Notes from the SNAMP Water Team fieldtrip
Southern Site - August 25th 2009and Northern Site - September 1st, 2009 9 am - 3 pm

In Attendance:

Oakhurst:

Chris Acree - Revive the San Joaquin
Larry Ballew - Coarsegold RCD
Skip Bullock - Mountain Home School
Mike Chapel - USFS Region 5
Dennis Dudley - USDA Natural Res. Cons. Serv.
Larry Duysen - Sierra Forest Products
Matthew Englund - Mountain Home School
Rocio Flores - Revive the San Joaquin
Joann Freemire - Northfork resident
Jeannie Habben - San Joaquin Watershed Council
Christi Hansard - North Fork Rancheria
Steve Haze - San Joaquin Watershed Council

Kent Kinney - Reedley College
Mark Lemon - USFS Sierra National Forest
Kirby Molen - Sierra Forest Products
Anne Lombardo - UCST Public Part.
Corinne Munger
Rob Roy - USDA Natural Res. Cons. Serv.
Mary Sanchez - Table Mountain Rancheria
Andy Stone - USFS Sierra National Forest
Phil Strand - USFS Sierra National Forest
Thomas Stratman - Kings River Exp. Watershed
Judith Red Tomahawk - Table Mountain Rancheria
Janice Ware - Northfork resident
Tom Wheeler - Madera County Supervisor

Foresthill:

Tim Biddinger - USFS Tahoe National Forest
Pete Cafferata - CalFire
Rob Collier - Sierra Nevada Alliance
Kalie Crews - USFS Tahoe National Forest
Marie Davis - Placer County Water Agency
Gary Estes - Protect American River Canyons
Chris Fischer - USFS Tahoe National Forest
Rich Gresham - Placer County RCD
Kim Ingram - UCST Public Participation Team

Susie Kocher - UCST Public Participation Team
Charles Lorenson - Nevada County Fire Safe
Lynn Lorenson - Nevada County Fire Safe
Tony Rodarte - USFS Tahoe National Forest
Dan Teater - USFS Tahoe National Forest
Roy West - Foresthill Forum
Tamra West - Foresthill Forum
Rebecca West - Foresthill Forum
Rather West - Foresthill Forum

Both: Martha Conklin - UCST Water Team
Sarah Martin - UCST Water Team

Phil Saksa - UCST Water Team

Introduction: Participants on the field trips met at the USFS office and introduced themselves. The goal of the field trip was to increase understanding of the water research being carried out by the Sierra Nevada Adaptive Management Project water team. Martha Conklin gave some background on SNAMP and the goal to look at fuels treatments holistically including the effects on water quality and quantity.

The goal of SNAMP is to help decision makers better understand the effects of fuels treatment and tradeoffs across many values. This information will be used to help the USFS learn whether their current forest management guidelines are adequate.

In each site, two similar watersheds (aspect [direction the slope is facing], orientation, slope and vegetation types) were selected, one that will be treated and one that will be a control where no treatment happens. The streams being monitored are Speckerman Creek and Big Sandy Creek in the south, and Frasier Peak and Bear Trap in the north. Preliminary data shows that the streams selected as pairs are behaving very similarly.

The water team's hypothesis is that the biggest effect of fuels treatments will be on water quantity since the number of transpiring plants will be reduced by thinning. The team expects that reducing the number of trees and their leaf area index will increase snow accumulation since snow will make it to the ground. However, snow retention will decrease where there is less shade. They also expect the stream's hydrograph peak and the shape of the recession curve (how quickly peak flow returns to normal) to shift. Moisture is also a primary determinant of whether forests will burn .Managing forests to maintain snow pack may help prevent some fires.

Leaf area index (LAI) is being measured using LiDAR (Light Detection and Ranging) data provided by the SNAMP spatial team. This data is then being ground truthed to ensure accuracy by data collection in the field. LiDAR has also been used to collect longitudinal profiles (surveys of the elevation of the stream bed as the stream flows downhill) of the streams being monitored.

The overall goal of the water team is to scale up treatment effects on water quantity and quality to larger areas based on field data by inferring measured values to similar areas using LIDAR data. At this point it looks like the team will have only 1 ½ years of pre treatment data instead of the preferred two years. To compensate for the shortened time span of the pretreatment data, the water team will parameterize hydrologic models to use on this basin. The models will be tested on the control basin as well. There is also the possibility of delaying treatments in the area until the fall of 2010 or 2011. This is good news in terms of helping the team stay integrated with other science teams. This is currently being discussed by the Forest Service.

The water team passed out a hand out with a map of the watersheds, and illustrations of the meteorological (met) station, snow pingers (snow depth sensors) and soil moisture nodes. This included a list of the data collected from the station and the streams. They also had data in graph form, such as snow melt, turbidity, conductivity and dissolved oxygen (DO). They also had much of this is big poster format which was shared through out the day. Data is being collected on streamflow, turbidity, erosion, although the team is still waiting on the delivery of scour point pans to measure bedload scouring.

Met Station Data Collection: Participants carpooled out to the closest meteorological station at their site to learn about how data was collected by the UC water team. After that, participants visited the stream site where instream data is being collected. The water team showed the equipment being collected and answered questions about the equipment and study overall.

