Midwest Association of Fish and Wildlife Agencies
Annual Meeting, July, 2008
Estes Park, Colorado
Compilation of Ongoing USGS Projects

Colorado

- ***NBII Southwest Information Node (SWIN)*--**Establish an NBII node that focuses on the biological problems and issues of the southwest, strengthened by data on geology, hydrology, geography, and human dimensions; develop web applications that make the node uniquely valuable to public and federal agency users.
- ***Fire ecology: impacts on birds and arid lands*--**Expand understanding of the ecological effects of wildland fire on avian and plant communities in forested systems across the Rocky Mountains; develop tools for assessment and modeling of post-give effects; evaluate the effects of prescribed fire and other fuels reduction practices on avian and plant communities in ponderosa pine forests; facilitate integration and evaluation of trade-offs among ecological, economic, and social impacts of fire management policies and practices.
- ***Reference ecosystems*--**Gain understanding of long-term change in structure and function of northern protected ecosystems in national parks and preserves; assess long-term effects of disturbances on ecosystem processes and biodiversity; link changes in processes and biotic composition to change in biodiversity and biomass; examine long-term interactions among below- and above-ground processes on biotic functional diversity.
- ***Fire and post-fire restoration*--**Expand understanding of ecological effects of wildlife fire on avian and plant communities in forested systems across the Rocky Mountains; develop tools for assessment and modeling of post-fire effects; evaluate effectiveness and ecological effects of prescribed fire and other fuels-reduction practices; develop protocols and techniques for improving communication with at-risk communities.
- ***Riparian vegetation response to tamarisk invasion and flow regulation in Dinosaur National Monument*--**Refine understanding of the process of environmental change using dendrogeomorphic techniques; develop integrated monitoring protocols for Dinosaur National Park riparian and aquatic ecosystems; evaluate effectiveness of management strategies.
- ***Response of western forests to climatic variability and change*--**Understand and predict the responses, with an emphasis on sensitivities, thresholds, resistance, and resilience.
- ***Nitrogen deposition***—Long-term (26 yrs) research within and around Rocky Mountain NP to determine the consequences of excess nitrogen from atmospheric deposition on alpine ecosystems. This work resulted in a 3-way MOU between EPA, NPS, and the Colorado Dept. of Public Health and Environment to address nitrogen emissions in the state.
- ***Forecasting invasions***—NASA, Colorado State University, and USGS scientists have developed an invasive forecasting and modeling system that has successfully been tested on tamarisk and cheatgrass, both of which occur in Colorado.
- ***The Conservation Reserve Program***—This partnership with the USDA Farm Services Agency helps improve the program by evaluating program performance socially (benefits to farmers) and ecologically. Based on average rental payments, the CRP brings in over $71 million per year to Colorado's farm economy.
- ***Gunnison sage-grouse*—**Genetics research characterizes the genetic makeup of all 7 Gunnison sage-grouse populations, using both mitochondrial and nuclear DNA markers. Ecological studies use recently collected and new movement data from radio-marked Gunnison sage-grouse hens and chicks to improve understanding of their survivorship and develop a habitat-selection model. The model will provide a stronger basis for identifying key resources needing conservation and areas suitable for habitat improvements.
- ***Elk and bison grazing in Great Sand Dunes National Park and Preserve***—Data collection on ungulate population size, movements, body condition, and herbivory effects on vegetation communities will be used in ecological models to evaluate ecosystem processes and simulate management scenarios.

- ***Aspen ecology in the core elk range of Rocky Mountain National Park***—Monitoring plan design and implementation to help park managers assess the effectiveness of management actions and adapt them, when and were necessary, to achieve intended goals.
- ***Monitoring the impacts of off-highway vehicle use on wildlife***—Research on how OHV traffic patterns affect wildlife to develop a model for management use.
- ***Improved population estimation techniques and immunocontraception and monitoring for wild horses***—Two-part study involved testing and refining the suite of new aerial population estimation techniques to improve their accuracy, and field trials on immunocontraception for reducing reproductive rates in wild horse herds.
- ***Negotiation training for Natural Resource Professions***—Social scientists conduct this training primarily for federal and state personnel. Content derives from USGS research on natural resource conflict resolution and negotiation.
- ***Environmental quality in the vicinity of a biosolids-application site near Deer Trail, Colorado***--Evaluate combined effects of biosolids applications, other land uses, and natural processes on soil, dust, crops, bed sediments, and aquifers, by comparing chemical data to regulations, to a control site, or to earlier concentrations from the same site; develop biosolids signatures of inorganic and organic chemicals for water and soil.
- ***Mancos Shale landscapes: science and management of black shale terrains***--Use science to help define issues requiring science, resource, and land-use managers who deal with black shale terrains.
- ***Environmental impacts of energy resources exploration, development, and production***--Develop, test, and transfer to users simple, real-time, field-assessment techniques for evaluating and prioritizing impacted oil and gas production sites on public lands; develop biogeochemical and geophysical assessment techniques for use in studies of produced water-impacted sites; use uranium isotopic analyses to assess ground- and surface-water contamination at uranium mine and mill sites.
- ***Fire science thrust: Colorado***--Develop and refine scientifically-based assessment tools that can aid land managers, water-resource managers, and the public in implementing effective pre-fire planning and in mitigating post-fire hazards to life and infrastructure in the Three Lakes watershed.
- ***Retrospective assessment of the Eagle River watershed***--Assess quantity and quality of surface- and ground-water resources in the Eagle River Watershed through a retrospective assessment of data; provide an understanding of the natural and human factors that affect quality and quantity of water and stream biota.
- ***Retrospective assessment of the Blue River watershed***--Assessment of the surface- and ground-water resources in the Blue River watershed.
- ***Ice-affected streamflow records using tracer-dilution methods***--Develop an automated tracer-injection, stream-gaging system to seasonally determine discharge for ice-affected streams.
- ***Retrospective assessment of the Roaring Fork Watershed***--Comprehensive surface- and ground-water resource assessment in the Roaring Fork River watershed; provide an understanding of the natural and human factors that affect the quantity and quality of water resources.
- ***Rocky Mountain Arsenal ground-water and surface-water monitoring and evaluation***--Provide guidance and review of remedial actions concerning ground-water flow, ground-water quality, contaminant migration, the relation between ground-water recharge and surface-water flow, and the interaction of contaminants found in ground and surface-water; operate series of ground-water monitoring networks to collect water quality samples and measure water levels.
- ***Colorado River salinity loading assessment***--Compute dissolved solids concentrations and loads at the 20 station network.
- ***Eagle River ground water vulnerability***--Assess the hydrogeologic characteristics of the major alluvial aquifer in the Eagle River watershed and develop maps that show susceptibility of areas in the Eagle River watershed to ground-water contamination.
- ***Manitou Springs ground water***--Compile, collect, and evaluate hydrogeologic and water-quality data from the Manitou aquifer in the Manitou Springs area.
- ***Western hydrologic benchmark network***--Oversee long-term water-quality monitoring in nine areas minimally affected by human activities.
- ***National irrigation water quality program***--Collect and analyze selenium and other hydrologic data for selected bottomland and backwater sites that are related to endangered fish recovery in the lower Gunnison River and Colorado River.
- ***Use of long-term specific conductance data to identify potential changes in the water quality of the Arkansas River near Avondale, Colorado***--Define background water-quality conditions at several sites on the Arkansas River and develop a method to determine if future conditions have changed is significantly as a result of re-operations of Pueblo Reservoir and/or exchanges and transfers of water in the basin.

- ***National Park Service northern and southern Colorado Plateau networks water quality data compilation, collection, and analysis***--Acquire, compile, review, and organize a relational database from available water-quality data associated with Colorado Plateau parks.
- ***Colorado ground-water data collection networks***--Long-term data base of water-level data to assess and predict effects caused by natural climatic variations and human-induced stresses, to document change in ground-water storage over time, and to provide an historical baseline to which data collected in future aquifer studies can be compared and evaluated.
- ***Colorado surface-water data collection networks***--Collect surface-water data sufficient to satisfy needs for uses such as assessment of water resources, operation of reservoirs or industries, forecasting and flood warning, disposal of wasters and pollution, controls, discharge data to accompany water-quality measurements, compact and legal requirement, and research studies.
- ***Colorado water-quality data collection networks***--Characterize surface- and ground-water quality at selected locations statewide.
- ***Colorado fluvial sediment data collection networks***--Provide data to national database for use in Federal, State, and local programs.
- ***Colorado precipitation data-collection networks***--Monitor precipitation quantity and quality on a nationally consistent basis using NADP/NTN guidelines.
- ***Water, energy, and biogeochemical budgets: Loch Vale***--Understand fundamental hydrologic processes that control the flux of water, energy, chemicals, and sediment in the alpine/subalpine environment.
- ***Summary of water-quality monitoring results for the Upper Gunnison River Basin***--Provide timely analysis of water-quality data collected in the Upper Gunnison River basin to provide a perspective of current data with respect to historic information, purposes of data collection, instream standards, and other local issues such as land-use change.
- ***Colorado River Basin salinity trends***--Delineate factors might be causing salinity changes in the Colorado River Basin upstream from Lake Powell and estimate salinity changes caused by salinity-controlled projects.
- ***Upper Colorado River detailed salinity and selenium model***--Create a statistical model for estimating selenium and salinity loading.
- ***Sediment and habitat monitoring and evaluation program: Gunnison River, Green River, and Colorado River***--Provide information with which to evaluate changes in the magnitude, timing, and size distribution of sediment delivery to the river systems and their potential effects on the riverine ecosystem, specifically as they relate to recovery of the endangered fishes.
- ***Watershed water-quality web sites***--Water-quality information will be presented on the Watershed Web page through an interactive internet-map-serving-software interface.
- ***Grand Valley deep percolation***--Quantify changes in water use and associated amounts of deep percolation where agricultural land has been converted to suburban use; evaluate how salt-loading is affected by changes in deep percolation associated with residential development of agricultural lands; accumulate pond-seepage data for the Grand Valley.
- ***Selenium occurrence in ground water of the Tollgate Creek watershed, Aurora, Colorado***--Characterize occurrence of selenium in bedrock and ground water in and around the Tollgate Creek watershed.
- ***Simulated effects of water quality in Pueblo Reservoir using 2D water-quality model***--Simulate potential changes in hydrodynamic and water-quality conditions of Pueblo Reservoir.
- ***McElmo Creek region salinity loading***--Quantify improvements in water-use efficiency associated with salinity-control projects, verify salinity reductions claimed, and determine nature and human-induced sources of salinity.
- ***Piceance Basin regional monitoring plan***--Develop with BLM a practical approach to integrated monitoring related to energy development that capitalizes on existing monitoring programs and available data and information.
- ***Evaluation of SNODAS***--Evaluate the accuracy of the National Weather Service's Snow Data Assimilation System (SNODAS) model.
- ***Regional streamflow equations***--Develop regionalized regression equations for the estimation of streamflow characteristic in ungaged watershed in Colorado.
- ***Hubbard Creek gain loss***--Determine streamflow gain and loss characteristic of Hubbard Creek under intermediate-flow and low-flow conditions in the vicinity of the Bowie mine expansion in the Hubbard Creek drainage area.
- ***Snowmelt timing***--Document recent tends in snowmelt and runoff timing in Colorado and quantity how these parameters are affected by changing climate.
- ***Deep-percolation recharge in the Central Colorado Water Conservancy District***--Improve understanding of deep-percolation return flow and aquifer recharge beneath irrigated fields and provide scientific data useful to irrigation management and water administration in the tributary hydrologic system.

