



Adult dragonfly.



Meadow at Bull Creek watershed.



Yosemite toad with tracking device.

Project Overview

Kings River Experimental Watersheds

Why the Research is Important

The quality of aquatic, riparian (near-stream area), and meadow ecosystems is directly related to the healthy condition of nearby uplands in their watershed. Ecosystems are the combination of living and nonliving things dependent upon each other to survive. Forest Service scientists believe that these ecosystems are the most altered and impaired habitats of the Sierra Nevada primarily

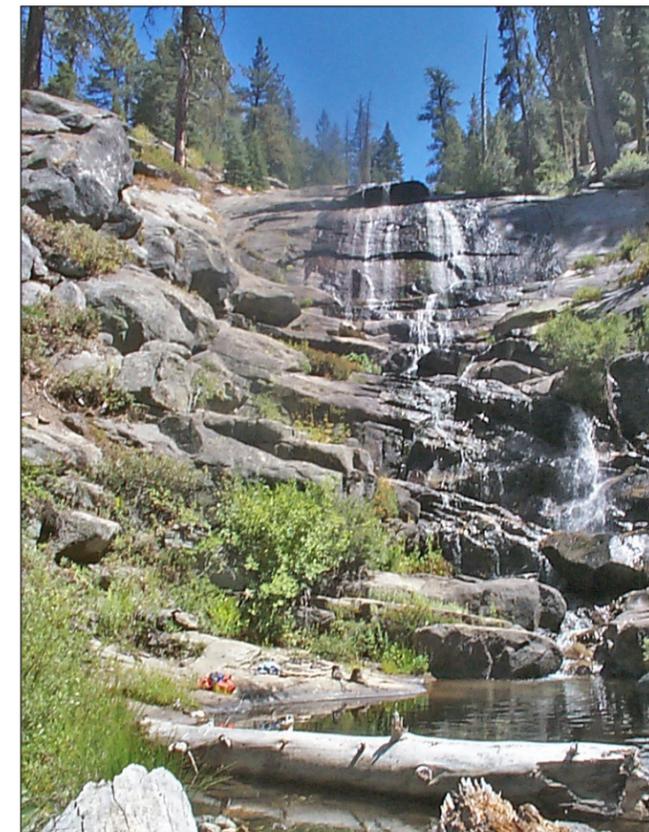
because of dams and diversions, overgrazing, roads, logging, and physical alteration that occurred in prior decades. However, no long-term experimental watershed studies exist in the southern Sierra Nevada to guide future land management. Work began on the Kings River Experimental Watersheds (KREW) in 2000 with data collection starting in October 2002.

Goals

- Measure the range of low and high values for selected characteristics of stream ecosystems and their associated watersheds.
- Provide an instrumented research site to evaluate stresses to forests from air pollution and climate change and to support computer modeling.
- Evaluate the effects of forest management for ecological restoration (prescribed fire, mechanical thinning, and tree harvesting).
- Maintain a patchwork of vegetation types and ages that mimic, to the extent possible, the historical distribution of vegetation resulting from frequent, low-intensity fires common before European settlement of the West.

Some Questions to be Answered for Forest Managers

- What is the effect of fire and fuel reduction treatments (i.e., thinning of trees) on the riparian and stream physical, chemical, and biological conditions?
- Does the use of prescribed fire increase or decrease the rate of soil erosion (long term versus short term) and affect soil health and productivity?
- How adequate and effective are current stream buffers (areas on both sides of a stream with restricted uses) at protecting aquatic ecosystems?



Stream at Bull Creek site.



Timber harvest.



Prescribed fire.



Treated forest.

Additional Information

For further information about the project please visit KREW on the Web at: <http://www.fs.fed.us/psw/programs/snrc/water/kingsriver>

Additionally, streamflow and precipitation data for KREW can be found online at: <http://lterweb.forestry.oregonstate.edu/climhy/plot.pl>

National Science Foundation, Southern Sierra Critical Zone Observatory <https://snri.ucmerced.edu/CZO>

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Collaboration and Funding

Research collaboration with Southern California Edison, U.S. Geological Survey in Sacramento, University of Nevada at Reno, Colorado State University at Fort Collins, California State University at Fresno, and Pennsylvania State University

