Project Summary

Intellectual Merit of the Proposed Activity
The proposed project will develop a new technology, a robotic minirhizotron system, and integrate it with existing technologies into a network of environmental monitoring probes (nitrate, carbon dioxide, water, temperature, microbial composition) that can both receive instructions and transmit data and images remotely using new wireless technologies. Soil ecology has generally consisted of individual static or harvest measurements that lack adequate small-scale, rapid replication. The new instrumentation and integration approaches should provide a quantum leap in the ability to monitor and describe small-scale phenomena and integrate a large number of measurements both spatially and temporally into integrated complex mechanics of soil ecology. The project consists of ecologists, environmental scientists, engineers, and computer scientists all working to develop the new instruments and integrate the array of parameters measured. Integration consists of face-to-face meetings, remote video-conferences, and one-on-one direct interactions among participants. All measurements are being designed to measure remotely, allowing for the observation of events as they occur. This project integrates prior work from programs in soil biocomplexity, technique development, and wireless engineering technologies.

Broader Impacts of the Proposed Activity
The project will take place at three locations that strengthen the broader impacts of the research and technology development. The first is the NSF S&T **Center for Embedded Networked Sensing (CENS)** environmental testbed – the James Reserve, a University of California Natural Reserve System site with an existing website and remote-controlled data access system used by schools nationally. The second location is the CENS agricultural technology testbed near Palmdale, CA, where the pollution sensors are being tested. Finally, the third location is at the NSF-funded **Sevilleta (SEV) Long-Term Ecological Research** (LTER) site, near Albuquerque, focused on drought studies using the rain-out shelters provided by the NSF S&T **Center for Sustainability of semi-Arid Hydrology and Riparian Areas** (SAHRA). The CENS program has an existing education and outreach focus (grades 7-12) for which we will develop a new soil ecology module. This module will also be available to the SEV Schoolyard LTER program as that program advances. As one of the most diverse, rapidly growing research universities in the nation, the University of California, Riverside (UCR) is a 2003 U.S. Department of Education Accredited Postsecondary Minority Institution. At the undergraduate level in fall of 2003, there is no ethnic majority population. And, 6.4% of students are African American, 23.5% Chicano-Latino and 0.4% Native American. Student enrollment for fall of 2003 is 17,296 with 15,282 undergraduates and approximately 2,000 graduate students.

All PIs have a history of supporting students and post-docs of under-represented groups and women. Many of these students are well represented in both industry and higher education. The priority will continue.

Both the technology and outreach represent important advances in soil ecology, relevant to the ecology of wildland ecosystems, impacts of environmental pollution, and agriculture.