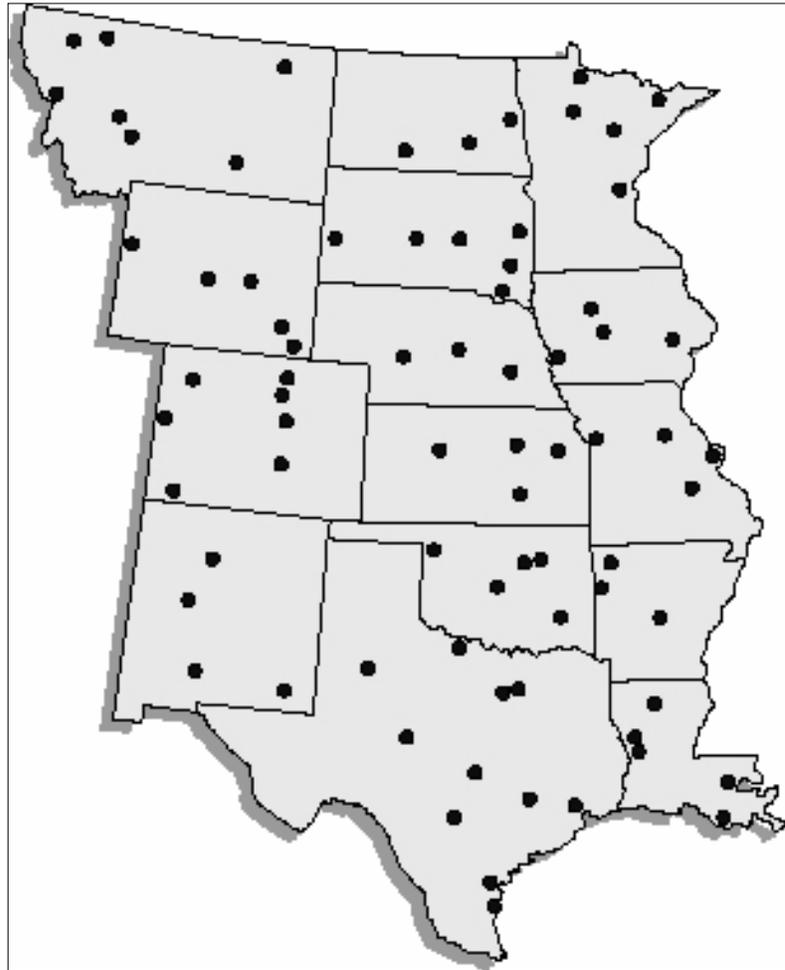


Central Region

The primary mission of the Central Region is to provide research expertise in the natural sciences for other Department of the Interior bureaus and Federal, State, and local government agencies. Central Region has offices in 76 cities staffed by approximately 2,700 employees and 900 onsite contractors. Field offices include water resource district offices in each of the 15 States, 3 mapping centers (Colorado, Missouri, and South Dakota), 13 cooperative fish and wildlife units, 5 biological science centers (Louisiana, Colorado, North Dakota, and Missouri) and an integrated science center (Montana). Administrative offices, including the Regional Director's Office and the Office of Regional Services, are located in the Denver metropolitan area as are the regional program offices for the mapping, geology, water, and biology disciplines. The mapping program also has a regional office in Rolla, MO. Within the Region, program integration and program relevance has been enhanced and administrative support costs reduced by co-locating discipline and Regional Director's Office staff at several locations and establishing liaison offices with partners within the Region. A wide range of USGS research and data collection activities are conducted in the Region. Specifically, regional executives coordinate integrated science activities in specific geographical areas throughout the Region (e.g., mountain west, arid Southwest, Missouri/Middle Mississippi Rivers, and gulf coast/Lower Mississippi River. External collaborators and cooperators for these projects include DOI agencies as well as other Federal, State, Tribal, and local agencies, universities, non-profit organizations, and citizen groups.



USGS conducts scientific research and monitoring activities from 76 cities in 15 States in the Central Region.

Issues

The USGS Central Region comprises the 15 States between the Mississippi River and the western slope of the Rocky Mountains. Physically, demographically, and culturally the Central Region is diverse. Physical characteristics vary from a mostly pristine montane ecosystem in

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the northwest and arid high plateaus and desert in the southwest, to sub-tropical coastal plains along the Louisiana coast and vast agricultural lands in the Great Plains and Mississippi River valley. The Region is climatologically bisected by the 100th meridian and contains the Continental Divide and the headwaters for many of the Nation's major river systems. The western portion of the Region comprises predominately public lands with many national forests, Bureau of Land Management and Tribal lands, and national parks. Rangelands west of the 100th meridian give way eastward to the ranches and farmlands of the prairies and plains and the agricultural lands of the Mississippi and the Missouri River valleys. The Region provides much of the Nation's energy and mineral resources as well. Though largely rural, the Region has some of the fastest growing population centers in the United States. The cultural and political landscape is equally diverse and includes the populations of the Texas/Mexico border area, ranchers and farmers, and cosmopolitan urban and suburban areas. Quality of life issues create a societal challenge to find a balance between conflicting priorities of recreation, urbanization, development of needed resources, safety from hazards, and maintenance of ecosystem health. As the process of urbanization accelerates, competition for natural resources creates a challenge for Federal, State, and local natural resource managers and urban planners who require a scientific basis for sound decisionmaking.