- ***Water-level monitoring, High Plains aquifer***--Monitor and assess water levels in the High Plains aquifer and provide the data, analysis results, and other information to the public and to Congress.
- ***Watershed-scale assessment of salinity loads in the Upper Colorado River Basin***--Calibrate a SPARROW model to better understand and estimate the sources, transport, and accumulation of dissolved solids load throughout the Upper Colorado River Basin.
- ***Regional regression equations for streamflow***--Re-compute regionalized streamflow equations for Colorado based on additional data, new sites, and improved methods of determining independent variables.
- ***Sources of metal loading to the Lake Fork from Turquoise Lake to the confluence with the Arkansas River***--Conduct a low-flow synoptic sampling study along the Lake Fork between Sugarloaf dam and the confluence with the Arkansas River; assess relation between Turquoise Lake levels and mine tunnel flow; conduct baseline water quality assessment and construct a groundwater flow model for decision making for construction of a bulkhead in the Dinero Mine drainage tunnel.
- ***Evaluation of base flow in selected stream reaches of the South Platte and Arkansas River Basins, Colorado***--Evaluate three base flow estimation methods in selected regulated mainstem reaches of the South Platte River in Colorado.

CO Cooperative Fish and Wildlife Research Unit

- Lynx project
- Bighorn sheep in Rocky Mountain National Park
- Design and analysis for evaluation of human impacts on Trust Species of the US FWS
- Shortgrass prairie avifauna
- Effects of off-highway vehicles on the flat-tailed horned lizard and improvements in lizard density estimation
- TAM (Triactinomyxon) filtration studies project
- Spatial and temporal dynamics of prion disease in wildlife: responses to changing land uses project
- What is whirling disease?
- Genetic diversity of humpback chub (*Gila cypha*) within the Colorado River ecosystem
- Northern pike/trout interactions in Colorado trout lakes
- Isotopic, elemental, and bioenergetics studies: application of isotopic and elemental techniques to identify provenance of fishes and to facilitate bioenergetics projections of food-web impacts of piscivores in rivers and reservoirs
- Isotopic and elemental studies: forensic application of isotopic and elemental techniques to identify hatchery of origin of at-large trout
- Abundance and relative dominance of various *T. tubifex* lineages
- Spatial distribution of Rocky Mountain sandhill cranes in response to habitat conditions during the annual cycle

ILLINOIS

- ***Long Term Monitoring of the Upper Mississippi River System (UMRS)***--The Long Term Resource Monitoring Program (LTRMP) is a multi-agency cooperative program whose partners include the U.S. Army Corps of Engineers, U.S. Geological Survey, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Upper Mississippi River System (UMRS), which covers the Mississippi River from Cairo, Illinois to Minneapolis, MN, and the entire length of the Illinois River. The objectives of this program are to: (1) Develop and maintain a long term database on ecological conditions within the UMRS; (2) Determine the effects of navigation and the infrastructure required for navigation on the ecological structure and function of the UMRS; (3) Provide decision makers with information and tools needed to manage the UMRS as a viable large river ecosystem while maintaining its value as a transportation corridor.
  Four LTRMP field stations collect detailed aquatic data in Illinois waters. The field stations work on a variety of projects supervised and administered by USGS. Their long term monitoring projects include; collecting data on water quality, fisheries, aquatic vegetation, and macroinvertebrates.
- ***UMESC Investigation of waterforwl die-off on the Upper Mississippi River System: Monitoring of the exotic Bithynia tentaculata, faucet snail***--The faucet snail (*Bithynia* spp.) is an invasive species that often harbors a parasite that can be lethal to waterfowl. During the last few years, thousands of waterbirds, primarily coots and scaup have died in the Upper Mississippi River National Wildlife and Fish Refuge from this parasite. To monitor the spread of *Bithynia*, vegetation samples collected by the LTRMP in Pools 8 and 13 in 2007 were inspected for

snails. All snails collected were identified and analyzed by the National Wildlife Health Center in Madison, Wisconsin. The results were then analyzed by UMESC staff to determine the primary locations where infected snails occurred. This project is a joint effort among LTRMP, USGS, the Upper Mississippi River National Wildlife and Fish Refuge, and the University of Wisconsin-La Crosse. Plans to continue this research using different sampling techniques are scheduled for FY 2008.

- ***Application of wind fetch and wave models for Habitat Rehabilitation and Enhancement Projects--***Computer models originally developed by USGS in Santa Cruz were updated for conditions on the Mississippi River System, to support the design of Habitat Rehabilitation and Enhancement Projects (HREP). The models aid HREP planners with their designs for HREPs, by providing them with a means to test the affects proposed island configurations would have on wind generated waves.
- ***Factors limiting the distribution and abundance of freshwater mussels in large rivers***
  River productivity team projects – UMESC--The River Productivity Team (RPT) evaluates those key factors controlling river productivity, enhancing river ecosystem and human health, and understands the ecosystem services provided by the river-floodplain in an unbiased manner. New and emerging threats (e.g., excess nutrients, invasive species, over-harvest, habitat destruction) are of increasing concern and require a large, integrated approach to develop solutions to these complex insults.
- ***Brewster Creek Dam Removal***--Develop criteria on sediment delivery and hydraulic conveyance for the gradual removal of dams in Illinois as a dam is removed slowly on Brewster Creek, Illinois. Advance the knowledge and understanding of sediment and hydraulic processes involved with dam removal in Illinois, and potentially for broader application in similar watersheds in the Midwest.
- ***Rasmussen Lake Dam removal***--Analyze sediment delivery and geomorphic response before, during, and after the removal of the dam on Rasmussen Lake and Old Mill Creek in Ethel's Woods Forest Preserve, Lake County, Illinois. Track changes in sediment transport and geomorphic response that are not well known when removing dams in northeastern Illinois.
- ***Kishwaukee River Fish Passage Study***--To complete a hydraulic model and sediment transport model to predict sediment movement and streambed stability for four fish-passage dam modifications in a 2.5-mile reach of the Kishwaukee River. Belvidere Dam is the only major obstruction to fish passage along the North Branch of the Kishwaukee River.
- ***Peoria Illinois River Bacteria Study***--The Illinois River is a large river system and as such has complicated hydrologic, hydraulic, and kinetic controls on water quality-bacteria processes Evaluate sources and loads of fecal coliform bacteria to the Illinois River between Hennepin, Illinois and the outlet of lower Peoria Lake at Peoria. Produce a calibrated model of streamflow and fecal coliform bacteria transport within the study reach. Determine what impact combined sewer overflows have on the water quality of the Illinois River and Peoria Lake, and provide information that can be used for future TMDL analyses within this reach of the Illinois River.
- ***Lake County Wetlands***--The wetland complex at the Lake County Forest Preserve District's Spring Creek Forest Preserve and the adjoining Illinois Beach State Park along the shore of Lake Michigan in Lake County, northeastern Illinois is experiencing changes in the floral community. This investigation will determine the effects of urban runoff on the floral community in wetlands at the Illinois Beach State Park as well as to determine the effects of the wetland complex on modifying water quality and sediment loads to Lake Michigan.
- ***Northern Illinois Stream Restoration***--Minimal high flow events had occurred between the installation of many restoration projects in 2003-04. In the summer of 2007, extreme floods in Northern Illinois tested the viability of many of these projects. Members of USGS have visited a number of newer 319 stream projects along the Fox River. While most have remained stable, approximately 10-15 percent of the sites have major damages. Since major floods are not a frequent occurrence, a rapid assessment of stream restoration projects will be developed.
- ***Otter Lake BMP Evaluation***--Otter Lake, Illinois, is a public water supply lake which also supports recreational uses such as fishing and boating. This study is designed to assess the effectiveness of the low-flow dam as a best management practice to reduce non-point source inputs to the main body of Otter Lake. The determination of sediment and nutrient transport in small, flashy Midwestern streams can aid in the development of nutrient standards, sedimentation control, and monitoring ability throughout the region.
- ***Stream and Wetland Assessment Bloomington***--Assess sediment transport disposition through the naturalized stream reaches. Document construction and erosion control activities in a new residential development throughout the development process. Evaluate the effectiveness of reducing runoff, and nutrient and sediment loads from the residential areas by routing flow through constructed wetlands. Determine the annual minimum dissolved oxygen levels by collecting continuous dissolved oxygen data at the downstream extent of the study area.

- ***Wetlands Protocols Coordination***--Develop wetland sampling protocols and a wetland monitoring and assessment program for the State of Illinois. Once fully implemented, the protocols and monitoring program will yield comprehensive data and information which can be used to 1) provide accurate assessments of the State's wetland resources, 2) determine the functional uses of wetlands and the extent to which these designated uses are being met, and 3) identify of the causes for impairment and impediments to meeting full use attainment of the wetland resources.

