CERC Areas of Expertise

Environmental Toxicology

CERC research in environmental toxicology is designed to understand and evaluate the effects of water quality on aquatic ecosystems, conducted in both laboratory and field.

- Freshwater, marine, and estuarine sediment toxicology
- Standardization of acute and chronic toxicity test methods
- Site assessments including Ecological Risk Assessment, and Natural Resource Damage Assessment and Restoration (NRDAR)
- Bioavailability of metals associated with mining
- Sensitivity evaluations of endangered fish, amphibians, and mussels
- Acute and chronic toxicity testing of fish, amphibians, invertebrates, and mollusks
- Fish, amphibian, invertebrate, and mollusk culture

Environmental Chemistry

CERC research in environmental chemistry advances development of analytical techniques and provides new tools for assessing fate of environmental contaminants. An extensive array of analytical equipment enables detection of chemical pollutants to support all aspects of field and laboratory studies, examining contaminant effects on organisms.

- Development and application of analytical methods to determine ultra-trace residues, and assessment techniques to define contaminant bioavailability and residue dynamics
- Development and application of passive integrative sampling devices for organic and inorganic contaminants
- Development of analytical methods for emerging contaminants such as algal toxins, antibiotics, and new generation pesticides
- Separation and interpretation of complex contaminant mixtures
- Application of broad based instrumental techniques: GC/MS, GC, HPLC, ICP/MS

Biochemistry and Physiology

CERC biochemical and physiological research studies the underlying mechanisms of fish development and physiology to examine the influence of a variety of stressors on these processes.

- Understanding biochemical mechanisms of toxic action and linkages to cells or tissues
- Using egg microinjection techniques to evaluate effects on embryonic development
- Assessing endocrine function, sexual differentiation and development, chemical estrogenicity, biological indicators of effects
- Histological image analysis, qualitative and quantitative microscopy
- Developing methods for microbiological, biochemical, and immunochemical microassays
- Functional genomics analysis, including microarray and Q-PCR, of effects on gene expression

Ecological Research

CERC ecological research links physical, chemical, or biotic environmental stressors with ecosystem-level responses and includes laboratory and field assessments.

- Biological effects of climate change to amphibians, fish, and aquatic invertebrates and plants
- Ecological risk assessments, restoration, and monitoring
- Exposure, effects and ecological valuation assessments supporting restoration science
- Behavioral ecology and toxicology
- Aquatic on site toxicological assessment
- Multiple stressor interactions in natural populations
- Ecological impacts of agricultural practices
- Plant/soil toxicology
- Vegetation community classification and analysis, fire ecology, plant-climate interactions, plant population biology and genetics

Large River Studies

CERC river studies examine the ecological consequences of land use, management actions, and altered flows on riverine environments by identifying and predicting the interactions between abiotic and biotic components.

- Using radio and ultrasonic telemetry systems to understand life history of fish
- Influence of invasive species on native populations
- Dynamic Geographic Information System (GIS) models, Global Positioning Systems (GPS), Decision Support Systems (DSS), remote sensing and long-term monitoring
- 3-D depth/velocity profiles, hydro-acoustic sediment mapping, side-scan sonar, geostatistical measures, fluvial geomorphology, hydraulics and hydrology, geospatial and digital image processing
- Benthic invertebrate community analysis related to aquatic ecosystem health

Information Technology and Transfer

- Local and wide-area networks, Internet connectivity, web development and design
- Database design and management
- Clearinghouse for the National Biological Information Infrastructure (NBII), a USGS network of distributed databases and information sources for biological information
- Information analysis and management