Columbia Environmental Research Center

Introduction

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

The U.S. Geological Survey (USGS) Columbia Environmental Research Center (CERC) conducts research needed to address national and international environmental contaminant issues and effects of habitat alterations on aquatic and terrestrial ecosystems.

The Center conducts both focused and large-scale multidisciplinary research with emphasis on projects integrating scientific disciplines to address complex environmental issues on large geographical scales. Scientists at CERC form partnerships with national, state and local agencies, non-governmental organizations and universities to enhance scientific information needed for management of the Nation's resources.

In addition to the main facility in Columbia, MO, CERC administers two field research stations in Jackson, Wyoming and Yankton, South Dakota.

Historically, the Center was established in 1959 at the Denver Wildlife Research Center of the U.S. Fish and Wildlife Service, and was called the Fish Pesticide Research Laboratory (FPRL). In 1966, the University of Missouri deeded 33 acres to the U.S. Fish and Wildlife Service and the FPRL moved to its present location. The Center was incorporated into the USGS in 1996.

CERC is involved in a multi-year, collaborative research study to determine factors leading to spawning and survival of the endangered pallid sturgeon (shown above) and the closely related shovelnose sturgeon.

Center Organization

Staff at CERC have an extensive range of scientific and technical expertise. Research areas and services cover broad aspects of environmental toxicology and chemistry, biochemistry, ecology, large river ecology, and information and technology transfer. The Center's science program is organized into branches:

Toxicology
Environmental Chemistry
Biochemistry/Physiology
Ecology
River Studies
Information Technology

Toxicology Branch

Environmental toxicology scientists develop, apply, and validate methods for assessing the effects of contaminants and other environmental stressors on aquatic organisms. Research focuses on bioaccumulation and toxicity of contaminants from water, sediment, and food; the physical, chemical, and biological factors affecting these processes; and relationships between lab responses and characteristics of contaminated aquatic ecosystems.

Current environmental toxicology studies include standardization of acute and chronic toxicity test methods, bioavailability of metals associated with mining, toxicity assessments of confined animal feedlot effluents, and sensitivity evaluations of endangered fish, amphibians and mussels.

Environmental Chemistry Branch

Environmental chemists characterize pollution of aquatic, terrestrial, and atmospheric ecosystems. Research is conducted to provide information to resource managers regarding source of pollution, exposure, trophic transfer, and environmental fate.

Custom analytical methods are developed to decipher complex mixtures of emerging contaminants, endocrine disruptors, toxic elements, and persistent organic pollutants (including dioxins). The Branch has state-of-the-art analytical facilities that include gas and liquid chromatography (LC), low and high resolution mass spectrometry (MS), ICP-MS, direct mercury analyzer, atomic absorption, and LC/MS. Passive sampling methods such as the SPMD, POCIS, SLMD, and PIMS were invented by the Branch and now used worldwide to assess pollutant exposure.

Biochemistry/Physiology Branch

The Biochemistry/Physiology Branch conducts basic and applied research at the cellular, organ, organism, and population levels in fish and wildlife. Emphasis is on the sublethal effects of chemicals that lead to behavioral, developmental and population changes that may ultimately influence ecosystem health.

Research focus includes reproductive, developmental and neurotoxic effects of stressors. Scientists develop and use molecular, genomic, biochemical and histological analyses to evaluate mechanisms of toxicity, and conduct forensic field investigations.

CERC and University of Missouri scientists conduct a Missouri River exposure of fathead minnows to determine sublethal effects of estrogenic contamination.

Fisheries biologists prepare an aquatic in situ *toxicity test to assess the biological significance of contaminant exposure in the field.*

Current studies in the Biochemistry/Physiology Branch include the use of DNA microarray technology to study endocrine disruptor mechanisms of action, mechanisms of intersex development in adult fish, definition of gene expression profiles for contaminants with diverse modes of action, effects of thiamine deficiency on early life stage mortality in salmonines, and effects of methylmercury on reproduction.