INDIANA

- ***Bat scat: using genetic tools to obtain information about the biology of summer-roosting Indiana bats***—Study examines whether demographic and relatedness information can be gathered using molecular techniques from non-invasively collected samples, such as fecal pellets. A pilot study has shown that DNA can successfully be extracted from single Indiana bat fecal pellets collected from underneath roost trees. Additionally, the scientists have isolated and developed primers for a suite of highly polymorphic microsatellite loci that can be used not only for unique identification of Indiana bats, but also for population genetics work and studies of relatedness. Investigators use these newly developed techniques and primers to gather a variety of data regarding Indiana bats—including information about social structure, demographics, and population structure.
- ***Mercury in precipitation***--Operate a network to monitor mercury in precipitation in Indiana, interpret, and report the data.
- ***IDEM SW mercury***--Collect samples of surface water on a quarterly schedule at 24 sampling locations in Indiana; data will be combined with mercury concentration data collected in 2002-2003 by IDEM; explore the relation between mercury concentrations and loads from atmospheric deposition and concentrations and loads of mercury in surface water in Indiana.
- ***Biological assessment, Marion County***—Collect sediment, fish, and benthic invertebrate samples at 13 locations on the White River and tributaries in Marion County (Indianapolis), IN to support the Dept. of Public Works effects to mitigate water-quality issues related to combined sewer overflows and to document effects of upgrades to wastewater treatment. Invertebrate samples are collected in the spring and fall. Sediment and fish samples are collected in alternating years.
- ***Algal biomass studies***—Collect and analyze samples for chlorophyll a (periphyton and seston), ash-free dry mass, and particulate organic carbon to augment nutrient data collected by the IN Dept. of Environmental Management and provide data and interpretations to support establishment of nutrient criteria for Indiana. Sampling has been completed in all major river basins in the state with the exception of the Patoka River. Samples are collected during spring, summer, and fall and interpretation includes regression analyses of the algal biomass nutrient, and environmental data and comparison of results with seasonal values published by the USEPA.
- ***Relation of diurnal dissolved oxygen fluctuation with nutrients, chlorophyll a, and biological communities***—This regional study is designed to investigate dissolved oxygen (DO) daily fluctuation (daily maximum DO minus DO) in relation to chlorophyll a in a nutrient-rich landscape. Sampling was completed at 6 or more locations in the six states within USEPA Region 5. Dissolved oxygen concentrations were monitored continuously for 1 week during the study.
- ***Ground water/surface water interactions near wetlands***—Establish a monitoring network to define directions of ground- and surface-water flow in the vicinity of a reconstructed wetland at the Indiana Dunes National Seashore. Collect and interpret data to determine effects of elevated surface water levels in wetland on ground water levels and flow directions beneath adjacent properties.

IOWA

- ***Integrating agriculture and conservation***—In cooperation with the USDA Farm Services Agency, FWS, Iowa Dept of Natural Resources, and Iowa Dept of Agriculture and Land Stewardship, researchers are investigating the environmental benefits of Conservation Reserve Enhancement Program (CREP) wetlands in Iowa. This long-term study will model potential nitrogen reduction, hydrological storage, and responses of wildlife species other than migratory birds, and assess vegetation communities in existing Iowa CREP projects. Results will indicate whether conservation policies and viable economic uses are complementary on agricultural lands.
- ***Long Term Monitoring of the Upper Mississippi River System (UMRS)--***The Long Term Resource Monitoring Program (LTRMP) is a multi-agency cooperative program whose partners include the U.S. Army Corps of

Engineers, U.S. Geological Survey, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Upper Mississippi River System (UMRS), which covers the Mississippi River from Cairo, Illinois to Minneapolis, MN, and the entire length of the Illinois River. The objectives of this program are to: (1) Develop and maintain a long term database on ecological conditions within the UMRS. (2) Determine the effects of navigation and the infrastructure required for navigation on the ecological structure and function of the UMRS. (3) Provide decision makers with information and tools needed to manage the UMRS as a viable large river ecosystem while maintaining its value as a transportation corridor.

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- ***Factors limiting the distribution and abundance of freshwater mussels in large rivers***
- ***River productivity team projects – UMESC--***The River Productivity Team (RPT) evaluates those key factors controlling river productivity, enhancing river ecosystem and human health, and understands the ecosystem services provided by the river-floodplain in an unbiased manner. New and emerging threats (e.g., excess nutrients, invasive species, over-harvest, habitat destruction) are of increasing concern and require a large, integrated approach to develop solutions to these complex insults.
- ***Cedar River alluvial wellfield*****--**Determine source of water to the alluvial aquifer and its recharge sources; determine pre- and post-development recharge to the aquifer; characterize the water quality of the aquifer and its recharge sources.
- ***Ground water quality monitoring in Iowa*****--**Provide consistent and representative groundwater quality data that describes chemical quality of groundwater resources in Iowa.
- ***National Trends Network*****--**Iowa stations are part of the NADP/NTN (National Atmospheric deposition Program/National Trends Network) program to provide a regional to national overview of chemical composition of atmospheric deposition.
- ***Emerging Contaminants Project*****--**Provide information on these compounds for evaluation of their potential threat to environmental and human health. To accomplish this goal, the research activities of this project are to: (1) develop analytical methods, (2) determine the environmental occurrence, (3) characterize the myriad of sources, (4) define and quantify processes that determine their transport and fate, and (5) identify potential ecologic effects.
- ***Measuring Organic Wastewater Contaminants in Iowa's Streams***--Determine the types and quantities of OWCs from urban areas. To accomplish this, 10 major urban centers were selected by the IDNR Geological Survey Bureau based on their city monitoring program. Samples were taken upstream and downstream of the selected urban centers to determine the potential contribution these cities have on OWC concentrations to streams.
- ***Agricultural Chemical Transport Study - Stream discharge and stream water quality stream*****--**Discharge and selected water-quality constituents are monitored at a near real-time basis at two sites in the South Fork Iowa River Watershed to allow for better understanding of the relation between stream discharge and stream quality. Data collected from site SF305 (South Fork near Blairsburg, IA) will provide data from the headwaters of the stream. Data collected from a site SF450 (Iowa River northwest of New Providence, IA) will help document effects of runoff from a larger watershed and assist in the understanding of the transport and behavior of natural and agricultural chemicals through the watershed.

IA Cooperative Fish and Wildlife Research Unit

- Physical habitat component of the Iowa REMAP Program
- Radio-telemetry investigation of common carp in Clear Lake, Iowa

- Relationships of fish communities and availability of deep-water habitat
- An integrated immunological-GIS approach for bio-monitoring of ecological impacts of swine manure pollutants in streams
- Development of harvest strategies for mourning doves
- Development and evaluation of methods for regional monitoring of mourning dove recruitment
- Amphibian malformation and disease in Midwestern landscapes
- Bird response to enhanced vegetation diversity in the Spring Run complex of NW Iowa

KANSAS

- ***Integrating agriculture and conservation***—FORT assistance to the USDA Farm Services Agency remains focused on refining management of lands enrolled in the Conservation Reserve program and other USDA-administered conservation programs. Collaborating with the Kansas Dept of Wildlife and Parks, field data collection was completed in FY07 for a 2-year study to determine effects of incidental cattle grazing on linear conservation practices associated with winter grazing in fields of crop stubble.
- ***Lesser prairie-chicken***—Using mitochondrial DNA sequence and nuclear microsatellite analyses on 3 Kansas populations of Lesser Prairie-Chicken, this study examines whether genetic diversity within individual populations is sufficient to maintain them. The results will help managers determine the best conservation practices for these birds at local and regional levels.
- ***Tri-State Model***--Construct and calibrate a groundwater flow model to simulate groundwater flow within the Ozark and Springfield Plateau aquifers; describe effects to future groundwater levels from various pumping scenarios; evaluate flow paths to large withdrawal wells and well fields; develop optimization model of sustainable yield; define and assess the current water quality conditions in the Springfield and Ozark aquifers.
- ***Water use***--Maintain a database of Kansas water-use information.
- ***Wichita ground-water pits***--Characterize the existing surface- and ground-water quality at selected sand and gravel pits with different amounts of urbanization in the vicinity of the Arkansas River and the Big Slough Creek basin near Wichita.
- ***Water level monitoring, High Plains aquifer***--Monitor and assess water levels in the High Plains aquifer, and provide the data, analyses, results and other information to the public and Congress.

KS Cooperative Fish and Wildlife Research Unit

- Range and training land assessment on Fort Riley (RTLA)
- Assessment of elk habitat use, population dynamics, and genetic variability at Fort Riley Military Reservation, Kansas
- Behavioral ecology of grasshopper mice and deer mice
- Status and distribution of black-tailed prairie dogs on small cultural national parks in the western Great Plains
- Landscape genetics of deer and the potential spread of CWD in Kansas: a pilot study to examine deer density and hunting pressure as factors
- Biogeography and molecular epidemiology of the PRNP gene in Kansas
- Variation in small mammal community structure in tallgrass prairie ecosystems in response to disturbance from military vehicle training
- Vegetation and small mammal community response to military track vehicle disturbance at Smoky Hills Air National Guard Bombing Range, Kansas
- Occupancy and interspecies relationships of river otters in eastern Kansas
- Deer density, movement patterns, and group dynamics on Quivira National Wildlife Refuge: assessing potential risk for disease transmission
- Impacts of road crossings on prairie stream fishes
- Evaluation of sampling methods and habitat use of Missouri River fishes
- Effects of anthropogenic disturbance of fish community and food web structure in a Great Plains river
- Recruitment of fishes in the Kansas River
- Effects of zebra mussels on reservoir aquatic communities
- Long-term monitoring of Kansas River fishes

