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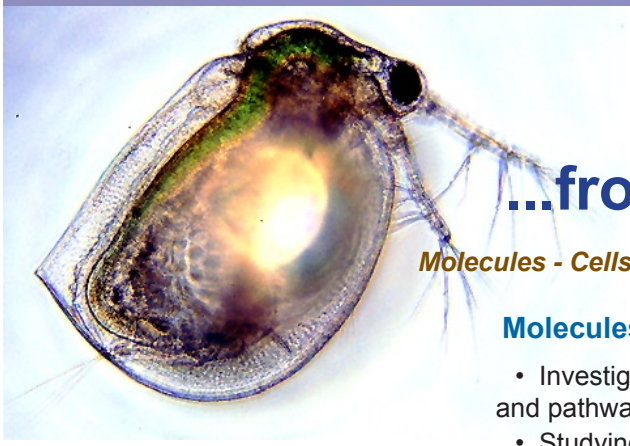


Columbia Environmental Research Center

Investigating Contaminants ...from Molecules to Landscapes

Molecules - Cells - Tissues - Organisms - Populations - Ecosystems - Landscapes

The focus of contaminant research at CERC is to discover and understand the complex environmental factors related to protecting and restoring our Nation's degraded environments.

The biological significance of degraded water quality from contamination continues to become increasingly important as our Nation's natural resources are reduced or depleted. To better understand the chemical, biological, and ecological ramifications of contaminants in the environment, CERC conducts scientific research, and biological and chemical monitoring programs.

CERC's primary science capability is environmental toxicology and chemistry using investigations to discover, understand, and evaluate the effects of contaminants on the quality of aquatic and terrestrial ecosystems, and their component species. Including:

1) fate and transport of contaminants through ecosystems,

2) determining effects of individual contaminants and complex mixtures on organisms,

3) interaction of contaminants in water and sediment in concert with other environmental stressors in the decline of aquatic and terrestrial species,

4) and levels of chemicals in aquatic and terrestrial ecosystems.

Molecules, Cells, and Tissues

- Investigating chemical transport and pathways.
- Studying complex mixtures of contaminants.
- Developing methods to detect contaminants in trace concentrations.
- Investigating complex pollutant patterns.
- Applying new approaches to interpreting environmental data.

The semipermeable membrane device (SPMD), developed at CERC, represents a passive sampling technique for assessing contaminants. SPMDs are placed in the environment with precautions such as the cage shown above.

- Developing immunochemical methods to determine environmental contaminants and their biochemical responses in fish.
- Developing bacterial toxicity tests on a micro-scale level for preliminary contaminant screening.
- Developing immuno- and bioassays for detection of cyanobacterial toxins.
- Assessing chemicals disrupting reproductive systems.
- Examining toxicity of contaminants in fish at embryonic, developmental, and early life stages.

Organisms

- Investigating photoenhanced toxicity of chemicals to amphibians.
- Examining the effects of irrigation drainwater on Colorado squawfish, bonytail, and razorback suckers in the Green River Basin.
- Studying the biological responses of Columbia River chinook salmon from exposure to metals.
- Assessing the reproductive biology of the Neosho madtom.
- Developing guidance for sediment toxicity tests with freshwater invertebrates.
- Investigating effects of contaminants in sediments on estuarine animals.
- Investigating effects of contaminants on terrestrial wildlife.
- Studying the effects of contaminants on endangered fish, amphibian, and avian, species.

Lake trout larva (upper) shows abnormal abdominal swelling when exposed to very low concentrations of PCBs, as compared to a normal larva (lower) not exposed.

Electrofishing techniques are used to collect fish in large river systems for analysis of contaminants and biological effects.