Priority science issues of resource managers in the Central Region are agricultural practices, urban dynamics, rivers, ground water, fire science, coalbed methane, and invasive species, with emphasis on the science issues of DOI bureaus. These science issues require the joint efforts of the many disciplines within the USGS and its partners to define the problem, use the scientific expertise to develop answers, and communicate the results to managers. The following are examples of USGS activities that address these science issues.

New USGS Science Center Dedicated in Fort Collins, Colorado – The USGS dedicated a new science center named the Fort Collins Science Center (FORT) in 2002. Formerly known as the Midcontinent Ecological Science Center, the FORT is located on the Natural Resources Research Center (NRRC) campus in cooperation with Colorado State University. The NRRC is a unique campus developed to support and enhance research on natural resources issues and represents a partnership among six Federal agencies from the Departments of Agriculture and the Interior, the General Services Administration, and Colorado State University. This co-location enhances service to customers, provides new research capabilities, and facilitates joint research opportunities. FORT conducts research and develops technical applications to assist land managers in understanding and managing biological systems and species. More information can be found on the Web at <http://www.fort.usgs.gov>.

Improve Water Quality Conditions in the Cedar River, Iowa – Excessive nutrient concentrations and loads have been an increasing concern in the Mississippi River Basin of the central United States due to impacts on human and ecological health. The concentrations of nitrate and total phosphorus in streams of the eastern Iowa Basin rank among the highest in the Nation and may be contributing to the Gulf of Mexico hypoxia problem. The Iowa Department of Natural Resources, EPA, the city of Cedar Rapids, and the USGS are examining ways of assessing fundamental questions of flow and transport of chemical constituents in the Cedar River watershed and using a basin-wide approach to establish a fundamental understanding of the sources, transport, and fate of nutrients to improve water quality conditions in the Cedar River. This integrated assessment of water quality conditions in the Cedar River Basin uses innovative methods to connect the landscape and hydrologic features and draws on the variety of expertise of USGS scientists. Databases have been developed for this study, for land use, land-use history, slope, and soils. These data were compared to site samples, in an effort to identify areas where land management activity changes could reduce nitrate concentrations and

loads. The Geographic Analysis and Monitoring and the Biological Research and Monitoring programs contribute to this effort.

Federal, State, and Community Leaders Meet to Discuss Mancos Shale Land Use and Water Quality – Responsible stewardship of western lands is a primary goal of many Federal and State agencies as well as non-government organizations and citizen groups. In parts of the West much of that land is underlain by marine shale, such as the Cretaceous age Mancos shale

of western Colorado, northern New Mexico, and eastern Utah. During the last few decades, land use and water-quality issues related to Mancos landscapes have risen in prominence in the west slope area of Colorado and parts of eastern Utah. Many immediate issues are related to specific, naturally occurring toxins such as selenium and salinity. The BLM and the USGS co-sponsored a workshop in 2002 to assess the state of scientific knowledge to date, interact with involved organizations to understand their immediate needs and concerns, develop lines of communication, and define what new research must be accomplished to address those needs and predict what effects may result from probable changes in land use and climate. The workshop was attended by community and State leaders; Federal and State land- and science-managers and decisionmakers; and scientists who are actively managing Mancos landscapes and researching issues related to those landscapes. A workshop summary is available and will serve as a foundation for planning future, multi-agency research related to the responsible stewardship of Mancos Landscapes. More information can be found on the Web at http://minerals.cr.usgs.gov/projects/mancos_shale. The Minerals program contributes to this effort.

“Scientifically defensible information is required by land managers in order to formulate and implement responsible land-use management policies. To those ends, understanding the processes responsible for the evolution of Mancos Shale landscapes in the western United States is imperative. The developing relationship between the USGS and BLM is designed to meet those needs by providing both objective and useful science.”

