

Columbia Environmental Research Center

Science Capabilities and Emphasis

The Columbia Environmental Research Center (CERC) provides technical leadership and scientific information on environmental contaminants, large river ecosystems, and impacts of habitat alteration. CERC has nationally and internationally recognized environmental science research and monitoring capabilities and areas of emphasis in:

Environmental Toxicology
Environmental Chemistry
Biochemistry and Physiology
Ecological Research
Large River Studies
Information Technology Transfer

Environmental Toxicology

Research in environmental toxicology is designed to understand and evaluate the effects of water quality on aquatic ecosystems, conducted in both laboratory and field. Areas of emphasis include:

- 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

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Environmental Chemistry

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. Areas of emphasis include:

- 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

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Biochemistry and Physiology

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. Areas of emphasis include:

- 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

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Ecological Research

Ecological research links physical, chemical, or biotic environmental stressors with ecosystem-level responses and includes laboratory and field assessments. Areas of emphasis include:

- 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

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Large River Studies

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. Areas of emphasis include:

- 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

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Information Technology Transfer

Information and technology transfer areas of emphasis include:

- Local and wide-area networks, Internet connectivity, web development and design
- Database design and management
- Information analysis and management
- Hosted websites:
 - MoRAP (Missouri Resource Assessment Partnership)
 - MICRA (Mississippi Interstate Cooperative Resource Association)
 - DOI Field Coordinating Committee (FCC) for the U.S.-Mexico Border Initiative

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