Met stations have many instruments installed on them including: an anaemometer for wind speed, a solar radiation meter, a tipping bucket rain gauge, a relative humidity sensor, a GPS to transmit the data

to a satellite, a barometric pressure logger and aN equipment box with a logger and a battery. Data from the met stations installed for SNAMP is currently available from the California Data Exchange Center at http://cdec.water.ca.gov/ . Data is collected every 15 minutes and averaged over every hour. Look under UC Merced as the station operator.

Data currently needs to be downloaded from the instruments once a month, which can be challenging in the winter. The water team uses snowmobiles to access equipment. The team has had some problems with accessing their instruments and so is designing a wireless system to monitor the station.

The cost is about $40,000 per tower plus about $4,000 for the snow ping and soil moisture cluster. Wireless connectivity will also cost more. The station can withstand gusts of up to 50 miles per hour. Wind speed should be less than 5 meters per second to be accurate. Snow load is not a factor and tends to stabilize the tower.

Snow pingers: Snow pingers are being used to detect snow depth and to understand how trees affect snow deposition and melting. They consist of a sound sensor mounted at the top of a straight PCV post. The sound signal is sent down to the ground below and reflected up. The distance reflected is less when there is snow on the ground. During snow storms it can also bounce off falling snow which can lead to misleading readings. Pingers have been installed in the open, under the drip edge of a tree and against the tree on north and south facing slopes. The team has 2 winters of snow melt data, temperature and snow level. Pingers have been located both catchment basins, treated and non-treated.

Soil moisture nodes: Soil moisture probes are being installed in conjunction with the pingers so the effect of snow depth on soil moisture can be measured. Trees intercept snow, and so there is less of it under trees than elsewhere, but snow does not melt as quickly under trees due to shade. They will measure soil moisture between 30 and 90 centimeters, where most tree roots occur on the north, south, east and west sides of a tree. The most change seems to occur between the 30 and 60 cm mark. Several different soil types are being measured. The water team also has access to PG&E's snow survey data.

The nodes have been installed in representative soil for the catchments.

Stream Data Collection: The group then traveled to a monitored stream and the water team explained the equipment being used there. A sonde/sensor with several meters covered with a perforated PVC pipe to protect if from boulders has been installed. There is difficulty in accessing the area during the winter so makes it necessary to have a better, longer lasting system of batteries as they are difficult to reach for maintenance sometimes. The team has moved from AA batteries to marine batteries for better results. Hand held tests on recalibrated equipment is done on visits to the site. Any biofilms must be removed from the equipment in the streams on these visits also.

Turbidimeters: To measure instream movement of sediment, the team has installed turbidity meters and bank pins. They also plan to install automatic samplers, scour chains, or preferentially, scour pans. Sediment movement that does not make it into the stream will not be measured. A turbidity meter is used to detect particles, including sediment, in the water which is measured by passing a beam of light through the water and recording the scattering of light by particles. The more sediment or algae in the water, the more the light is scattered. The water team is finding very low turbidity levels with occasional increases. Turbidity readings are as low as 8 NTUs in the north, but have occurred up to 150 NTUs in

the south. NTUs are a measurement of light scattering (normalized turbidity units). The sensors have wipers that clean them before a measurement. The northern streams have few roads and no stream crossings above the instruments. The team has put bank pins in the stream banks to measure erosion and will install scour chains or scour pans to measure deposition. In addition, grab samples of water will be collected to calibrate the turbidity measurements.

Bedload scour pans: Scour pans which are similar to snow pillows used to measure snow depth. They have a liquid filled cell with a pressure transducer that measures the pressure due to sediment that accumulates on the pan. These measure 10" by 10". Bedload scour pans are being installed in the channel in lieu of sediment basins outside channels due to the findings of a recent master's thesis done at UC Merced that showed that basin capture efficiency of the basins is less than expected.

Conductivity: Conductivity, or the ability of the water to conduct electricity, is also being measured. Water with higher salts has higher conductivity. This can be used to track where instream flow is coming from, with ground water having higher conductivity than precipitation.

Dissolved Oxygen: DO is an important property of water for the health of aquatic life that is affected by water temperature. DO is high in these streams, running 8 and above. Measurements of isotopes of Oxygen 16 and 18 can also help determine where the water came from in terms of elevation.

Streamflow: A pressure transducer is being used to measure the weight of water (or stage). This can infer the depth of the water in a known channel which has a rating curve developed.

Water samples: The team is installing ISCO automated samplers. These consist of a barrel with a tube that collects 24 water samples to be taken back to the lab for chemical analysis.

Next Steps: Participants also made many suggestions to the water team about other studies and people to contact.
- Andy Stone the USFS hydrologist on the Sierra National Forest said they have some required studies to do and could do a paired watershed study and perform them in the SNAMP study site area to add additional data. The water team is working with Andy on a drill permit and a weir application.
- Kent Kinney from Reedley College, School of Forestry is teaching a watershed class this semester and would love to have some one from the water team come to speak to the class sometime.
- Skip Bullock, Matthew Englund and Dr Klimbal from Oakhurst schools are interested in doing a macroinvertebrate study with their students. The water team will forward protocol and date sheets.
- Marie Davis of the Placer County Water Agency was interested in learning the incremental cost of adding instruments to existing met stations.
- Rich Gresham and Gary Estes are planning a water conference in November that they plan to invite SNAMP to participate in.