Scott Davis
BLM Chair, Science Coordination Committee
BLM-Colorado State Office

Environmental Quality and Human Health Issues in the U.S./Mexico Border Region – The border region of the United States and Mexico encompasses an array of habitats, such as freshwater and marine wetlands, deserts, rangeland, mountains, and forests, that are unique in terms of the diversity of their water, mineral, and biological resources. Almost 12 million people reside within the border region, which is a tenfold increase in population during the past 60 years, and the population is predicted to double within the next 20 years. This rapid population growth and consequent economic development and land-use changes are pushing the limits of environmental sustainability and quality. A lagging pace of infrastructure development has resulted in a shortage of clean water for municipal, agricultural, and industrial purposes that could threaten the quality of life in the region and raises concerns about the interactions between environmental quality and human health. To continue economic growth, protect the area’s natural resources, and maintain a high quality of life, the United States and Mexico need a clear understanding of these changes to environmental quality. Issues of particular concern to Federal, State, and local land and resource managers include (1) organic contaminants in ground water, surface water, and biota as a consequence of industrial, agricultural, and municipal uses; (2) airborne pollutants from energy production and dust and particulate dispersion; (3) inorganic and trace metal compounds from historic and present mining activities and surface mineral deposits; and (4) pathogens and other biological contaminants from untreated and under-treated sewage and related sources. The USGS developed a work plan that includes creating an integrated, Web-based, environmental-resource database containing both U.S. and Mexican data within a geographic information system (GIS) framework. This GIS

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provides the needed data and tools for furthering the understanding of the occurrence and distribution of compounds and pathogens in the environment and their specific exposure pathways in water, air, biota, and soil. The Geographic Analysis and Monitoring, Minerals, Ground Water, Toxics, and Biological Research and Monitoring programs contribute to this effort.

Mark Twain Project Characterizes Past and Potential Impacts of Lead-Zinc Mining in Southeast Missouri – Southeast Missouri hosts world-class lead-zinc ore deposits, and recent proposals to expand areas of prospecting for deposits of lead ore in the Mark Twain National Forest of southeast Missouri raised concerns about potential surface and ground-water quality degradation due to lead mining. In response to concerns about potential impacts in Federal lands (the Mark Twain National Forest; and the Ozark National Scenic Riverway) and to understand how different mining practices affect the quality of water resources, the USGS is evaluating the effects of current and proposed mining activities on water quality and aquatic biota of the Missouri Ozarks. Current mining activities in the Viburnum Trend mining district (New Lead Belt) are being studied as an indication of potential impacts of future mining in the Ozarks. These studies include onsite studies of stream, spring, and aquifer hydrology; field geologic mapping and geochemistry on the movement of trace elements during the mining of lead-zinc ore; the effect of tailings piles on stream water and sediment quality; 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. A database of historical and current water quality and geochemical and biological data has been compiled and used to establish statistical measures of pre-mining water quality. Preliminary results of toxicity tests indicate that exposure to sediments from sites in the vicinity of mines and tailings deposits may adversely affect aquatic invertebrates. Chemical analyses of sediments and water from these studies are ongoing and will provide information about potential causes of the observed toxicity. Geochemical modeling tools and methodology specific to the study area have been developed and are used to predict impacts to water quality under various mining practices. More information can be found on the Web at <http://minerals.cr.usgs.gov/projects/ozarks/> and <http://mo.water.usgs.gov/mining/leadmining.asp>. The Biological Research and Monitoring program contributes to this effort.

Pallid Sturgeon – What do They Need to Recover – Recovery of the Missouri River's endangered pallid sturgeon requires a scientific understanding of the complex interactions between the ecological requirements of a very rare species and the physical processes of a large-river ecosystem. The USGS is studying pallid sturgeon reproductive biology, reproductive development as related to environmental conditions, and habitat use and availability. Using shovelnose sturgeon as a surrogate, monthly profiles of reproductive development were created. Six automated telemetry receiving stations were established in the Lower Missouri River between Hermann and Lisbon Bottom (river mile 90 to 220) to track pallid sturgeon. Out of several thousand sturgeon captured, only five were pallid sturgeon, demonstrating the rarity of the fish; of those, only two were sufficient size for implantation of acoustic transmitters and archival tags that continuously record the temperature and depth of the habitats selected by the fish. A similar investigation of the habitat requirements is also being conducted in the Upper Missouri River (near Fort Peck). Each month, over 800 miles of river are searched to locate the tagged sturgeon. Hydrologists conducted quantitative habitat assessments at locations where sturgeon were found. These data will be incorporated into hydraulic models to refine estimates of habitat availability. More information can be found on the Web at http://infolink.cr.usgs.gov/Science/Pallid_Sturgeon/pallid_factsheet.pdf. The Biological Research and Monitoring program contributes to this effort.

