SIERRA NEVADA ADAPTIVE MANAGEMENT PROJECT
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Water Quality & Quantity

Research Objective

Develop a sound scientific basis for assessing how forest treatment strategies affect water quality (e.g. stream temperature, turbidity/sediment, dissolved oxygen), catchment water cycle (e.g. infiltration & soil moisture versus runoff & evapotranspiration), & ecosystem response (e.g. forest health, stream macroinvertebrates).

Methods

Field measurement program

- before/after treatment;
- control measurements in parallel w/ treatment;
- stream temperature, turbidity, dissolved oxygen, electrical conductivity, aquatic habitat, aquatic biota (macroinvertebrates);
- stream stage/discharge, soil moisture; and
- supporting meteorological, erosion, soil temperature, snowpack, precipitation measurements.

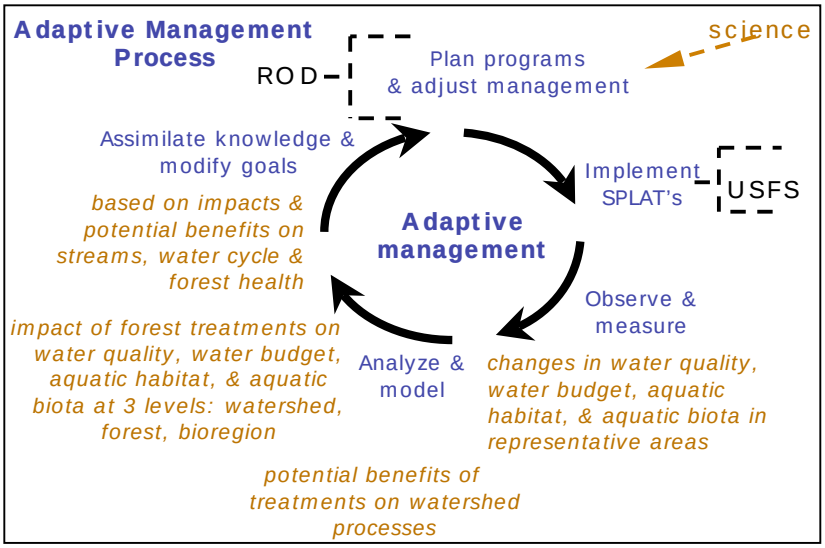
Modeling & spatial scaling

- integrate observations using gridded hydrologic model;
- estimate model parameters from satellite & ground data;
- extend impacts across hydrologic & watershed conditions; and
- couple watershed, erosion, stream responses.

Immediate next steps for implementation

- Develop detailed work plan: field measurement protocols, instruments, schedule, data needs, personnel
- Acquire & analyze additional data: aerial photography, updated GIS layers, satellite snowcover, vegetation features, meteorology, hydrology
- Set up & test hydrologic models for proposed study areas, using available data for parameter estimation
- Establish data management procedures

Adaptive Management Process



Questions & Hypotheses

- Treatment will alter soil moisture patterns, with effects dropping off in riparian areas, in untreated forest & drier areas.
- Treatment will affect the timing, duration, and magnitude of rainstorm & snowmelt flow in headwater streams. These responses will be linked to changes in soil moisture patterns, to canopy attenuation of rainfall/snowmelt, & to changes in the surface energy balance.
- Stream turbidity & transport of suspended material will increase following treatment, but effects will diminish with subsequent runoff events. These effects will be reflected in stream macroinvertebrates.
- Treatments will have a small, positive effect on summer stream baseflow, depending in part on proximity of treatments to streams; the first fall storms may induce a greater response in streamflow. These responses will be linked to changes in soil moisture & evapotranspiration.
- Effects of treatments will be more significant in 1st & 2nd order streams that drain treated headwater catchments (up to a few km^2) & will have modest, if any, effects on lower order streams.
- In the context of the physiographic & hydroclimatic regimes, it will be possible to define thresholds linking area treated with both aquatic effects & impacts on the forest water cycle.

Products & Outcomes

- Rich data set to serve as basis for multiple modeling & scenario analysis activities;
- Calibrated hydrologic, erosion & stream-impacts models for study areas & larger forest management areas;
- Estimates of impacts and potential benefits on water quality, water quantity, aquatic habitat, & aquatic biota based on scenarios of interest to forest managers & other stakeholders; and
- Improved basis for estimating effects of SPLATS & related treatments across range of watershed & climate conditions.

Investigators

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