KENTUCKY

- ***Emerging contaminant reconnaissance***—According to research conducted by USGS, the ability of environmental contaminants to affect reproductive and developmental processes in fish and wildlife species has long been known. An increasingly persuasive body of evidence indicates that many of these contaminants may be causing such effects through interference and disruption of normal endocrine function. Field observations have correlated abnormal sex organ morphology, unusual sex hormone levels and ratios, and altered physiological and biochemical processes with exposure to environmental contaminants. Many of these endocrine-disrupting compounds are found in the effluent from animal feeding operations, wastewater treatment facilities, and/or other areas with large populations using prescription drugs, hormones, and other compounds. The objective of this study is to target smaller streams located within central Kentucky (from Lexington to Louisville) with known, potential sources of pharmaceuticals and hormones discharging within the watershed to assess the magnitude of any threats to human health through these potential endocrine disrupting compounds. These sample locations will possibly include, but not be limited to, stream reaches located downstream from wastewater treatment facilities, animal feeding operations, agricultural areas using waste products as fertilizer, and/or larger developed areas. This synoptic study will have limited quality control (blank samples, duplicates) and is intended to identify areas of potential risk and direct future study design.
- ***Estimates of flow duration in Kentucky streams***—Water resource managers, planners, and regulators need reliable, accurate streamflow statistics. Information is needed at ungaged locations for management, planning, and regulatory purposes. Statistics such as peak flows, mean annual flows, and low flows can be calculated using regression and other methods. Additional information needed to describe flow regimes, construct load duration curves for non point source pollutants, and characterize pollutant sources would be beneficial, especially to those involved in the development of Total Maximum Daily Loads (TMDLs) for streams. One method for providing this information is through calculation of the flow duration curve, which specifies the percentage of time that a particular flow is equaled or exceeded using daily discharges. Flow duration curves can be used to calculate load duration curves for non point source pollutants, which can assist in the TMDL development process.
- ***Floyds Fork TMDL***—The Kentucky Water Science Center will provide data and modeling analysis to assist in the development of a pathogen Total Means Daily Load (TMDL) for the Floyds Fork Watershed Basin. Program objectives include collecting nutrient and suspended sediment data in the Floyds Fork watershed to provide a basis for improved SPARROW modeling and to calibrate existing statewide SPARROW nutrient models and develop a statewide sediment SPARROW model using site-specific nutrient and sediment data.
- ***Karst hydrology initiative***—Multidisciplinary investigation to collect and synthesize regional karst hydrogeologic systems using GIS methods; map and characterize karst features in major karst settings; and develop new or improved methods to achieve better understanding of conduit-dominated karst hydrology, with special emphasis on water budgets and recharge processes. Project activities are focused on the major karst hydrogeologic settings and aquifers within the Interior Low Plateaus region, encompassing 69,000 sq mi and including parts of Alabama, Indiana, Kentucky, and Tennessee. Major karst aquifers occur in 7 distinct hydrogeologic settings and developed in Mississippian aged limestones; subregional karst aquifers are developed in Lower-Middle Ordovician limestones.
- ***Ohio River alluvial aquifer***—In cooperation with the Louisville Water Company, USGS collected groundwater level and quality data and provides analysis involving stream aquifer interaction along the Ohio River. This will aid the Louisville Power Co. in developing and installing a well-infiltration system along the Ohio River.
- ***Pennyroyal nutrients***—Additional nutrient data is required to adequately evaluate the cause-response relations with nutrient concentrations and diatom/macroinvertebrate community structure in the Pennyroyal bioregion. Nutrient samples from 20 wadable streams (where nutrient data deficiencies exist) will be used to assess the relation between nutrient concentrations and the biological community structure in the ecoregion. Parameters to be collected include total phosphorous, total Kjeldahl nitrogen, ammonia, and nitrate/nitrate. Samples will be collected during ambient and low-flow conditions; at least one sample will be collected during wet weather. Flow measurements will be made 2-3 times at selected sites during high- and low-flow.
- ***Sediment laboratory***—The lab performs suspended sediment concentrations and suspended sediment sand/fine breaks analyses for USGS. Analyses can be used to estimate silt transportation and deposition in streams, rivers, and reservoirs. See “Quality Assurance Plan for the analysis of fluvial sediment by the northeastern region, Kentucky District Sediment Lab”, USGS OFR 2005-1230 (available as PDF).
- ***Source water assessment***—The Safe Drinking Water Act amendments of 1996 require that each state prepare a source water assessment program for all public water supplies. This project will provide the Texas Commission on Environmental Quality (TCEQ) Water Utilities Division staff with GIS and other databases and software tools capable of

assessing 17,000 public supply wells and 550 public supply surface water intakes, and assists TCEQ in conducting assessments for these water supplies.

- ***Survey of abandoned oil and gas wells*—Ft. Knox—**Abandoned and unrecorded wells may act as conduits for the contamination of groundwater supplies by oil and gas field brines and other pollutants. Casings eventually develop leaks which, if not properly plugged, can allow pollutants to reach freshwater aquifers that supply drinking water. Such is the case in the Fort Know well field near West Point, KY. Abandoned oil and gas wells provide a route for deep formation brines to migrate upward into the shallow alluvial deposits and contaminate the water table aquifer. Many Fort Knox drinking water supply wells have chloride concentrations in excess of maximum contaminant levels of 250 mg/l with some as high as 800 mg/l.

MICHIGAN

- ***Spatial and temporal effects of climate change on Great Lakes wetlands***--Use past responses of wetland plant communities to relate to current climate conditions and use as a predictor of future responses to climate change.

MINNESOTA

- ***Effects of land set-aside practices on stream quality***--Project is being conducted in cooperation with the Minnesota Board of Soil and Water Resources and the Legislative and Citizens Commission on Minnesota Resources. The effort seeks to evaluate effects of agricultural set-aside (land retirement) practices on water quality and aquatic biological conditions in three streams in the Minnesota River Basin.
- ***Long Term Monitoring of the Upper Mississippi River System (UMRS)--***The Long Term Resource Monitoring Program (LTRMP) is a multi-agency cooperative program whose partners include the U.S. Army Corps of Engineers, U.S. Geological Survey, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Upper Mississippi River System (UMRS), which covers the Mississippi River from Cairo, Illinois to Minneapolis, MN, and the entire length of the Illinois River. The objectives of this program are to: (1) Develop and maintain a long term database on ecological conditions within the UMRS; (2) Determine the effects of navigation and the infrastructure required for navigation on the ecological structure and function of the UMRS; (3) Provide decision makers with information and tools needed to manage the UMRS as a viable large river ecosystem while maintaining its value as a transportation corridor.
  Two LTRMP field stations collect detailed aquatic data in Minnesota waters. The field stations work on a variety of projects supervised and administered by USGS. Their long term monitoring projects include; collecting data on water quality, fisheries, aquatic vegetation, and macroinvertebrates.
- ***UMESC Investigation of waterforwl die-off on the Upper Mississippi River System: Monitoring of the exotic Bithynia tentaculata, faucet snail--***The faucet snail (*Bithynia* spp.) is an invasive species that often harbors a parasite that can be lethal to waterfowl. During the last few years, thousands of waterbirds, primarily coots and scaup have died in the Upper Mississippi River National Wildlife and Fish Refuge from this parasite. To monitor the spread of *Bithynia*, vegetation samples collected by the LTRMP in Pools 8 and 13 in 2007 were inspected for snails. All snails collected were identified and analyzed by the National Wildlife Health Center in Madison, Wisconsin. The results were then analyzed by UMESC staff to determine the primary locations where infected snails occurred. This project is a joint effort among LTRMP, USGS, the Upper Mississippi River National Wildlife and Fish Refuge, and the University of Wisconsin-La Crosse. Plans to continue this research using different sampling techniques are scheduled for FY 2008.
- ***Application of wind fetch and wave models for Habitat Rehabilitation and Enhancement Projects--***Computer models originally developed by USGS in Santa Cruz were updated for conditions on the Mississippi River System, to support the design of Habitat Rehabilitation and Enhancement Projects (HREP). The models aid HREP planners with their designs for HREPs, by providing them with a means to test the affects proposed island configurations would have on wind generated waves.
- ***Determine the effects of food quality on juvenile unionid mussel survival and growth in the St. Croix National Scenic Riverway--***Characterize quality of seston and benthic sediments across a water quality and nutrient gradient; experimentally determine the effects of food quality on growth and survival of juvenile mussels.
- ***Factors limiting the distribution and abundance of freshwater mussels in large rivers***

- ***Demonstration of an approach to assess the impact of emerging contaminants on aquatic invertebrates in national parks: A project for the St. Croix National Scenic Riverway a NRPP project***
- ***River productivity team projects – UMESC--***The River Productivity Team (RPT) evaluates those key factors controlling river productivity, enhancing river ecosystem and human health, and understands the ecosystem services provided by the river-floodplain in an unbiased manner. New and emerging threats (e.g., excess nutrients, invasive species, over-harvest, habitat destruction) are of increasing concern and require a large, integrated approach to develop solutions to these complex insults.
- ***Nutrient-criteria development*--**This project focuses on assisting the Minnesota Pollution Control Agency in documenting relations among nutrients and selected biological response variables such as plankton chlorophyll-a, dissolved oxygen, and aquatic community structure in selected rivers. These relations are important to state water managers in the development of nutrient criteria. Assistance has included analysis of existing data and field sampling. Preliminary analysis indicates a significant relation between average annual chlorophyll-a concentrations and total nitrogen concentrations among all sites.
- ***Glacial ridge hydrology*--**This integrated groundwater and surface water study in northwest Minnesota examines the effects of wetland restoration and drainage ditch abandonment on water quality. A component of mercury sampling in surface water sites has been implemented. The report is currently being used by The Nature Conservancy to make decisions regarding areas of restoration and ditch selection for abandonment.
- ***Suspended sediment monitoring across Minnesota--***A daily sediment site has been operated since 1967 on the Minnesota River. Newly added sites include about a dozen sites sampled during stream gaging trips at various locations throughout the state.
- ***Oxygen flux in EPA-5 streams in Minnesota*--**The study will both benefit from and contribute to an ongoing national-scale USGS study (NAWQA Nutrient Enrichment Effects Topic (NEET)) with a component of this program that began in 2006 in the St. Croix and Upper Mississippi River watersheds. The focus of NEET in the Upper Mississippi River basin is to determine how biological communities and processes respond to varying levels of nutrient enrichment among small agricultural streams from contrasting environmental settings. The NEET project streams are representative of headwater tributaries of both the St. Croix and Mississippi Rivers and supply nutrients and sediments to the river reaches to be included in the proposed study. Comparisons among the NEET sites and mainstem sites will be facilitated through the measurement of identical variables.
- ***Nutrient study of Kabetogama*--**This project is one of a series of projects on borderlands in Voyageurs National Park. The study will collect data to determine whether changes in reservoir operations are affecting algal production (chlorophyll-a) and nutrient enrichment (total phosphorus) in Kabetogama Lake. The study will also estimate nutrient loading to Kabetogama Lake from inflow sources and the potential contribution of nutrients from lake bottom sediment and determine the extent to which algal blooms in Kabetogama are producing microcystin.
- ***Upper Mississippi NAWQA study unit—nutrient synthesis in the Mississippi, Ohio, Red, and Lake Superior watersheds*--**The focus of this study, which is nearly completed, investigates temporal trends in nutrient and suspended sediment loads and concentrations in streams. The objectives are to (1) estimate nutrient loads and trends in annual and seasonal loads, (2) determine annual and seasonal trends in nutrient and suspended sediment loads and concentrations, (3) compile ancillary data on nutrient sources, evaluate and interpret various measures of nutrient sources during the period of record for this study and explain trends in terms of changes of inputs and specific sources, and (4) put results in context of long-term historical records.
- ***Nutrient enrichment effects topic (NEET)*--**NAWQA is assessing the effects of nutrient enrichment (nitrogen and phosphorus) on streams in the Upper Mississippi River Basin as part of this national project to provide consistent data and analyses of nutrient conditions, including how these conditions vary as a result of natural and human-related factors, and how nutrient conditions affect biological communities and ecological processes in streams. The 8 study areas encompass a diversity of agricultural practices. Information from the study will benefit many stakeholders involved in the development of nutrient criteria to protect the aquatic health of streams in different geographic regions.
- ***Nutrient processes—river backwaters*--**This project is in cooperation with National Park Service and UMESC. The investigation evaluates the role nutrient dynamics plays in our understanding of nutrient issues at the St. Croix National Scenic Riverways and the Mississippi National River and Recreation Area. The study focuses on investigating biogeochemical processes affecting nutrient cycling between the river mainstem and backwater, and, at the same time, the study is quantifying biological effects of nutrient enrichment on key indicator taxa and ecological processes. At the St. Croix, small increases in nutrient and sediment loading have caused large observable changes in algal production and water clarity, and protection from additional nutrient enrichment is a high priority.
- ***Nutrient reduction—St. Croix River at Grantsburg*--**Project is in cooperation with the NPS St. Croix National Scenic River Waterway. In 2004, the Interagency St. Croix Basin Water Resources Planning Team developed a goal to reduce