Tracking the Endangered Sandhill Cranes on the Platte River – Because of declining waste corn, the number of sandhill cranes that can be supported on corn ground in the Central Platte River Valley has declined by about 60 percent over the past 20 years resulting in the birds now having to fly four times as far from the river to meet their nutritional needs than formerly occurred. USGS Satellite telemetry in 2002 documented that sandhill cranes from the midcontinent population breed at least 1,600 kilometers westward into Siberia from the Bering Strait. Lesser sandhill cranes breeding in Siberia and wintering in southeast Arizona and central New Mexico migrate through Nebraska in spring despite adding 1,500 kilometers to the length of their spring migration. In Canada, greater sandhill cranes were documented from the midcontinent population breed westward to near the eastern edge of the Rocky Mountains in Alberta. In fall, lesser sandhill cranes were confirmed wintering in Mexico and are primarily from the Siberia/Western Alaska subpopulation. At the Platte River, radio-marked cranes changed their roost-site location in Platte River channels an average of 3.6 kilometers from 2001 to 2002 and some birds homed back to the same roost site. Eighty-eight percent of radioed cranes marked in previous years were in the Central Platte Valley on the date of the annual March survey of the midcontinent population conducted by the U.S. Fish and Wildlife Service. This percentage of cranes is consistent with finding from previous years and suggests that 10 percent of the cranes have either not arrived or have departed by the date of the survey. More information can be found on the Web at <http://mcmcweb.er.usgs.gov/platte/>. The Geographic Analysis and Monitoring and Biological Research and Monitoring programs contribute to this effort.

Partnerships

Partnerships with the DOI bureaus, other Federal agencies, Tribal, State and local agencies, universities, non-government organizations, and citizen’s groups provide the input needed to identify the regional science priorities for USGS and the feedback on how USGS work is used to address their issues.

Partnerships Associated with Accomplishments in the Central Region*

	Coalbed Methane	Fire Science	Yellowstone	Abandoned Mine Lands	Texas	Carbon Sequestration	Mercury	Chronic Wasting Disease
Department of the Interior								
Bureau of Land Management (BLM)	X	X	X					
Bureau of Indian Affairs (BIA)	X	X	X					
Fish and Wildlife Service (FWS)	X	X	X			X		X
National Park Service (NPS)		X	X				X	X
Other Federal Agencies								
Center for Disease Control and Prevention								X
Environmental Protection Agency (EPA)	X			X				
Food and Drug Administration (FDA)								X
U.S. Department of Agriculture (USDA)						X		X
U.S. Forest Service (USFS)		X	X					
Other Organizations								
State and Local Governments and Universities		X	X	X	X		X	X
Tribal Governments	X	X						X

*The bureaus listed are a small subset of the bureaus served by USGS science.

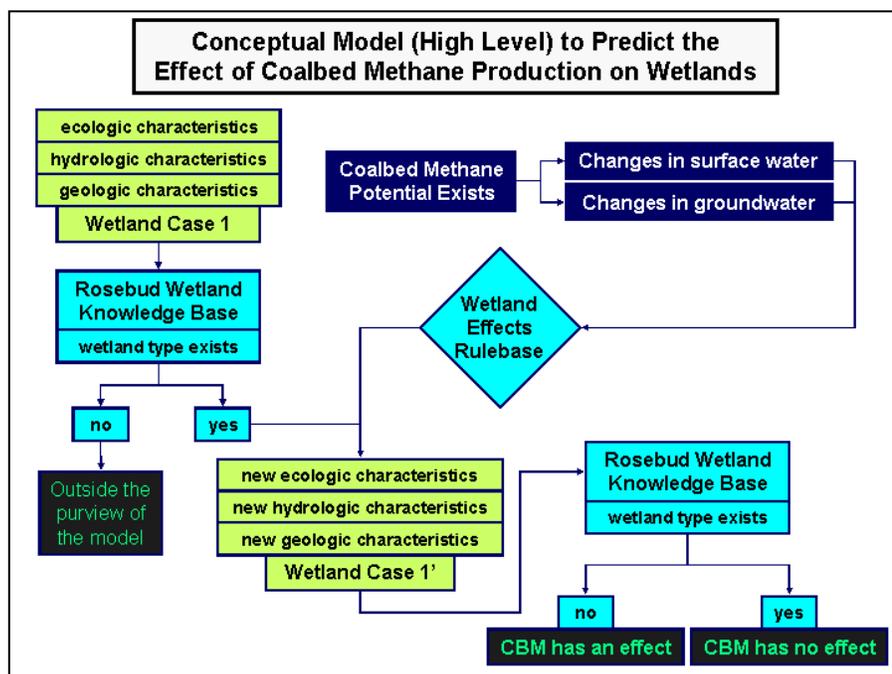
Program Accomplishments

Below are selected FY 2002 accomplishments that illustrate the scientific efforts being undertaken through various USGS programs in the Central Region.

