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Title

KNO 1: Facilitating the Adoption of Embedded Networked Sensing by Emerging National Environmental Observatories

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Facilitating the Adoption of Embedded Networked Sensing by Emerging National Environmental Observatories

J. Goldman, D. Estrin, M. Hamilton, T. Harmon, and W. Kaiser

Background

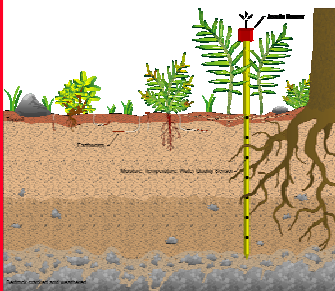
What is an environmental observatory?

- **Nationally-distributed field facility and suite of measurement systems designed to enable next-generation scientific inquiry**
- **Many disciplines planning or building observatories**
Ecology (NEON), Environmental Engineering (CLEANER), Hydrological science (Hydrologic Observatories), Seismology (EarthScope), Oceanography (ORION)
- **NSF is a primary sponsor**
- **Analogous to Radio Telescopes and Particle accelerators in scope, expense, and community benefit**

Why does CENS invest in KT with observatories?

- **Service and mutual benefit**
All environmental observatories aim to capitalize on advances in technology and cyberinfrastructure, including sensor networks. We can help meet this need, while also exploring new design solutions based on these applications
- **Effective outreach mechanism**
Environmental observing systems are envisioned to serve thousands of users. By providing sensing solutions to these efforts we can reach large portions of our prospective future user base

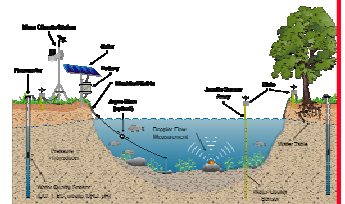
Role of Embedded Networked Sensing



Sensor networks provide:

- Appropriate temporal and spatial resolution at multiple scales
- Ability to measure multiple heterogeneous variables
- Capacity for adaptive sampling

All of which are needed to understand the multiple factors that influence natural systems

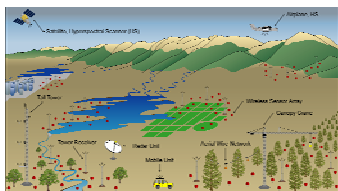


CENS Contributions to Two National Observatories

National Ecological Observatory Network

Objective

- Enable environmental scientist to understand how land use and climate affect ecological systems in order to make forecasts about future ecological states



Description

- Geographically nested set of sites in a variety of landscapes
- Sites contain several embedded sensor networks to observe the climate, canopy, soil, and freshwater

CENS Involvement

- **National Leadership**
 - D. Estrin and J. Goldman serve on the NEON Board of Directors
 - D. Estrin and M. Hamilton, serve as co-chairs of the sensing subcommittee
 - W. Kaiser and P. Rundel are frequent advisors & workshops participants
- **Workshop Host and Organizer**
 - CENS hosted and helped to organize a workshop with ENS vendors to define specifications & prepare for construction
- **System Integration at James Reserve**
 - In preparation for construction the James Reserve is a potential site for sensor system integration work



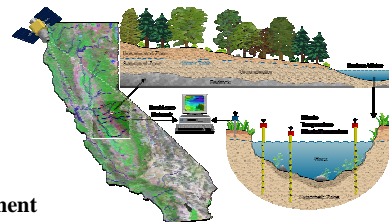
Collaborative Large-Scale Engineering Assessment Network for Environmental Research

Objective

- Develop an engineering analysis network and field facilities to protect, remediate, and restore stressed environments and promote sustainable environmental resources

Description

- A network of instrumented field facilities
- A virtual repository of data
- A mechanism for multi-disciplinary research, education, and the formulation of engineering and policy options
- A collaboration among engineers and others interested in solving environmental problems



CENS Involvement

- **Planning Grant**
 - Envisions a backbone network of sensors installed throughout the San Joaquin River Basin
 - Runs along the Merced River in the Sierra Nevada snow pack area; through the foothills, farmlands and urban areas of the San Joaquin Valley; and into the low wetlands around the river
- **National Leadership**
 - T. Harmon serves on the national CLEANER Executive Committee and as co-chair of the Sensors Subcommittee; D. Estrin serves on the advisory board