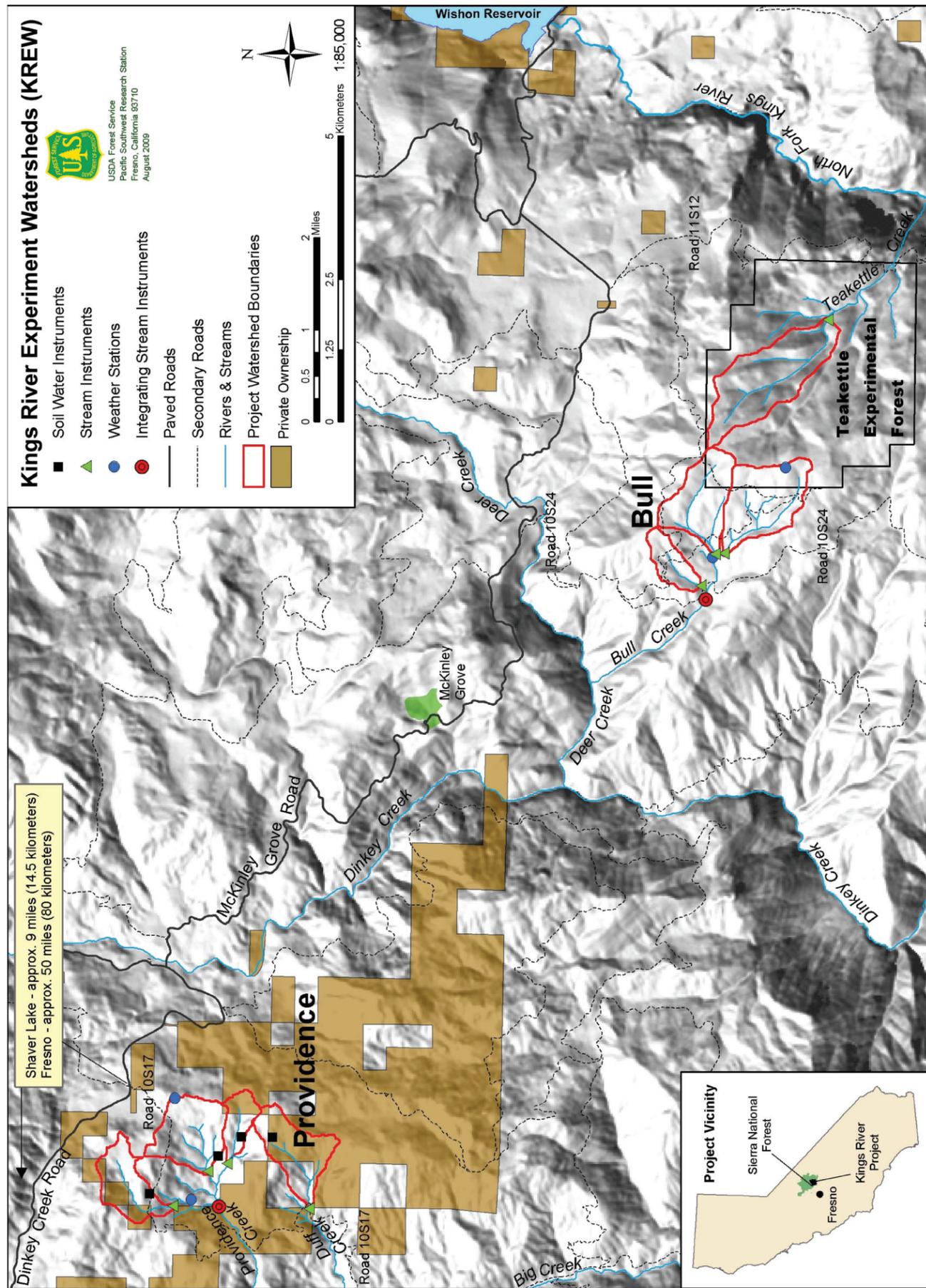
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Location

The KREW is located on the headwaters of the Kings River that drains into the Central Valley of California and is part of the Kings River Sustainable Forest Ecosystem Project, Sierra National Forest. The Kings River Project (150,000 acres or 60 750 ha) was implemented in 1994 as a joint effort of the Pacific Southwest Region (Sierra National Forest and High Sierra Ranger District), the Pacific Southwest Research Station, and Southern California Edison.

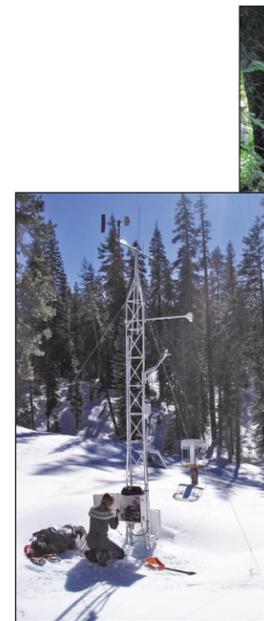
Methods and Design

Two sites are instrumented with four watersheds each: the Providence site between 4,900 and 6,800 feet (approximately 1,500 and 2,100 meters) elevation and the Bull site between 6,700 and 8,200 feet (approximately 2,000 and 2,500 meters). They both contain mixed-conifer forest. Watersheds range in size from 100 to 300 acres (40 to 120 ha); a size that can be consistently treated.

Data are being gathered for a 6-year reference period after which fire and mechanical thinning treatments will be applied. After the treatments, data will be gathered for at least 5 years to evaluate change. Each site has a control watershed that receives no treatments, a watershed that is burned, a watershed that is thinned, and a watershed that is both burned and thinned. We are interested in evaluating the integrated condition of the streams and their associated watersheds (i.e., physical, chemical, and biological characteristics).

- Physical measurements include upland erosion, turbidity (suspended sediment), stream temperature, streamflow, channel characteristics, and weather conditions.
- Chemical measurements for stream water, shallow soil water, precipitation, and snowmelt include nitrate, ammonium, and phosphate (primary biological nutrients); chloride; sulfate; calcium; magnesium; potassium; sodium; pH; and electrical conductivity.
- Biological measurements include stream invertebrates (like dragonflies and mayflies), algae, and riparian and upland vegetation (herbs, shrubs, and trees). Yosemite toads are also being studied at the Bull Creek site.

Baseline data were collected starting 1 October 2002 for the Providence site and 1 October 2003 for the Bull site. Two weather stations are installed and operating at each site. Streamflow, turbidity, temperature and weather data are collected every 15 minutes. These data are transmitted using Forest Service radios from field sites to computers in the Fresno office. Vegetation and soil data were collected for the first time in 2003. Yearly measurements of chemistry are made for shallow soil water and precipitation at 460 points in the eight watersheds; vegetation and physical soil measurements are made at a subset of these points. Stream and snowmelt chemistry are done every 2 weeks. Measurements of soil erosion from upland slopes and roads were started in 2003.



Tower with weather instruments at Bull Creek site.



Soil sampling during summer.



Basin for collection of sediment in stream.



Stream invertebrate sampling during spring.