**Project title:** Water balance & carbon cycling across the snow line in forested landscapes

**Purpose of study:**
The purpose of the project is to describe water and carbon cycle interactions between the land surface and the atmosphere in forests and meadows near the rain-snow transition. The study uses both remotely sensed and ground-based information. In Long Meadow, existing wells will be monitored, and one micrometeorological station deployed. The met station is no more than 3 m high by 3 m wide with its instruments mounted on a tripod, and it would be deployed continuously from snow melt, through the snow-free season. The proposed location of the met station is about 100 m south of monitoring well SM5-M1. It may be visible from the trail and visitors may hear a fan if they are within about 10 m of the station. The instruments will be powered by a 95 watt solar panel and battery mounted on the tripod. Up to 24 Hobo temperature loggers, about 3 cm in diameter would be installed in and around the meadow. They would be shielded with reflective bubble wrap and tied to a small tree branch at approximately 2 m above the ground.

A YSI water quality sonde may be deployed in the upper reaches of Long Meadow and at the Wolverton Creek outlet, where the existing pressure transducers are located, to collect continuous measurements of temperature, conductivity, turbidity, and pH. The salt dilution tracer method will continue to be utilized for developing rating curves at measured surface water locations. ISCO automatic water samplers will continue to be used for collecting water samples.

**Subject/Discipline:** Water / Hydrology

**Locations authorized:**
Studies will be carried out at sites outside of Wilderness in the Wolverton Creek watershed centered at (36o 35’ 54.30” N; 118o 43’ 50.30” W, 2215 m elevation) and extending to where the creek enters Wolverton Scout Camp.

Collect small diameter soil cores from each of the 13 monitoring wells currently installed in Long Meadow.

Temporary installation for the summer/fall in Long Meadow of an eddy covariance equipped micrometeorological station. The met station instruments will be deployed on a tri-pod no more than 3 m high and 3 m in diameter and be powered by a 95W solar panel and battery. The tri-pod will be secured to the surface using 12-18” spikes.

Installation of up to 24 Hobo temperature loggers, ~3cm in diameter, in and around the meadow to assess variability in air temperature. These would be shielded by reflective bubble wrap and tied to a small tree branch at approximately 2m above the ground surface.

**Transportation method to research site(s):**
Access to the proposed sites in the vicinity of Wolverton will be by vehicle on the existing road that extends off Generals Highway, which includes the Wolverton parking loop, as well as by foot and pack stock on the existing trails around Wolverton. For those proposed sites in the non-wilderness areas extending south to Panther Meadow and east to Panther Gap, access will be by foot, snowshoes, or skis on the existing trail and pack stock.
**Collection of the following specimens or materials, quantities, and any limitations on collecting:**

Water sampling may be conducted in Long Meadow as often as every two weeks. Samples will be collected from meadow surface water inlets and outlet, the 13 monitoring wells, up to 10 meadow pools, and from locations on Wolverton Creek. Up to 30 locations will be sampled during each event. Up to 5 liters of water will be collected at each location. Total water collections will be up to 1500 liters.

Soil core samples will be collected once during the 2013 season at each of the 13 monitoring well locations. Soil cores will be 6 centimeters in diameter and up to 2 meters long. Total soil volume will not exceed 80 liters.

**Name of repository for specimens or sample materials if applicable:**

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<tr>
<th>Repository Type</th>
<th>Will be destroyed through analysis or discarded after analysis</th>
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**Objects Collected:**

- Soil core samples will be collected at each of the monitoring well locations. Soil samples will be collected once during the 2013 season. Soil cores will be 6 cm in diameter and up to 2 meters long. Total soil volume collected will not exceed 80 liters of soil. Samples will be analyzed at UC Merced for water retention curves and may be sent off to UC Davis for particle size distribution or loss on ignition analyses. Samples will be archived at UC Merced or destroyed in analysis.

**Specific conditions or restrictions (also see attached conditions):**

- Refer to attached Park-specific Conditions
- Geospatial coordinates for the locations of actual study sites, specimen collections, and/or equipment installations are required by March 1 following the year in which the permit was issued.
- Check in at nearest ranger station at start of field season, and show Research and Collecting Permit.
- Be prepared to explain your research activities (what you are doing and why) to the inquisitive public you may meet in the parks.
- Please, bear in mind that performing research in a National Park, especially in wilderness, will bring field workers into contact with natural hazards. Field personnel must employ best safety practices and be aware of their working environment at all times. (See Park-specific Conditions for more information.)
- Minimize visual impact of installations and collections.
- Prior to causing any soil disturbance the researcher will discuss their sampling and/or installation plans and locations with the cultural resource specialist (Dave Humphrey, 559-565-3139 or Dave_Humphrey@nps.gov) to ensure that there are no adverse effects to SEKI cultural resources. If artifacts are encountered during sampling, operations at that site will cease and the park cultural resource specialist will be notified. Operations can continue after approval by the park cultural resource specialist and superintendent.
- All study installations must be removed by the PI at the end of the study and the research permit coordinator must be informed after removal is completed.
- Equipment used in lakes or streams must be de-contaminated according to NPS or US Fish & Wildlife Service protocol.

**Recommended by park staff (name and title):**

Koren R. Nydick  
Ecologist/Science Coordinator

**Recommended by park staff (name and title):**

Koren R. Nydick  
Ecologist/Science Coordinator

**Approved by park official:**

Woody Smec, Acting Superintendent

**Date Approved:**

April 23, 2013

**I Agree To All Conditions And Restrictions Of this Permit As Specified**

(Not valid unless signed and dated by the principal investigator)

**Principal investigator’s signature**

Date: 4-24-13

**THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)**