USGS Programs in Support of Accomplishments in the Central Region

	Coalbed Methane	Wildland Fire Science	Greater Yellowstone Area	Abandoned Mine Lands	Texas Science Issues	Carbon Sequestration	Mercury	Chronic Wasting Disease
MAPPING, REMOTE SENSING & GEOGRAPHIC INVESTIGATIONS								
Cooperative Topographic Mapping					p. 129			
Geographic Analysis & Monitoring	p. 156	p. 156	p. 156	p. 156				
GEOLOGIC HAZ., RESOURCES, & PROC.								
Geologic Hazard Assessments								
Landslide Hazards		p. 196						
Geologic Resource Assessments								
Mineral Resources			p. 240	p. 240				
Energy Resources	p. 254							
WATER RESOURCES INVESTIGATIONS								
Hydrologic Monitoring, Assess. & Research								
Hydrologic Networks & Analysis	p. 315	p. 315						
Cooperative Water Program							p. 324	
BIOLOGICAL RESEARCH								
Biological Research & Monitoring		p. 345	p. 345	p. 345		p. 345		p. 345

Coalbed Methane – Joint Endeavor in the Powder River Basin – Recent rapid Coalbed Methane (CBM) development and a projected 60,000 wells in the Powder River Basin in Wyoming and Montana by 2010 has created a critical need by land managers for reliable and unbiased data on CBM resources underlying Federal and Tribal lands. CBM development affects ground-water systems, ecosystems, and surface landforms because water is



brought to the surface during production to release methane by lowering pressure in the coal reservoirs. CBM production could potentially withdraw millions of gallons of water from target coals and discharge them to infiltration ponds, streams, or injection wells. Impacts of this water on environmental conditions are unknown and raise geologic, hydrologic, and ecologic questions about wetlands. The need to understand the physical, chemical, and biological processes of CBM led to a joint endeavor of the USGS, BLM, BIA, and the Northern Cheyenne Tribe in Montana. Results also are being used by the FWS and EPA. Project results include estimates of CBM resources, gas loss due to drainage and coal mining, coal reservoir characteristics, and origin and chemistry of gas and co-produced water. USGS gas content data were utilized by BLM to estimate gas-in-place and recoverable resources. Also, estimates of lost gas due to drainage from Federal leases and dewatering during coal mining led to estimates of lost royalty revenues. Gas content data of coalbeds and water quality data from observation wells in the Northern Cheyenne Indian Reservation provide baseline information for the Tribal Council to plan and protect their CBM resources from rapid development in surrounding Federal, State and private (fee) leases. To help understand the potential effects of CBM production on wetland flora and fauna, the USGS developed a conceptual model of how wetlands in the northern part of the Powder River Basin function, their importance to waterfowl and waterbirds, and the extent to which the wetland is likely to be affected by CBM development. More information can be found on the Web at <http://energy.cr.usgs.gov/oilgas/cbmethane/index.htm>. For a related accomplishment, see Geographic Analysis and Monitoring accomplishments beginning on page 156 and Energy Resources accomplishments beginning on page 254.

Wildland Fire Science – Suppression to Rehabilitation – To help land and water management agencies contend with the devastating effects of the 2002 wildfires in the West, USGS scientists provided data and expertise that were used in suppression activities and rehabilitation efforts. These efforts consisted of supporting fire operations through GEOMAC (Geospatial Multi-Agency Coordination including the BLM, NPS, FWS, BIA, and USFS); establishing gages to monitor rainfall and runoff; using information from rainfall and runoff monitoring to conduct post-fire debris and flood hazard assessments, including developing models to help predict flood hazards; assessing the impacts to water quality and water supply for the City of Denver; and evaluating the biological effects of fire including the toxicity of fire retardants, vegetation, and animal response.

Sponsored by the National Interagency Fire Center, GeoMAC is managed and maintained by the USGS. GeoMAC provides users online access to near-real-time data depicting the wildland fire situation across the Country. GeoMAC received 40 million requests over the course of the 2002 fire season, with a one-day high of 1.7 million requests. GeoMAC can be found on the Web at <http://geomac.cr.usgs.gov/>.

Along with GeoMAC information, detailed current maps are critical during fire suppression operations. Using current aerial photos, the USGS updated roads on about 100 electronic images and produced critical data for the Southwest Geographic Area Coordinator Center and the Rocky Mountain Area Coordination Center. In 2002, page-sized maps for each State containing completed hazardous fuels treatments projects for 2001, congressional districts, communities at risk, and base layer mapping information were made for the DOI Office of Wildland Fire Coordination congressional briefing materials. Seamless, Web-based maps

GeoMAC Website

“Your site is a great service, and I hope it continues. This information is not readily available through the news media, and is extremely useful. Thank You!”

Rodeo/Chediski Wildfire Evacuee

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showing congressional districts and communities at risk were developed and linked to The National Fire Plan website, on the Web at www.fireplan.gov.

Millions of liters of fire-retardant chemicals are applied to wildland fires each year in the United States. Little is known about the toxicity to aquatic organisms and the persistence of these chemicals. Fire retardants may persist in rainwater runoff, and their toxicity may increase when exposed to sunlight. These results have been provided to the land management agencies in DOI and the USFS for guidance in the selection and use of fire-retardant chemicals.