Ecology Branch

Research in the Ecology Branch focuses on characterizing and understanding the exposure and response of aquatic and terrestrial ecosystems to habitat alteration. Research is focused on the population, community, and ecosystem levels of biological organization. Scientific expertise includes behavior, botany, ecology, toxicology, physiology, and risk assessment.

The Ecology Branch has both laboratory and field capabilities that are frequently deployed through integrated field and laboratory studies across a wide range of habitats throughout the world. These integrated, multidisciplinary studies are conducted in conjunction with investigations conducted in experimental ecosystems including constructed streams, ponds, and greenhouse facilities located at CERC.

Areas of emphasis include ecological evaluations of chemical substances resulting from agricultural, industrial and mineral extraction activities; on-site assessment of habitats disturbed by multiple stressors; invasive species ecology and mitigation; endangered species ecology and recovery; climate change; fire ecology and management; ecological risk assessments; and monitoring. Research is focused on both system response as well as ecological resistance, resiliency and recovery processes. The results of these studies are used to add to our basic understanding of natural and altered ecosystems, and are applied in the emerging fields of adaptive management and restoration ecology.

River Studies Branch

The primary mission of the River Studies Branch is to increase the understanding of how management and restoration activities function on large river systems using integrated science approaches. River studies emphasizes how changes in the physical and chemical condition of rivers affect habitat, and fish and invertebrate populations.

River Studies examines ecological consequences of land use, management actions, and altered flows on riverine environments by identifying and predicting the interactions between abiotic and biotic components. Rivers are evaluated by habitat changes over temporal scales ranging from centuries to individual floods, and over spatial scales ranging from river segments to broad river reaches.

Scientists provide information and technical support for natural resource planning and management, ecosystem scale research, and the development and use of digital databases. Currently, this Branch has critical projects on the ecology of endangered and invasive fish species, and Missouri River restoration.

CERC scientists use hydroacoustic mapping and hydraulic modeling to assess sturgeon habitat dynamics and availability in the Missouri River.

Information Technology Branch

The Information Technology (IT) Branch performs information analysis and management, and provides the technology infrastructure allowing Center staff to manage, utilize and deliver scientific information. Functional areas within the IT Branch include computer services, data management, information management and security, telecommunications, database development, and library and outreach resources.

Field Research Stations

The Field Research Stations specialize in ecological and toxicological research that is relevant to natural resource issues in the DOI from the Intermountain West and Great Plains areas. Research Stations are located in Jackson, WY, and Yankton, SD.

Field Stations scientific expertise includes assessment of organic and inorganic contaminant effects in native western fishes; Natural Resource Damage Assessment and Restoration (NRDAR); irrigation drainwater assessments; and aquatic community evaluations of endangered, native and invasive fish species.

Obtain more information on CERC research and science areas of emphasis by contacting CERC staff:

Center Director
Rip S Shively 573.876.1900
rsshively@usgs.gov
Deputy Center Director
Carl Orazio, PhD 573.876.1823
corazio@usgs.gov
Program Coordinator
Susan Finger 573.876.1850
sfinger@usgs.gov
Outreach Coordinator
Marcia Kelly Nelson 573.876.1875
mknelson@usgs.gov

Toxicology
Chris Ingersoll, PhD 573.876.1819
cingersoll@usgs.gov
Environmental Chemistry
David Alvarez, PhD 573.441.2970
dalvarez@usgs.gov
Biochemistry/Physiology
Don Tillitt, PhD 573.876.1886
dtillitt@usgs.gov
Ecology
Ed Little, PhD 573.876.1817
elittle@usgs.gov
River Studies
Robert Jacobson, PhD 573.876.1844
rjacobson@usgs.gov
Field Research Stations
Carl Orazio, PhD 573.876.1823
corazio@usgs.gov
Information Technology
Chris Henke 573.876.1884
chenke@usgs.gov

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

Columbia Environmental Research Center
U.S. Geological Survey
U.S. Department of the Interior
4200 New Haven Road
Columbia, Missouri 65201 USA
573.875.5399 (phone) 573.876.1896 (FAX)