phosphorus loading to Lake St. Croix by 20% by 2020. In 2006, regulatory agencies for Minnesota and Wisconsin signed a formal Nutrient Agreement endorsing the 20% phosphorus reduction goal.

- ***Mississippi River low flow***--Twin Cities metropolitan water supply planning is an ongoing issue. Understanding stream flow in the Mississippi River and its tributaries during drought conditions are keys to understanding water sustainability in the Twin Cities metropolitan area. The primary objectives of this study are to characterize regional low flows in the Mississippi River basin above Anoka and to estimate the likelihood of extremely low flows in the Mississippi River. This study will provide scientific understanding of the potential low-flow characteristics of the Mississippi River to water managers and help understand the effects of climate change and variability on water supplies and regional information that supports U.S. Water Census.
- ***Statewide sediment studies (several projects)***--The general goals are to (1) describe sediment concentrations, loads, and turbidity as a function of streamflow and season at selected stream sites, (2) describe relations between mean cross-sectional suspended sediment concentrations and point measurements of water transparency, and (3) provide training about sediment transport processes and sampling techniques. The MPCA has established a standard for stream water quality based on turbidity, and many streams fail to meet the standard. Relating these standards to general stream water quality if problematic. USGS is using a network of stream-gaging stations to provide a framework for routine monitoring to better understand how various factors affect turbidity and sediment in streams throughout the state.
- ***Determine the effects of food quality on juvenile unionid mussel survival and growth in the St. Croix National Scenic Riverway***--Characterize quality of seston and benthic sediments across a water quality and nutrient gradient; experimentally determine the effects of food quality on growth and survival of juvenile mussels.
- ***Alkphenols (APs) in tributaries***—This study, in partnership with MPCA, quantifies the occurrence and persistence of APs and other endocrine disruptors in water and streambed sediment downstream of wastewater treatment plant discharges. Following a multi-tiered approach that expands upon previous studies, we (1) determine the fate (persistence and partitioning) of targeted compounds in three streams receiving wastewater treatment plant effluent discharge, and (2) determine temporal variability at selected streams.
- ***Emerging contaminants: lake and stream sediments***—This study, in partnership with MPCA, quantifies the occurrence and persistence of emerging contaminants in lake and stream sediments throughout the state. Following an approach that expands upon previous studies, the study will determine the fate (persistence and partitioning) of targeted compounds in sediment and determine temporal variability at selected locations.
- ***NAWQA Synthesis—mercury bioaccumulation topical study***—The objective of the NAWQA Mercury Bioaccumulation topical study, led by Mark Brigham, is to determine dominant factors influencing delivery of total mercury and methylmercury to streams and bioaccululation of methylmercury in lotic ecosystems. Source strength and type, various biogeochemical transformations, and food-web interactions (food-web complexity) all interact to determine mercury levels in fish. The study describes processes that predominate in two contrasting stream ecosystems—one in the Adirondacks in New York and one in the Atlantic Coastal Plain in South Carolina.
- ***St. Croix River emerging contaminants***—The goal of this study is to demonstrate an approach to assess effects of emerging contaminants on aquatic invertebrates in national parks. The occurrence of selected pharmaceuticals and personal care products (PPCPs) will be determined in river water and in bottom sediment near Taylors Falls, MN (exposed site) and near Wild River State park (control site). Controlled life-cycle toxicity studies will be conducted with a representative aquatic invertebrate organism (*Daphnia*) to estimate the chronic toxicity of selected PPCPs. Methodology will be developed to conduct chronic laboratory toxicity trials with juvenile mussels. If feasible, controlled exposure studies with juvenile mussels will be conducted to estimate chronic toxicity of selected PPCPs occurring in waters of the riverway.
- ***Effects of biofuels production on water quality, Cedar Creek site***—Spreading liquid manure on agricultural fields is a routine way of disposing of animal feedlot wastes and providing a nutrient source for crops. This liquid manure is known to contain veterinary pharmaceutical compounds. Runoff from these fields, as well as from the animal feedlots, has been a concern for human and environmental health. The use of diverse prairie buffers along these types of agricultural fields may help to reduce contamination of ground- and surface-water resources. Recent research also indicates that prairies offer an efficient feasible biofuel source. USGS research is directed toward evaluating the fate and transport of veterinary pharmaceutical compounds and nutrients applied to the selected plant communities of prairie grasses, corn, and hay in relation to ground-water quality.

MN Cooperative Fish and Wildlife Research Unit

- Fall movements, habitat use, and survival of the American woodcock in the western Great Lakes region
- Home range and habitat use of breeding northern goshawks in north-central Minnesota
- Geographical information systems techniques to channel slope delineation in Minnesota
- Mortality of walleye caught in live-release tournaments: assessment, reduction, and determination of acceptable levels

- Effects of riparian forest harvest on instream habitat and fish and invertebrate communities
- Stream classification for TMDL assessment using a dimensionless, reference reach approach
- Biodiversity conflict management: land-use policies in island landscapes, a state-level comparison
- Interactions between native and non-native species: consequences of a brown trout introduction on a coldwater stream community

MISSOURI

- ***River and stream ecosystems: ecology and restoration***--Investigate ecology and life history of important river and stream biota; investigate river corridor habitat dynamics; develop a decision support system for the Missouri River in partnership with stakeholders.
- ***Effects of global change on shorebird migration***—Studying how climate change might affect the network of Central Flyway wetland stopover sites and the sensitivity of migratory birds to such changes. This information will help land and resource managers identify priorities on a regional scale to ensure an adequate network of high-quality sites, a central feature of the U.S. Shorebird Conservation Plan.
- ***Shorebird management on National Wildlife Refuges***—Measuring turnover rates (length of stay) at migration stopover sites for the 30 species of shorebirds that migrate across the Great Plains and combining these data with periodic census data from different sites throughout the region to generate more accurate population estimates. Length of stay data is an urgent need of the U.S. Shorebird Conservation and North American Waterfowl Management Plans and will help wildlife refuge managers in Missouri and elsewhere identify actions to enhance conservation efforts locally and throughout the Western Hemisphere.
- ***Long Term Monitoring of the Upper Mississippi River System (UMRS)--***The Long Term Resource Monitoring Program (LTRMP) is a multi-agency cooperative program whose partners include the U.S. Army Corps of Engineers, U.S. Geological Survey, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Upper Mississippi River System (UMRS), which covers the Mississippi River from Cairo, Illinois to Minneapolis, MN, and the entire length of the Illinois River. The objectives of this program are to: (1) Develop and maintain a long term database on ecological conditions within the UMRS; (2) Determine the effects of navigation and the infrastructure required for navigation on the ecological structure and function of the UMR; (3) Provide decision makers with information and tools needed to manage the UMR as a viable large river ecosystem while maintaining its value as a transportation corridor.
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- ***Tri-State Model***--Construct and calibrate a groundwater flow model to simulate groundwater flow within the Ozark and Springfield Plateau aquifers; describe effects to future groundwater levels resulting from various pumping scenarios; evaluate flow paths to selected large withdrawal wells and well fields; develop optimization model to provide estimates of sustainable yield; define and assess water quality conditions.
- ***NASQAN***--Provide a national bank of water quality data for broad federal planning and action program and to provide data for federal management of interstate and international waters.
- ***Greene County groundwater***--Compile and collect water use, water level, and streamflow data necessary to construct and calibrate a groundwater flow model; develop model that incorporates streamflow, groundwater, flow and well pumpage in the Springfield Plateau and Ozark aquifers; determine potential effects of continued groundwater withdrawals on water levels in the Ozark aquifer.

- ***PMRNRD QW/GW analysis, 1992-2009 and sampling 2008-2009***--Water quality monitoring and water level monitoring in the Papio-Missouri River Natural Resources District (PMRNRD).
- ***Missouri River geologic framework***--Provide digital georeferenced geologic mapping of prioritized areas and reaches of the Missouri River corridor.

MO Cooperative Fish and Wildlife Research Unit

- Paddlefish ecology in the lower Osage River
- Using amphibians to measure Wetland Reserve Program restoration efforts
- Evaluating a passage facility by Missouri River fishes for spawning in floodplain wetlands
- Using historical conditions to facilitate ecological improvement along the Missouri River
- Relating Missouri River sandbar morphology in relation to Missouri River flows: implications for selected biota
- Use of main channel and shallow water habitat by larval fishes in the lower Missouri River
- A fish IBI system for Missouri streams
- Secondary production of 3 species of crayfish important to stream ecosystems
- Landscape factors controlling sediment in streams
- Landscape influences on smallmouth bass populations in Missouri streams
- Effects of PL-566 projects on ecological integrity of Missouri stream system
- Developing biomonitoring protocols for the Ozark National Scenic Riverways (NPS): tributaries and springs
- Flathead and blue catfish use of the Lower Missouri River and tributaries
- Invasive crayfish species: Can their spread be halted?