Landslides and debris flows are potential hazards when late-summer thunderstorms drenched the burned areas only weeks after the devastating fires. After the 2002 Missionary Ridge fire, with funding support from the USFS, precipitation gages were installed near Durango, CO. This precipitation-gage network records precipitation over the burned area in near-real time. The network helped National Weather Service forecasters determine storm movement within a matter of minutes and predict areas at risk for landslides and debris flows.

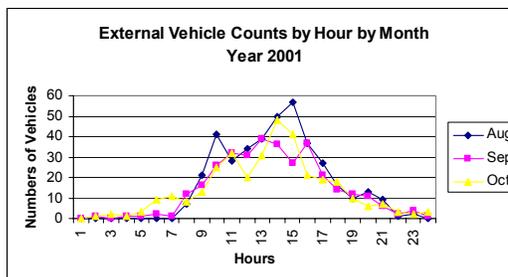
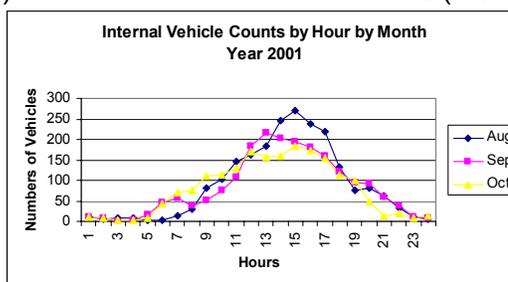
“USGS represents a vast resource of expertise that can and is being put to good use by BLM, FWS, NPS, BIA and so forth...”

Tim Murphy
Bureau of Land Management
National Office of Fire and Aviation

The USGS continues to provide electronic maps on wildland fire effects, including burn severity assessments, final fire perimeters, and tabulations of burn severity area. While the work was started as a cooperative project with the NPS in 1995, over 390,000 burned acres were mapped in 2002 within 34 NPS units on 103 fires, and over 800 field plots were sampled within 13 NPS areas. An additional 1,285,000 burned acres outside National Parks (representing 32 fires) and 21 other land management units from the DOI and the USFS were assessed. More information can be found on the Web at <http://firescience.cr.usgs.gov/>. For a related accomplishment, see Geographic Analysis and Monitoring accomplishments beginning on page 156 and Biological Research and Monitoring accomplishments beginning on page 345.

USGS Greater Yellowstone Area Research for Land Managers – The major natural resource management bureaus (NPS, USFS, USFWS, BIA, BLM) in the Greater Yellowstone Area (GYA) identified four key management challenges: wildlife-habitat interactions, human-habitat interactions, human-wildlife interactions, and biogeochemical processes (climatic, geologic, hydrologic).

In support of the wildlife-habitat interactions, grizzly bear research and long-term monitoring continues through an interdisciplinary group of scientists from the USGS, NPS, USFS, FWS, Montana State University (MSU), and State wildlife agencies of Montana, Idaho, and Wyoming. The team has worked on a conservation strategy and associated State management plans that will come into effect once the bear is taken off the Endangered Species List and has provided research results addressing the potential impacts of winter recreation on denning grizzly bears to the USFS and NPS for biological



assessments and a winter use plan. More information can be found on the Web at <http://www.nrmisc.usgs.gov/research/igbst-home.htm>.

Under human-habitat interactions, the USGS continued a series of interdisciplinary investigations in the GYA to provide information to land managers about land use changes and how they affect natural resources of the region. Specific datasets, analytical tools, and research results from these studies were furnished directly to resource managers of the NPS, USFS, FWS, BLM, Wyoming Department of Game and Fish, Montana Fish Wildlife and Parks, and Idaho Fish and Game. Results of the studies and the databases and analytical tools were used in development of environmental impact statements, Forest Service travel plans, and a model that integrates climate, landscape, and elk nutritional requirements. More information can be found on the Web at <http://nrin.nbio.gov/climate/> and <http://www.nrel.colostate.edu/projects/teton/TBISON1.pdf>.

Human-wildlife-habitat interactions are being investigated using a variety of tools including satellite telemetry (to track grizzly bears), land-cover maps, elevation maps, and traffic counters. While grizzly bear records are still being collected, information on traffic patterns already shows an unexpected result – the daytime pattern of traffic at the main road entering the Taylor's Fork valley is nearly identical to the temporal pattern at traffic monitoring sites within the valley. If this similarity holds in other places, then a significantly smaller number of traffic monitoring sites will be needed for construction of traffic models for the entire park and for other public lands.

