

Postdoctoral Fellowship in Watershed Hydrology

We seek an exceptional candidate in watershed hydrology for a postdoctoral fellowship with the long-term Caspar Creek watershed experiments. The fellowship will be hosted by our partners at the Oak Ridge Institute for Science and Education and the fellow will collaborate with staff at the USDA Forest Service's Pacific Southwest Research Station (PSW), the California Department of Forestry and Fire Protection (CAL FIRE), and other partners. The position is located in Arcata, CA. The fellow will join the Caspar Creek research team to study watershed hydrology in managed coastal forests in northern California. Specifically, the fellow will synthesize data collected from past experiments and implement new studies associated with the third experiment in the Caspar Creek watersheds.

In the first experiment (1962-1985), roads were constructed in the South Fork of Caspar Creek and two-thirds of the stand volume was selectively cut and tractor yarded, while the North Fork served as a control. In the second experiment (1985 to present), half of the North Fork was clear cut and mainly cable yarded and internal sub-watersheds served as controls. Short-term effects on streamflow, sediment, and ecosystems were documented, and monitoring of long-term effects continue.

The study plan for the third experiment, which is focusing again on the South Fork, was developed to examine hydrologic changes in sub-watersheds harvested with varying levels of stand density reduction. Logging of the third generation forest and remaining second growth will occur in 2017-18, and this will provide an opportunity to assess the effects of new road construction, road decommissioning, harvest reentry, and interactions between modern logging practices, legacy watershed effects, and rehabilitation activities on watershed processes. We added gauging stations starting in 2000 in preparation for the third experiment, and data collection continues at those headwater tributary stations, as well as in some of the stations from the second experiment. An initial road rehabilitation treatment was completed in 2011. A suite of sub-studies have been implemented, with the goal to quantify the influence of multi-aged silvicultural systems on physical, chemical, and biological watershed processes. The third experiment will result in a systematic understanding of the connection between forest canopy removal and watershed processes that can be used to develop sound management practices in similar rain-dominated Coast Range watersheds in the future.

The Caspar Creek watersheds are the only long-term research watersheds in coast redwood forests, and are among few throughout the US with streamflow and sediment data spanning over 50 years. Previously published South Fork studies at Caspar Creek focused their attention on early harvest techniques and examined hydrogeomorphic responses to more severe hillslope and stream channel damage, followed by studies in the North Fork documenting the impacts from extensive clearcut silviculture. The current project will examine impacts from contemporary timber operations using best management practices that have been designed to limit impacts of timber harvest on hydrogeomorphic function. More information can be found at <https://www.fs.fed.us/psw/topics/water/caspar/>

The assignment entails challenges to advance our basic understanding of how hydroclimate, land cover, harvest practices and hydrologic flowpaths affect water quality and quantity in coast redwood forests. Applications of research results include: restoration of the functional attributes of riparian and upland zones; rehabilitation of riparian areas impacted by timber harvesting; and estimating the effects of harvest techniques on water quantity and water quality over a wide range of anticipated winter storm intensities. Tool development will include models that extrapolate small spatial and temporal scale measurements of hydrogeomorphic processes to larger watersheds to assess the impacts of cumulative land uses and changes in land cover. Research in this area will require creativity in synthesizing information from diverse disciplines, such as hydrology, fluvial geomorphology, soils, climatology, and forest ecology.

Opportunities for independent research

The long history of world-class watershed data allows some flexibility in specific research objectives, and we anticipate the fellow will pursue research based to some degree on their scientific interests. We anticipate the fellow becoming involved in three components of our work:

1) Synthesis, focusing on long term recovery of the watersheds. This will include:

- Review and discussion of the extensive collection of Caspar Creek literature.
- Development of (1) researchable questions or problems, and (2) an associated experimental design capable of addressing these questions or problems.
- Participation in the quantification of pre-treatment watershed conditions in the South Fork and its tributaries, defining hydrologic conditions, sediment sources and amounts, and trends.

2) Assisting with the implementation of the third experiment. Specifically, this will entail:

- Assist with review and management of planned project activities and data collection for the new South Fork experiment. This will require field work to become familiar with the watersheds.
- Analyze data from the Caspar Creek watersheds.
- Assess consistency of discharge measurements and recommend a maintenance schedule.
- In collaboration with other project scientists, design, implement and field test methods for measuring and collecting fog and fog drip.

3) The fellow will also have an opportunity to pursue a line of research that complements existing sub-studies, addressing sediment transport, nutrient transport, or meteorological phenomena related to the Caspar Creek watersheds:

- Develop a research question that makes use of historic or current data.
- Develop and implement a plan to address the question, including experimental design, site and instrument selection, and coordinating and analyzing field measurements.

Other details

A stipend of \$55,000 will be provided for the first year. A second year of the fellowship is anticipated and is contingent on funding and significant progress in the first year. The fellowship will also contribute to a health insurance premium. Occasional overnight travel to field sites or conferences will be required and will be reimbursed. We encourage pursuit of additional collaborative funding within the scope of the project. The fellow will provide regular updates on research activities. The fellow may provide intermittent technical guidance to graduate students and technical staff. Results and manuscripts will be reviewed by the lead scientist and other project staff as well as the program manager.

Qualifications

A doctoral degree in hydrology, biogeochemistry, hydrogeochemistry, civil or environmental engineering, geomorphology, or a closely related field is required. The assignment requires a strong background in forest hydrology or ecohydrology, with a working knowledge of forest ecology and biogeochemistry. Experience working with long term watershed studies is preferred. Experience with state-of-the-art field equipment for measuring streamflow, stream sediments, sap flow, soil moisture, and microclimate is desired. Preference will be given to US citizens, and non-citizen applicants must demonstrate the ability to obtain a valid US visa for the period of the fellowship. The fellow is expected to participate in the Forest Service work environment, which will require: successful completion of a background investigation, specified training, a state motor vehicle license, and a clean driving record.

To apply

Please email a cover letter, CV, research statement (2 pp max), PhD university transcripts, and names and contact information of three references as a single pdf file to Joe Wagenbrenner (jwagenbrenner@fs.fed.us) by 30 June 2017.