NEBRASKA

- ***Water level monitoring, High Plains aquifer***--Monitor and assess water levels in the High Plains aquifer and provide data, analyses, results and other information to the public and Congress.
- ***Sampling and analysis of the ground-water quality in east-central Saunders, Nebraska***--Determine if detectable concentration of VOCs or explosives are present in the Platte River alluvial aquifer near the new well field.
- ***Evaluation of streamflow characteristics at selected gages as related to instream flows in the Elkhorn River, Salt Creek, and Lower Platte River basins, eastern Nebraska***--Focusing on the availability of ground-water resources, the effect of anthropogenic stresses on the availability and quality of the ground-water resource, and the interaction of ground- and surface-water in the Elkhorn River Basin.
- ***Water consumption of Central Platte River riparian vegetation***--Quantify water consumption rates of riparian grasslands and woodlands along the Platte River; compare water consumption rates to understand how natural riparian vegetation cover influences water availability; identify critical depths to water below which vegetation does not directly utilize ground water as a source.
- ***Nuclear magnetic resonance—Central Platte River***--USE MRS in conjunction with ground-truthing to provide more accurate hydrogeologic parameter estimates for use in ground-water models.
- ***Pollution and economic decision support tool for impaired watershed management***--Assessment of BMPs and SWCPs farming system on watershed pollution and economic return.
- ***Heliborne electromagnetic surveys within the North Platte River and Lodgepole Creek Valleys, western Nebraska***--Identify and define underground supplies of drinking water in the North and South Platte Basins; provide new groundwater models; estimate amount of groundwater in storage; improve the ability to prevent and mitigate water contamination; enhance geologic maps.
- ***Aquatic assessments for the Nation's Rivers and Streams Assessment***—50 sites in Nebraska, including fish community and habitat assessment.
- ***NAWQA low intensity site***—Maple Creek at Nickerson. Work will include fish, algae and macro-invertebrate community assessment and habitat assessment.
- ***Platte River Ecosystem***--To understand the dynamics of this complex ecosystem and the relationship between physical and biological systems in order to provide better information to land managers.

NE Cooperative Fish and Wildlife Research Unit

- Amphibian monitoring techniques—Rainwater Basin region
- Assessing local and regional variability in productivity and fidelity of grassland birds on National Park Service units in the Great Plains

- Cross-scale structure in ecosystems
- Diversity and ecological functions
- Evaluation of landowner incentives
- Impact of white perch on walleye
- Predators of white perch at Branched Oak and Pawnee Reservoirs
- Monitoring, mapping, and risk assessment for non-indigenous invasive species in Nebraska
- Population assessment of channel catfish in Nebraska
- Productivity and biology of ducks nesting in the Sandhills of Nebraska
- Recruitment of walleye and white bass in irrigation reservoirs
- Resilience in ecosystems
- River otter home range and habitats use pilot study
- Spatial risk assessment of invasive species impacts on native species in Nebraska
- Understanding invasions and extinctions

NORTH DAKOTA

- ***Development of adaptive land management models and practices for Federal lands*****--**Design an applied research program to increase understanding of functions and processes that influence plant community composition and structure; develop tools (predictive models, decision support systems) to assist federal land managers in developing restoration and management strategies.
- ***Wetlands modeling (COOP)*****--**Develop a better understanding of the relations that wetlands and land use have with the hydrology of the Red River basin.
- ***Impact of DOI activities on carbon sequestration and greenhouse gas emissions of natural and restored wetlands in the Prairie Potholes Region and the Lower Mississippi River Valley*****--**Quantify carbon storage and GHG flux in restored, native, and farmed wetlands in the PPR.

SD Cooperative Fish and Wildlife Research Unit

- Status of selected fishes with immediate conservation need in North Dakota

OHIO

- ***2 reports using NAWQA data from major river basins (upper Midwest to Ohio)***—(1) "Evaluation of aquatic biota in relation to environmental characteristics measured at multiple scales in agricultural streams of the Midwestern United States" focuses on the biotic responses to their physical environment at various scales from local reach features to segment slope and landcover features to watershed scale features; (2) "Building the linkages between nutrient enrichment and stream ecosystem impairment in the Midwest" focuses on nutrients and the condition of the biotic (algae, invertebrates, fish) assemblages. Using data collected throughout the year to evaluate the relative importance of nutrient samples taken at the same time as the biotic sample vs. annual averages and maximum concentrations, this report provides a valuable reference to Midwest states building links between biotic condition and nutrients to fulfill EPA mandates for nutrient criteria.
- ***Ohio periphyton data for developing nutrient criteria***—Assisting Ohio OEPA with managing samples collected for taxonomic identification of algal taxa and the calculation of algal metrics based on assemblage data. Data are provided to Ohio EPA to use with nutrient, chlorophyll, fish, and invertebrate data to evaluate biotic responses to nutrients in streams.
- ***Mercury deposition network sites***—Prevailing winds across Lake Erie have the potential to carry mercury-laden air masses from industries and coal-fired power plants, believed to preferentially deposit as lake-effect precipitation inland. NE Ohio has the greatest number of fish consumption advisories in the basin for mercury, 9 specific advisories for the Cuyahoga River, 18 for the Grand River, 10 for the East Branch of the Black River—all without an apparent trend toward urban-dominated land uses or known direct industrial inputs.

- ***Lake Erie-Lake St. Clair NAWQA ecological sites*—**NAWQA provides assessments on aquatic ecology and the chemical and physical factors that affect aquatic conditions and health. NAWQA data on chemistry, hydrology, land use, stream habitat, and aquatic life use a nationally consistent study design and uniform methods of sampling.
- ***Chagrin River watershed low impact development practices***—The Chagrin River Watershed Partners (CRWP) received an EPA grant to help implement and monitor low-impact development best management practices aimed at distributed stormwater management. A variety of BMPs that are common low impact practices (Natl. Association Home Builders, 2006) will be implemented, including rain gardens, porous pavers, and bioretention swales. Data are needed to document the performance characteristics of the various BMPs.

SASKATCHEWAN

- ***Western hydrologic benchmark network*--**Long-term water-quality monitoring at nine hydrologic network stations in the western U.S.; measurements of streamflow and water quality in areas of the United States minimally affected by human activities.

SOUTH DAKOTA

- ***Vaccination and flea control to assess invasion of plague into the Conata Basin, South Dakota***—With the impending advent of plague into the Conata Basin, the last plague-free black-footed ferret recovery site, USGS scientists are employing flea control to prairie dog burrows and an experimental plague vaccine in an attempt to detect low levels of enzootic plague and prevent failure of the colony.
- ***Development of adaptive land management models and practices for Federal lands*--**Design an applied research program to increase understanding of functions and processes that influence plant community composition and structure; develop tools (predictive models, decision support systems) to assist federal land managers in developing restoration and management strategies.
- ***Water level monitoring, High Plains aquifer*--**To monitor and assess water levels in the High Plains aquifer and provide the data, analyses, results, and other information to the public and Congress.
- ***Paleoflood study*--**Evaluate the potential for improving historical peak-flow records and flood-frequency relations for the Black Hills area of South Dakota using paleoflood hydrology techniques.

SD Cooperative Fish and Wildlife Research Unit

- Development of an energetics-based habitat assessment tool for juvenile pallid sturgeon in the Missouri River, South Dakota
- Factors affecting mercury availability and bioaccumulation in glacial lakes of eastern South Dakota
- Influence of prey resources on food web dynamics in Missouri River impoundments
- Influence of an invasive diatom Didymosphenia geminate on food availability and brown trout energetics in Rapid Creek, South Dakota
- An aquatic invasive species risk assessment for South Dakota
- Fishes and riverine habitat of Badlands National Park, with emphasis on the sturgeon chub and other imperiled species
- Vulnerability of age-0 pallid sturgeon to predation: implications for restoring pallid sturgeon with hatchery-reared fish
- Water quality, nutrient dynamics, and factors affecting water clarity in Belle Fourche and Keyhole Reservoirs, South Dakota-Wyoming
- Below-ground food production in habitats utilized by the Rocky Mountain population of Greater Sandhill Cranes throughout the Intermountain Corridor
- Use of stable isotope analysis to estimate trophic position of pallid sturgeon and shovelnose sturgeon in the Upper Missouri River
- Development and application of a wetland rapid assessment protocol for eastern South Dakota wetlands

