

Eel River Critical Zone Observatory Field Site & Research Infrastructure at the Angelo Coast Range Reserve



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Angelo Coast Range Reserve Field Site

The 30 km² Angelo Coast Range Reserve, one of 35 natural history research reserves in the University of California Natural Reserve System, is one of the largest tracts of coastal Douglas fir-coast redwood forest remaining in California.

Five km of the South Fork of the Eel River and the entire watersheds of three of its perennial tributaries are contained in the Reserve. One of these, the Elder Creek watershed, is considered the largest pristine watershed remaining in the state of California, and has been continuously monitored since 1967 by the U.S. Geological Survey as a benchmark for purity of natural waters.

The 3D map below shows the Reserve boundary facing east. It is an aerial photo overlaid on LiDAR elevation model.

Rivendell Field Site

Rivendell is our intensively sampled field site. It was created with a grant from the Keck Foundation for the HydroWatch project. It is intended as a permanent realtime sensor observatory.

- Coastal Belt rock with lenses of sandstone
- Runs from Elder Creek to ridge
- Has north slope & south slope - roughly 200 m x 70 m
- 11 wells to bedrock
- 7 Rigged trees
- 700 sensors



streams and ocean as they drive and are altered by a succession of ecosystems, and explore the consequences for management practices caused by changing climate and land use.

Fox Creek

Watershed

 (2.7 km^2)

<-- South Fork Eel River

Watershed (150 km²)-

McKinley

Creek

Watershed

(0.5 km2)



<--- South Fork Eel **River to Ocean**

Tenmile Creek

Watershed

(150 km2)

Barnwell Creek Watershed (2.0 km^2)

CyberInfrastructure

The Berkeley Sensor Database

sensors: 700 records: 244.6 million was designed to manage the operational since 2008 large volumes of heterogeneous

data coming from this sensor network. This system is an open source superset of the Observations Data Model (ODM 1.1) developed by the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI). Platform used is LAMP, i.e. Linux, Apache, MySQL, and Perl.

Added features:

• Datastreams: allow for the movement and reuse of devices • Incident Reports: record changes in setup or accidents • Stations: mechanisms to configure automated data loading • Monitoring Collections: access control



Snow pack height, sonic Soil Hygrometer/Psychrometer Soil moisture, Electrical resistance Soil moisture, sm200 Soil moisture, time domain reflectometer emperature, air emperature, air, offline emperature, water Nater content reflectometers Nater samples, isco Nater turbidity Well and stream water level Well water level, manual Wind, direction Deer Creek Wind, speed Total

Jack of Hearts Creek Watershed (15 km²)



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We have 14 trees rigged for climbing. - Redwood (Sequoia sempervirens) and Douglas Fir (Pseudotsuga menziesii) -30-60 meters in height

- Solar panels in canopy for power
- Used as wireless relay towers

Isco Automated Water Samplers

- Tool for anlyzing water chemistry
- 1 stream (Elder Creek)
- 3 ground water in wells
- Online: sampling rate can be modified on the fly
- Developed device to preserve water chemistry.





Neutron Probe

Daniella Rempe measures rock moisture in a deep groundwater well using a nuclear moisture gauge. the neutron probe is lowered down the well incrementally and measures the abundance of hydrogen. repeat surveys down wells reveal a dynamic zone of moisture storage in weathered fractured bedrock. Only instrument capable of producing reliable rock moisture measurements.

- Measurement volume: ~soccer ball, decreases with increasing moisture content

- Neutron probe is a Am/Be radioactive source that emits neutrons, a helium detector located within the probe measures the number of thermal neutrons which are produced from ~ 18 collisions with hydrogen atoms

Thermal neutron count can be related to volumetric moisture content through a linear laboratory calibration equation provided that the casing material used in the laboratory calibration is the same as that used in the field.

Tree Psychrometer & Sap Flow

Tools for measuring water use by trees.

- Sap flow measures flow direction and velocity within the vegetation. - Psychrometer measures water potential. Directly tests the relationships between moisture, lithology, and water balance in the dominant vegetation types. Plants extract water based on water potential so this metric must be used if you want to make sensible arguments on what "in" the sub-surface limits water extraction and plant performance.



