 plots)

EXTRAPOLATE

We then use the imagery to produce
A wall-to-wall map

VALIDATE

With a sample of our field data

Sierra Nevada Adaptive Management Project

snamp.cnr.berkeley.edu
Results
1. Fuel types can be predicted reliably using SMO
2. Specific surface fuel models are difficult to predict
3. Accuracy of continuous canopy metrics decreases with lidar penetration into the canopy
4. Use simple input with simple models to predict simple metrics
5. Use complex input with complex models for more challenging metrics

Lidar pulse density
Depending on flying height, discrete return lidar can yield pulse densities of 1-12 pulses/m². How much is enough?
Lidar pulse density is important

but flying height, flight paths, sensor design can increase costs

Many plot level forest variables can be accurately modeled with lower resolution lidar data...

Individual tree information require high resolution lidar data

Viewing a Virtual Scene in 3D
The Virtual Forest

The Virtual Forest: A fisher’s perspective