WISCONSIN

- ***Long Term Monitoring of the Upper Mississippi River System (UMRS)--***The Long Term Resource Monitoring Program (LTRMP) is a multi-agency cooperative program whose partners include the U.S. Army Corps of Engineers, U.S. Geological Survey, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Upper Mississippi River System (UMRS), which covers the Mississippi River from Cairo, Illinois to Minneapolis, MN, and the entire length of the Illinois River. The objectives of this program are to: (1) Develop and maintain a long term database on ecological conditions within the UMRS; (2) Determine the effects of navigation and the infrastructure required for navigation on the ecological structure and function of the UMR; (3) Provide decision makers with information and tools needed to manage the UMR as a viable large river ecosystem while maintaining its value as a transportation corridor.
- Two LTRMP field stations collect detailed aquatic data in Wisconsin waters. The field stations work on a variety of projects supervised and administered by USGS. Their long term monitoring projects include; collecting data on water quality, fisheries, aquatic vegetation, and macroinvertebrates.
- ***UMESC Investigation of waterforwl die-off on the Upper Mississippi River System: Monitoring of the exotic Bithynia tentaculata, faucet snail--***The faucet snail (*Bithynia* spp.) is an invasive species that often harbors a parasite that can be lethal to waterfowl. During the last few years, thousands of waterbirds, primarily coots and scaup have died in the Upper Mississippi River National Wildlife and Fish Refuge from this parasite. To monitor the spread of *Bithynia*, vegetation samples collected by the LTRMP in Pools 8 and 13 in 2007 were inspected for snails. All snails collected were identified and analyzed by the National Wildlife Health Center in Madison, Wisconsin. The results were then analyzed by UMESC staff to determine the primary locations where infected snails occurred. This project is a joint effort among LTRMP, USGS, the Upper Mississippi River National Wildlife and Fish Refuge, and the University of Wisconsin-La Crosse. Plans to continue this research using different sampling techniques are scheduled for FY 2008.
- ***Application of wind fetch and wave models for Habitat Rehabilitation and Enhancement Projects--***Computer models originally developed by USGS in Santa Cruz were updated for conditions on the Mississippi River System, to support the design of Habitat Rehabilitation and Enhancement Projects (HREP). The models aid HREP planners with their designs for HREPs, by providing them with a means to test the affects proposed island configurations would have on wind generated waves.
- ***Factors limiting the distribution and abundance of freshwater mussels in large rivers***
- ***Demonstration of an approach to assess the impact of emerging contaminants on aquatic invertebrates in national parks: A project for the St. Croix National Scenic Riverway a NRPP project***
- ***River productivity team projects – UMESC--***The River Productivity Team (RPT) evaluates those key factors controlling river productivity, enhancing river ecosystem and human health, and understands the ecosystem services provided by the river-floodplain in an unbiased manner. New and emerging threats (e.g., excess nutrients, invasive species, over-harvest, habitat destruction) are of increasing concern and require a large, integrated approach to develop solutions to these complex insults.
- ***Wisconsin urban stream toxicity***--Examine the relation of watershed imperviousness in urban river systems to measures of toxicity in aquatic organisms. More specifically, the objective is to determine the toxicity of urban river systems to *P. promelas* as measured in 21-day spawning tests using in-situ caged fish.
- ***Wisconsin Buffer Initiative***--Determine the trends in water quality at selected watersheds during and after implementation of best-management practices using the Wisconsin Buffer Initiative approach at the watershed scale.
- ***Low-toxicity airplane deicer and anti-icer fluid***--Define the present state of the art of aircraft deicer and anti-icer fluid (ADAF) with respect to minimizing their aquatic toxicity and BOD5; identify promising alternative ADAF formulations with reduced aquatic toxicity and BOD5 ; evaluate the performance, efficiency, material compatibility, and environmental, operational, and safety impacts of these alternative ADAF formulations; and describe the fate and transport of ADAF and their degradation products.
- ***Northern Wisconsin Temperate Lakes Water Energy and Biogeochemical Budget***--Describe processes controlling water and solute fluxes in northern Wisconsin lake watersheds, examine interactions among those processes and their relations to climatic variables, and improve the capability to predict changes in water and solute fluxes for a range of spatial and temporal scales.
- ***Southeastern Wisconsin Regional Planning Commission Water Management Plan***--Assess the current sustainability of groundwater resources in the SEWRPC region and evaluate historic trends through time, and employ the existing regional groundwater model to optimize pumping from shallow and deep high-capacity wells in

a way that satisfies future demand without causing excessive drawdown or surface-water depletion. A collaborative effort of the Wisconsin Geological and Natural History Survey, University of Wisconsin Milwaukee and the USGS on behalf of the SEWRPC.

- ***Evaluation of mercury contamination in US coastal settings***--Fill critical data gaps that currently hinder a more complete understanding of mercury contamination across the US, and conduct research that will allow for a better quantitative understanding relating mercury releases to the environment and contamination levels in aquatic food webs
- ***Distribution of mercury and methylmercury in Northern San Francisco Bay***--Examine the environmental factors controlling Hg and MeHg distribution in sediments, water and selected biota of tidal marshes in North San Francisco Bay.
- ***Upper Midwest Spatially Reference Regressions On Watershed Attributes (SPARROW) modeling***--Describe the distribution (and factors influencing the distribution) in present suspended sediment and nutrient loads (natural and anthropogenic) in the Upper Midwest (Upper Mississippi and Great Lakes Basins) and throughout the Mississippi River Basin.
- ***Western Lake Michigan (WMIC) NAWQA EUSE***--Examine the relation of watershed imperviousness in urban river systems to measures of toxicity in aquatic organisms. The primary objective is to determine the toxicity of urban river systems to P. promelas as measured in 21-day spawning tests using in-situ caged fish.
- ***Western Lake Michigan (WMIC) NAWQA Hg***--Quantitatively evaluate mercury bioaccumulation in periphyton at the eight study sites from watersheds of different hydrological, biogeochemical, and land use characteristics. Evaluate the links between water, sediment, algae, invertebrates, and fish to determine controls on methyl mercury and total mercury bioaccumulation.
- ***Geomorphology of Lake Superior tributaries, Bayfield County***--Identify present and historical geomorphic and hydrologic conditions and causes for instability in five Bayfield Peninsula tributaries to Lake Superior: Whittlesey Creek, Sioux River, Raspberry River, Bark River, Cranberry River.
- ***Geomorphology of the Bad River, Ashland County***--Understand the historical and modern impacts of land cover on streamflow, sedimentation and erosion rates, and geomorphic conditions in the Bad River and some of its key tributaries. Monitor sediment and nutrients in Bear Trap Creek, a major contributor to Kakagon Slough.
- ***Sediment transport in Whittlesey Creek, Bayfield County***--This proposed study would provide more quantitative data on erosion and deposition rates throughout the watershed and build off of previous USGS work. This study is part of a larger sediment transport study for the entire Whittlesey Creek watershed that provides the foundation for the USFWS Restoration Workplan.
- ***Bank erosion analysis at Pioneer Farm, Lafayette County --***Quantitatively measure bank erosion along the reach of the Fever River with intensive rotational grazing, and determine if there are changes (assuming reduced rates) in the amount of bank erosion over time.
- ***Water quality of selected Lake Michigan tributaries***--Characterize present-day water column PCB, nutrient, and mercury concentrations at five Lake Michigan Mass Balance sampling sites.
- ***Reference streams***--Develop numeric physical, chemical, and biological reference condition criteria for warm-water streams. Develop numeric criteria to advance the development of the upper tiers of Tiered Aquatic life Use designations for various strata (e.g. small, large, cold, warm) of streams.
- ***Wisconsin Department of Natural Resources Biology***--The USGS Wisconsin District Middleton Data Center (MDC) constructed an Oracle database system to enable data management from WDNR offices in all parts of the state via the Internet, using on-line forms and reports.
- ***Wisconsin Department of Natural Resources Fish Mapping***--Develop a mapping interface accessing WDNR fish collection information compiled as part of the Aquatic GAP program. The mapping interface will provide generally presence/absence type information per species over the state of Wisconsin.
- ***Aquatic GAP***--Classify aquatic habitats in rivers, streams, and in selected coastal margins using regionally consistent methods, develop aquatic biological databases at state and regional scales, map the actual and predicted occurrence and distribution of fish and other aquatic species in streams and selected coastal habitats, complete a Gap analysis of fish and selected aquatic invertebrate species, serve these data and products on the Internet and on CD-ROM, and (8) analyze, synthesize, interpret, and publish results at statewide, lakewide, and basinwide scales.

WI Cooperative Fishery Research Unit

- An evaluation of walleye (*Sander vitreus*) spawning potential in a north temperate lake
- An ichthyofaunal study of Paleocene and Eocene fishes in the Sentinel Butte and Green River Formation
- Cooper's hawk genetic structure and parentage assessment

- Delineation of muskellunge genetic structure in northern Wisconsin
- Development of a habitat quality index for littoral zones of north temperate lakes in Wisconsin
- Effects of managing riparian vegetation to increase the length of suitable trout water
- Estimating strain contribution for lake trout naturally produced at Lake Michigan's mid-lake reef complex
- Forecasting future riparian forest stand characteristics and sustainable contributions of riparian trees to littoral zone woody habitats in developing watersheds
- Genetic concerns and paddlefish propagation; genetic analysis of North American yellow perch strains; genetic assessment of the Humboldt River Lahontan cutthroat trout distinct population segment; genetic stock structure and genetic diversity of Wisconsin walleye; genetic impact of broodstock selection strategies in Wisconsin's wild trout stocking program
- Lake sturgeon rehabilitation using streamside rearing facilities
- Spawning strategies and impacts on the maintenance of genetic diversity in lake sturgeon propagation
- Spawning habitat selection of sympatric smallmouth bass and rock bass in two north temperate lakes—habitat separation in space and time
- Tournament-associated mortality and the effects of culling in Wisconsin black bass tournaments

WI Cooperative Fish and Wildlife Research Unit

- The impact of fencerow removal on predators of grassland birds in southwestern Wisconsin
- Predicting the spread of chronic wasting disease in an agricultural landscape
- Modeling the dynamics of avian influenza in wild birds and potential transmission with domestic fowl
- Chronic wasting disease—evaluation of disease patterns and management actions
- Factors affecting CWD transmission—a comparison of CWD epizootics in Wisconsin and Illinois
- The effects of woody removal on a grassland bird community in southwestern Wisconsin
- Immunization of prairie dogs and other wild rodents against sylvatic plague
- Use of genetic markers to investigate the route of CWD transmission in free-ranging white-tailed deer
- Risk of CWD transmission associated with supplemental feeding and baiting of free-ranging white-tailed deer
- Potential transmission of CWD to other native wildlife
- Genetic resistance to chronic wasting disease in white-tailed deer
- Development of molecular assays to identify disease agents (Ribeiroia spp. trematodes and Chytrid, Ichthyphonus, Dermosporidium and Dermocystidium-like fungi) implicated in amphibian die-offs, population declines and malformations
- Disease patterns in the CWD eradication zone

OTHER AQUATIC PROJECTS

Great Lakes Basin

- ***Lampricides--***The efforts of UMESC scientists to register and re-register the lampricides and the general piscicides rotenone and antimycin are crucial to the efforts of tribal, state, and Federal natural resource agencies to control non-native aquatic species.
- ***Other Invasives--***A quick response proposal was prepared to evaluate the toxicity of BioBullet and BioBullet degradation products to zebra (*Dreissena polymorpha*) and black sandshell mussels (*Ligumia recta*). The study was funded and the research completed. BioBullets were shown to have potential as a selective toxicant for zebra mussels. Tests evaluating the toxicity of rotenone and antimycin at three temperatures to Asian carps have been completed and a manuscript is in review. The research was presented at Aquaculture America, Orlando, Florida, February 2008. Spawning methods for Asian carps were developed and incorporated into a manuscript which is in review. A study evaluating the effect of water hardness on egg hatching success of silver carp (*H. molitrix*) has been completed and a manuscript is in preparation. The research will be presented at the Mississippi River Research Consortium meeting. Results from this research indicate that water hardness will not limit silver carp distribution in the United States.

