USGS
science for a changing world

Integrated Science

Providing a More Complete Understanding of Complex Problems

Integration among sciences is critical in order to address some of our most pressing problems. Because of the inherent complexity of natural systems, and the increasing complexity of human demands on them, narrowly focused approaches are no longer sufficient.

USGS Workshop on Enhancing Integrated Science, November, 1998.

USGS scientist collecting data aboard USGS R/V Slim Funk.

Lower Missouri River near River Mile 186.

Science to Support Adaptive Ecosystem Management in Rehabilitation Projects, Lower Missouri River

The construction of levees, bank revetments, and wing dikes along the lower Missouri River has resulted in an alarming reduction in the quantity (spatial and temporal extent) and quality (species diversity) of its terrestrial and aquatic habitats. Recent efforts to naturalize the river corridor have included modifications of existing channel control structures, rehabilitation of floodplain wetlands, and construction of side-channel chutes. The success of these and other rehabilitation efforts along the lower Missouri River are dependent upon an understanding of the inherent complexity of riverine ecosystems. Questions regarding the interdependence of floodplain hydrology, geology, and ecosystem structure and function are at the cutting edge of ecological research interests, and critically important to Refuge managers practicing adaptive management at several sites along the lower Missouri River.

The objective of this project is to evaluate the response of floodplain vegetation to the construction of a side-channel chute by the U.S. Army Corps of Engineers at Overton Bottoms, a unit of the U.S. Fish and Wildlife Service's Big Muddy National Fish and Wildlife Refuge. Five inter-related tasks have been defined, which include mapping the floodplain vegetation communities, evaluating the efforts of the chute on groundwater flow patterns, quantifying the response of vegetation to groundwater gradients, and synthesizing the science into adaptive ecosystem management.

This project will provide a transferable, predictive understanding of the interactions between the floodplain hydrology, geology, and ecology of large rivers, and promises to demonstrate the effectiveness of integrated, interdisciplinary science in improving adaptive management of rehabilitation projects on the Missouri River.

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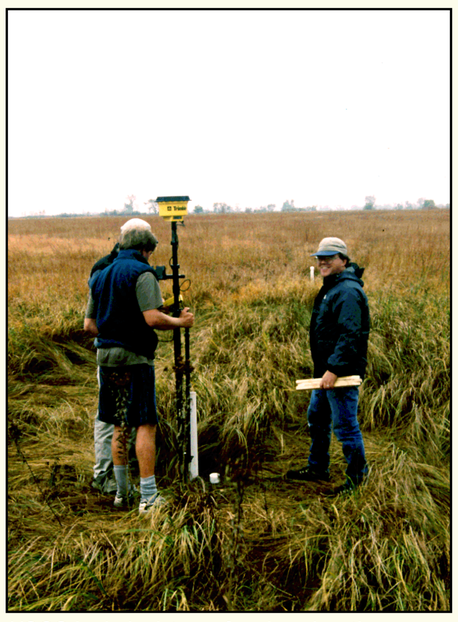

USGS hydrologists performing elevation surveys in a wet meadow near the Platte River in Nebraska.

Aerial view of a portion of the Platte River, Nebraska.

Sandhill cranes in a cornfield, Central Platte River Valley, Nebraska.

Geohydrological and Biological Investigations Associated with Lead-Zinc Exploration and Mining in Southeastern Missouri

Lead-zinc mining in the Viburnum Trend began in the mid-1960's around Viburnum, Missouri. During the next 2 decades, 10 mines were opened along the south-trending ore deposit. In response to declining economical ore reserves in the trend, mining companies began to explore for new ore bodies in an area south of Winona, Missouri, and north of the Eleven Point River. The exploration area is within a region highly valued for its scenic beauty and recreational opportunities including two federally designated scenic rivers: the Ozark National Scenic Riverways administered by the National Park Service, and the Eleven Point National Scenic River administered by the U.S. Forest Service.

Because of the many environmental concerns associated with potential lead-zinc mining in the new exploration area, the U.S. Geological Survey has initiated a 5-year integrated study of the possible effects of mining in the new exploration area and the Viburnum Trend. The Viburnum Trend offers an ideal laboratory for assessing potential environmental effects of mining in the new exploration area because geologic conditions and mining practices in the Viburnum Trend are similar to the geology and likely mining practices in the exploration area. The investigation includes onsite studies of stream, spring, and aquifer hydrology, field geologic mapping, geochemical research on trace element mobility from mined ore bodies, surveys of stream biological quality and lead accumulation by aquatic biota, and research on the toxicity of lead and other heavy metals to aquatic biota.

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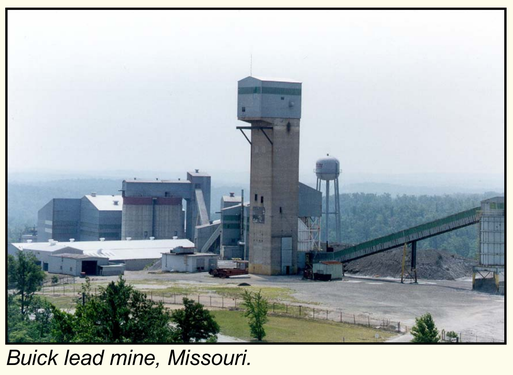

Buick lead mine, Missouri.

USGS biologists collect fish using backpack electrofishing gear.

Platte River Priority Ecosystem Study, Nebraska

The central Platte River Valley in Nebraska is an internationally significant staging area for migratory water birds of the Central Flyway and is best known for the one-half million sandhill cranes and the several million other waterfowl that migrate annually through the valley. Nine endangered species use the central Platte River Valley for habitat, including the whooping crane, piping plover, and least tern. Changes in water and land use have transformed the river channel and altered adjacent wet meadows. With changes in hydrology of the river and the structure of riparian habitats, the sustainability of migratory and resident birds and other biota have been brought into question. Of central concern is how the ecosystem has adjusted to changes in streamflow. Developing successful strategies to sustain or rehabilitate the riparian ecosystem of the central Platte River requires an understanding of the linkages between hydrology, river morphology, biological communities, and ecosystem processes.

In 1995, a memorandum of agreement was signed by the Secretary of the Interior and the governors of the States of Colorado, Wyoming, and Nebraska to begin developing a basinwide habitat recovery program for the Platte River. This agreement was implemented by the Platte River Endangered Species Partnership (PRESEP) beginning in 1997. Major aspects of the program call for the acquisition and restoration of habitat areas, design and implementation of water augmentation and conservation measures, and development of an overall monitoring and research plan to determine the effectiveness of an adaptive management plan. The USGS Platte River Priority Ecosystem Study supports the recovery program by building an interdisciplinary team to address the overall objectives of; (1) providing a better understanding of the migratory and resident birds and other biota and the ecology of their habitats, (2) providing a better understanding of the physical processes that influence the habitats, and (3) using this knowledge to evaluate the effects of different management strategies on individual species and their habitats.

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