In 2002, the installation of three USGS stream-monitoring stations on the Firehole, Gibbon, and Boiling Rivers renewed monitoring and assessment of the hydrothermal systems in Yellowstone National Park. Near-real-time data on streamflow and water temperature are available through the USGS National Water Information System. Water-quality samples, primarily used for analysis of chloride concentration, are collected periodically at each of the sites to help assess hydrothermal activity. Completed in 2002, bathymetric mapping of Yellowstone Lake is critical to understanding potential volcanic, hydrothermal, and seismic hazards. The bathymetric survey and accompanying interpretive reports have allowed NPS staff to better manage resource and hazards issues associated with active volcanic features concealed beneath the lake. Details of the project can be found on the Web at <http://minerals.cr.usgs.gov/projects/yellowstone/task7.html>.

For related accomplishments, see Geographic Analysis and Monitoring accomplishments beginning on page 156; Mineral Resources accomplishments, page 240, and Biological Research and Monitoring accomplishments, page 345.

Abandoned Mine Land Project Frames Remediation Scenarios for Two Watersheds – The USGS delivered to partners an environmental response map of the Boulder River watershed, Montana study area. Working with EPA, project members assisted in developing fundamental geologic data for waste repository evaluation and worked with their contractors on the application of newly developed criteria for site characterization in the recently declared Tenmile watershed Superfund site, which is the water supply for Helena, MT. The USGS developed a conceptual framework for understanding the contribution of metals derived from weathering of hydrothermally altered rock to the quality of ground and surface water in the Animas River watershed in Colorado. This

“The Forest Service uses the watershed characterization information provided by the USGS to help set National AML funding priorities. The ribbon maps are especially useful for summarizing the results.”

Ray TeSoro
Abandoned Mine Lands Coordinator
USDA-Forest Service, Northern Region

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framework results in ribbon maps, which show the risk to water quality. Collaborative studies with colleagues in the Colorado Geological Survey, Colorado Department of Health and Environment, local governments, and Animas River Stakeholders Group (a coalition of local concerned citizens) have resulted in development of a watershed-scale strategy for remediation developed and implemented by the Stakeholders Group using EPA grants. Two tools that assist land managers in making science-based remediation decisions were completed and delivered. The first tool is a mass-loading method used to evaluate and rank the importance of loading sources in streams affected by mine drainage. The second tool is a solute-transport model that can be used prior to remediation to evaluate the effects of remedial alternatives on stream water quality. The mass-loading method has been applied by local stakeholders to help choose remediation sites out of 1,500 existing sites in the upper Animas River Basin in Colorado. The solute-transport model has been used to illustrate that certain remedial alternatives may degrade water quality. More information can be found on the Web at <http://amli.usgs.gov/amli/> and <http://www.usgs.gov/themes/factsheet/095-99/>. For a related accomplishment, see Geographic Analysis and Monitoring accomplishments beginning on page 156, and Mineral Resources accomplishments beginning on page 240.

Integrated Science to Address Texas Population Growth Issues – Multiple Science Issues Addressed – Texas population growth has been among the highest in the Nation. Regions that were until recently sparsely settled, such as the U.S.-Mexico border, the Hill Country, and the Texas Coast, are experiencing rapid growth and development. An integrated approach to science issues in Texas was formalized in 2002 when the USGS, along with its partners, drafted a strategic science plan that identifies the issues and an integrated approach to address those issues. As one of the first steps to increase integration projects locally, the USGS established a mapping partnership office in October 2001 in Austin, TX, co-located with the USGS Texas Water District Office. Along with enhancing integrated science projects, this office will also build upon the USGS partnership with the Texas Natural Information System (TNRIS) to make its statewide geographic database, StratMap, the base map for *The National Map* pilot for the State of Texas. More information can be found on the Web at www.tnr.is.state.tx.us and <http://tx.usgs.gov>. For a related accomplishment, see Cooperative Topographic Mapping accomplishments beginning on page 129.

USDA Uses USGS Research to Aid in Restoring Wetlands for Carbon Sequestration – Scientific understanding of carbon cycling is critical to the study of global warming. Carbon dioxide and methane are greenhouse gases that contribute to this warming. Through photosynthesis, atmospheric carbon can be stored in the soil. Through microbial respiration soil carbon can be returned to the atmosphere. Both the DOI and USDA have expressed the need to understand the carbon cycle and in particular carbon sequestration. Research demonstrates that wetlands in the prairie pothole region of Iowa, Minnesota, South Dakota, North Dakota, and Montana traditionally functioned as sinks for atmospheric carbon, but row crop agriculture, the current principal land use, releases carbon to the atmosphere instead of storing it. Data suggest that greater amounts of atmospheric carbon can be stored in restored wetlands than in agricultural lands that are specifically managed to promote carbon sequestration, even though the area of wetlands is much smaller. Based on this research, USDA is adding restored prairie wetlands to the National Carbon Sinks Table. More information can be found on the Web at <http://www.npwrc.usgs.gov/resource/othrdata/amnorpln/conclu.htm>. For a related accomplishment, see Biological Research and Monitoring accomplishments beginning on page 345.