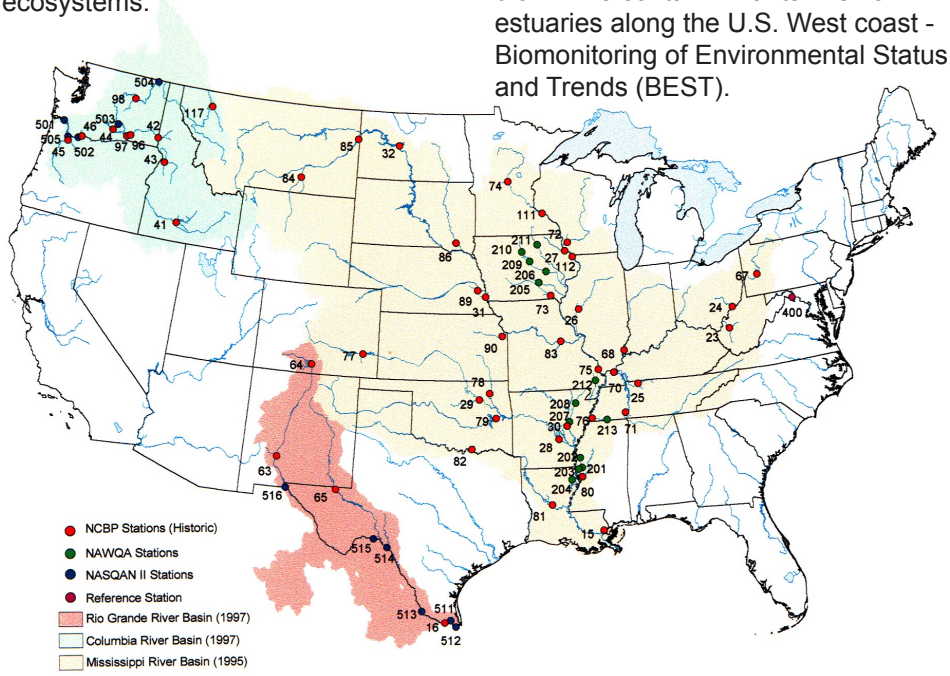
Populations, Ecosystems

- Evaluating ultraviolet radiation as a factor in amphibian decline in montane habitats.
- Studying effects of exotic rainbow smelt on nutrient pathways and mercury uptake in the aquatic food web of Voyageurs National Park.
- Assessing multiple stressors influencing endangered aquatic species of southeastern ecosystems.
- Conducting toxicity assessments of metals entering the Missouri River.
- Participating in Natural Resource Damage Assessment and Restoration (NRDAR) projects.
- Identifying Missouri River aquatic invertebrates as indicators of water quality.
- Assessing the fate and effects of nitrogen in experimental aquatic ecosystems.

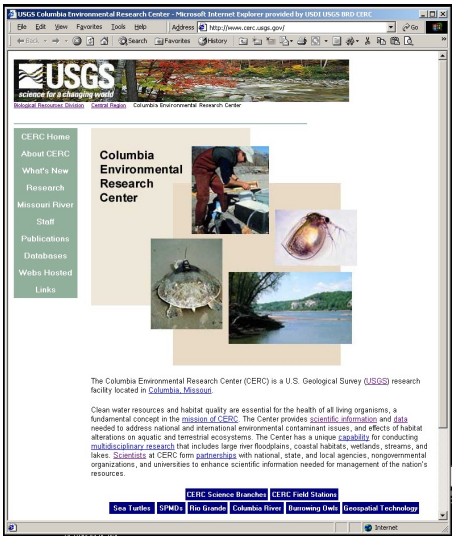
The Columbia Environmental Research Center addresses national and international environmental contaminant issues, and assesses effects of habitat alterations on aquatic and terrestrial ecosystems.

Landscapes

- Monitoring contaminants in the environment and their effects across broad geographic areas.
- Investigating the toxicity of forest fire retardant chemicals to aquatic communities.
- Developing and testing biomarkers for use in biomonitoring programs of aquatic ecosystems.
- Studying the water quality of Western reservoirs and desert rivers.
- Investigating environmental effects of leachate from abandoned uranium tailings pile adjacent to the Colorado River.
- Characterizing the aquatic health of the Boulder River watershed.
- Investigating the biological effects of metals from abandoned mine lands in the Upper Animas River watershed.
- Biomonitoring contaminant trends in fisheries of the Nation's major lakes and streams - National Contaminant Biomonitoring Program (NCBP)
- Investigating PCBs, dioxin and dioxin-like contaminmants in small estuaries along the U.S. West coast - Biomonitoring of Environmental Status and Trends (BEST).



Three large river basins, Mississippi, Columbia, and Rio Grande, are the primary focus of contaminant monitoring in the USGS Biomonitoring of Environmental Status and Trends (BEST) program. The objectives of this sampling program are to describe the occurrence and distribution of contaminants and their effects on fish in the three basins.



CERC Homepage http://www.cerc.usgs.gov/

For More Information...

Center Director
Michael J. Mac, 573.876.1900
mmac@usgs.gov

Assistant Center Director
Susan Jones, 573.876.1828
sbjones@usgs.gov

Program Coordinators
Susan Finger, 573.876.1850
sfinger@usgs.gov

Denny Buckler, 573.876.1803
dbuckler@usgs.gov

Science Branch Chiefs

- **Toxicology**
  Chris Ingersoll, 573.876.1819
  cingersoll@usgs.gov
- **Environmental Chemistry**
  Carl Orazio, 573.876.1823
  corazio@usgs.gov
- **Biochemistry and Physiology**
  Don Tillitt, 573.876.1886
  dtillitt@usgs.gov
- **Ecology**
  Ed Little, 573.876.1817
  elittle@usgs.gov
- **River Studies**
  Carl Korschgen, 573.876.1901
  ckorschgen@usgs.gov
- **Field Station Research**
  Laverne Cleveland, 573.876.1874
  lcleveland@usgs.gov•

Information Technology
Ted Schwartz, 573.876.1832
tschwartz@usgs.gov

Outreach Coordinator
Marcia Nelson, 573.876.1875
mknelson@usgs.gov

Columbia Environmental Research Center
4200 New Haven Road
Columbia, Missouri 65201
573.875.5399; FAX: 573.876.1896