Understanding the Mercury Issue at Voyageurs National Park, Minnesota – Currently, most State and Federal land and resource management agencies are struggling with a widespread

mercury problem. Much of the difficulty comes from trying to understand its complexities and respond to the public who recreate on these lands and want to know why some lakes are worse than others. In the past decade, mercury contamination has prompted steadily increasing numbers of fish-consumption advisories, such that 49 States have issued advisories. In total, mercury advisories comprise 80 percent of all such advisories in the Nation. Voyageurs National Park (VNP) in northern Minnesota is in an extremely remote setting with no known nearby mercury sources, yet mercury advisories are posted for the entire Park. However, there is a wide range in mercury levels among the many lakes at VNP, and controlling variables were poorly understood. USGS researchers conducted a series of experiments to reveal whether the observed trend in fish-mercury levels among sampled lakes in VNP could be explained by the uptake of mercury and methylmercury (the most toxic form of mercury) by plankton. Previous studies demonstrated a direct relation between fish mercury and dissolved organic carbon (DOC) in lake water over low to moderate DOC levels; however, fish mercury levels decline in relation to moderate to high DOC in lake water. Experiments revealed that lake water with high DOC levels effectively “bind” mercury and keep it out of the food web. The project was jointly conducted with the NPS, the Minnesota Pollution Control Agency, and the University of Wisconsin. The research findings will aid NPS and possibly other land management agencies to better understand this complex problem as well as regulatory agencies (e.g., EPA) that are considering emission reduction strategies. Details of the project can be found on the Web at http://mn.water.usgs.gov/active_projects/

Chronic Wasting Disease – Chronic Wasting Disease (CWD) is a long-known disease of deer and elk in northeastern Colorado and southwestern Wyoming related to mad cow disease. The lack of information establishing risk associated with consuming CWD-tainted venison has led to reluctance or refusal by many hunters to continue to hunt. Also, management of the big game species, such as elk, mule deer and white-tailed deer is at risk as a result of CWD. The USGS as well as other DOI Bureaus, the USDA, FDA, CDC, tribes, and State wildlife management agencies across the country are working to obtain answers to the many questions surrounding CWD. Thus far, surveillance programs have detected CWD in captive or wild deer and elk in Wisconsin, Nebraska, South Dakota, New Mexico, Illinois, and in expanded areas of Colorado. Research has demonstrated that CWD has not passed from deer to cattle in a captive enclosure. Transmission of disease amongst deer and elk is most likely by direct contact, and the disease behaves differently in the three susceptible hosts. The CWD issue demonstrates that science needs do not follow regional boundaries and USGS scientists in the Eastern and Central Regions are working with many State and Federal agencies to understand this diseases and its potential impact.

The USGS participated as a key member of the Task Force for Chronic Wasting Disease and then the Implementation Team. These groups were assigned to develop actions, funding, and timelines for measures to initiate a national plan to assist States, Tribes and Federal agencies with CWD control. The National Plan for CWD was completed in late June 2002, and the Implementation Plan followed in September 2002. USGS scientists at the Eastern Region National Wildlife Health Center located in Madison, WI, assisted the Wisconsin Department of Natural Resources in establishing the capacity to test white-tailed deer tissues for CWD by forming a partnership with the Wisconsin Veterinary Diagnostic Laboratory and provided direct input into the investigation of CWD in Wisconsin by developing predictive models of disease occurrence and distribution. USGS is also providing technical assistance to State and Federal land management agencies in developing surveillance and contingency plans for wild deer and

Regional Activities

elk herds in the Central United States. More information can be found on the Web at http://www.nwhc.usgs.gov/research/chronic_wasting/chronic_wasting.html. For a related accomplishment, see Biological Research and Monitoring accomplishments beginning on page 345.

Administrative Support Success Stories – The Central Region enhanced USGS science endeavors through major accomplishments in contracting, network security, and safety. A new technical support services contract was awarded at the EROS Data Center. This is the largest Performance Based Service Contract in the Department of the Interior, with an estimated 5-year total value of \$154.7 million. Also, the first award to an Alaska Native corporation was given for administrative, warehouse, and data entry support services. CR personnel implemented new top-of-the-line network security technology and continue to monitor and enhance Internet security. The Safety Office developed and implemented an automated external defibrillator program for the USGS offices within the Denver metropolitan area. The USGS contracted with the U.S. Public Health Service's Federal Occupational Health Division to develop building-specific protocols and provide program oversight. Fifty-eight volunteer lay responders have been trained to respond to cardiac arrest-type emergencies and to administer potential life-saving measures with the use of an automated external defibrillator.