OTHER AQUATIC PROJECTS
Non-State Specific

- ***Hydrogen peroxide***:--35% PEROX-AID® (hydrogen peroxide) was approved by the FDA Center for Veterinary Medicine on January 11, 2007 for control of mortality in (1) freshwater-reared finfish eggs due to saprolegniasis, (2) freshwater-reared salmonids due to bacterial gill disease associated with *Flavobacterium branchiophilum*, and (3) freshwater-reared coolwater finfish and channel catfish due to external columnaris disease associated with *Flavobacterium columnare (Flexibacter columnaris*). This drug is the first new waterborne drug approved for U.S. aquaculture in more than 20 years. The broad use approval obtained is unique and significant for U.S. aquaculture in that it covers two fish life stages (eggs and fish) of a number of cultured freshwater fish species for three separate disease indications. The UMESC data were critical to this approval, satisfying FDA data requirements for animal safety, drug effectiveness, and environmental safety. The UMESC, in collaboration with FDA, developed the first water quality benchmark for an aquaculture drug. Developing the water quality benchmark was critical to support the broad use of this drug across the United States because the benchmark standard provides environmental regulatory agencies with the data needed to establish site-specific effluent limitations. The result is a much more flexible method of limiting the environmental risk associated with drug use in aquaculture. UMESC conducted and reported on more than 20 studies to FDA to ensure approval of the broad drug label needed by U.S. natural resource agencies.
- ***Chloramine-T***--Chloramine-T (Cl-T) is waterborne disinfectant whose therapeutic use to reduce mortalities associated with external bacterial infections of freshwater fish has been a priority of U.S. aquaculture since the inception of the Federal-State Drug Approval Partnership Project. The FDA has recently accepted data submitted by UMESC scientists that ultimately satisfied Cl-T's drug approval requirements regarding human food safety, animal safety and effectiveness. Most recently (October 12, 2007), FDA accepted the UMESC environmental risk assessment that evaluated the potential environmental effects of Cl-T use in aquaculture. FDA's acceptance of the UMESC environmental assessment fulfilled the last outstanding major drug-approval technical section for Cl-T and places this drug on the cusp of obtaining a new animal drug approval in the United States. Once approved, Cl-T will provide hatchery managers with a safe effective treatment to control mortality associated with a variety of external bacteria that presently cripple the culture of juvenile fish in U.S. aquaculture. UMESC has completed more than 15 regulated studies and submitted the final study reports to FDA in support of a future Cl-T approval. UMESC specifically designed these studies to ensure the broadest possible approval for Cl-T to support the diverse fish needs of our natural resource partners.
- ***Oxytetracycline***--Oxytetracycline (OTC), a broad-spectrum antibiotic used to control Gram-negative bacteria, was originally approved for restrictive use in salmonids, catfish and lobster in U.S. aquaculture. This narrow approval severely restricted its disease control potential. FDA recently accepted data submitted by UMESC scientists that satisfied oxytetracycline's drug approval requirements regarding human food safety and animal safety. The UMESC research ultimately led FDA to consider OTC therapy to be safe for all freshwater fish and to recalculate its withdrawal time (the period of time that must pass before exposed fish can be made available for human consumption). Most recently, FDA accepted a comprehensive environmental risk assessment prepared by UMESC that showed that OTC use in aquaculture does not pose a risk to the environment. The UMESC science has positioned oxytetracycline for an expanded new animal drug approval in the United States in the near future. Once approved, oxytetracycline will provide hatchery managers with a safe effective treatment to control mortality associated with a variety of systemic bacterial infections, a leading cause of mortality in U.S. aquaculture.
- ***United States Re-Registration of Rotonone and Antimycin***--Recently, conducted research to support the United States re-registration of rotenone. UMESC scientists have also validated a critical analytical method to detect antimycin A (at part per trillion levels) in surface waters as part of the information needed to re-register antimycin (re-registration review by the EPA targeted for 2008).

Report to the Midwest Association of Fish and Wildlife Agencies
from the
USGS National Wildlife Health Center
June 19, 2008

The following information is of a topical nature for wildlife management agencies and entities; many partners and collaborators are involved in gathering and researching the information herein.

Field Investigation Team Summaries: September 2007 to June 2008

Parasites cause continued seasonal die-offs on the Mississippi River (WI, IA)--Mortality resulting from heavy infections of trematodes, like *Cyathacotyle bushiensis* and *Sphaeridiotrema globulus,* continued in fall and spring for birds migrating through the Mississippi Flyway. Birds become infected with the parasites after feeding on the non-native *Bithynia tenaculata*, or faucet snail. Mortality reports began in late September and weekly monitoring resulted in nearly 20,000 birds estimated dead during the fall migration. American coots and lesser scaup were most affected, with ring-necked ducks, mallards, ruddy ducks, gadwalls, buffleheads, canvasbacks, wigeon, and redheads also known dead. Mortality has occurred since 2002 at Lake Onalaska, near Lacrosse, Wisconsin. This year, American coot mortality was observed for the first time in Pool 10 of the Mississippi River, near Guttenberg, Iowa. Mortality numbers for spring migration were lower with about 1,200 birds affected (same species) and was mostly confined to the Upper Mississippi River National Wildlife Refuge. NWHC parasitologists continue to monitor sites in the area for infected snails.

Avian cholera and Newcastle disease virus outbreak at atypical time and location (MN)--In northern Minnesota in early September, an avian cholera mortality event affected ring-billed gulls, herring gulls, American white pelicans, double-crested cormorants, and Caspian terns. An estimated 400 birds were affected. There is no previous record of avian cholera in this area. Herring gulls exhibited enlarged livers and spleen, as well as pericarditis, which is characteristic of chlamydiosis, a potentially zoonotic bacteria. Subsequent bacterial cultures in herring gull and cormorant tissues were positive for *Pasteurella multocida*, the causative bacterial agent of avian cholera. Non-virulent Newcastle disease virus (nvNDV) also was found in the cormorant, leading to the question of which infection developed first, and whether dual infection exacerbated the effects of either agent. This outbreak demonstrates the complexities of dual infections in a location frequented by multiple species.

Avian cholera outbreaks in the Central and Mississippi Flyways (NM, KS, NE, MO, IA, TN)--Substantial outbreaks of avian cholera had not been seen in the Mississippi and Central Flyways for several years. Snow geese were a primary species involved and are known carriers of the bacterial agent of avian cholera, *Pasturella multocida*. Other species affected included Ross' and greater white-fronted geese, with multiple species of waterfowl (mallards, northern pintails, teal, etc.). In autumn 2007 and spring 2008, disease events occurred in several locations including Bosque del Apache National Wildlife Refuge in New Mexico, with estimated losses of 4,000 birds. Known mortality totaled over 2,300 snow geese and 473 Ross' geese. Other areas with substantial losses included Lake McKinney (Kearny Co.) in western Kansas with 550 birds dying, and several waterfowl production areas in the Rainwater Basin Wildlife Management Area in Nebraska losing about 600 birds. Outbreaks occurred at Rush Lake (Palo Alto Co.) in Iowa (mortality of 224 birds); Mississippi Co., Missouri (75 birds); and Black Bayou Refuge, Lake Co., Tennessee (50 birds).

Type E botulism claims thousands of birds in 4 of 5 Great Lakes during 2007--As in recent years, botulism type E was responsible for the mortality of waterbirds resident to and migrating across the Great Lakes during the summer and fall of 2007. Botulism type E was detected in a small sample of the *6,982 dead birds collected on the shores of Lakes Ontario (June – December; *1,753 carcasses), Erie (July – December, 1,694 carcasses), Huron (September – December, 44 carcasses), and Michigan (June – December, 3,491 carcasses). The top 5 affected species were the ring-billed gull (2,362), common loon (1,458), double-crested cormorant (743), long-tailed duck (676), and horned grebe (354). Peak mortality occurred during October through December as fish-eating birds migrated southward, but there were avian botulism type E mortalities during the entire June to December period, including the death of 4 endangered piping plovers at Sleeping Bear Dunes National Lakeshore. The characteristics of the 2007 event were similar to botulism type

E outbreaks that have occurred annually in at least one of the Great Lakes since 1998. Estimating total avian mortality, the event's time-course in a lake, as well as the spatial extent the disease is difficult because efforts to detect and tally beached carcasses vary across the entire Great Lakes region. A systematic approach to track mortality, coordinated across organizations, would provide a more comprehensive understanding of the impact on bird populations, as well as the circumstances leading to the exposure of these varied avian species to botulinum type E toxin.
**These estimates are low because the New York Department of Environmental Conservation continues to analyze their transect data.*

Two NWHC scientists attended the Great Lakes Botulism Coordination Workshop in Detroit, MI, June 24-25, 2008, and participated in a Federal Agency panel that discussed lessons learned, anticipated projects, and needs identification. The objective of the workshop was to foster collaboration and generate new management ideas in response to Type E botulism outbreaks across the Great Lakes Basin.

Lesser scaup mortality due to parasitism at Lake Winnibigoshish, Minnesota (MN)--Three trematode parasites: *Sphaeridiotrema globulus, Cyathocotyle bushiensis,* and *Leyogonimus* sp., were responsible for the death of 6,500 lesser scaup at Lake Winnibigoshish in northern Minnesota. Mortality was detected at the end of October and continued through November 2007. About 200 American coots were affected as well. The non-native faucet snail (*Bithynia tentaculata*) is the traditional intermediate host for these parasites before the birds become infected. However, faucet snails have not been identified in this lake yet. There were large populations of a mystery banded snail, but banded snails are not known to serve as a host to the parasites.

Hemorrhagic enteritis in American crows (NY, NJ, MO, IA, OH, MA)--Between the end of December 2007 and January 2008, American crows in multiple states were found dead around their roost sites in large numbers, ranging from a few dozen to more than a thousand across several counties in New York. Crows that have been examined have a hemorrhagic enteritis and enlarged spleen. A reovirus is the suspected agent. Since 2002, the NWHC has had numerous crow submissions from more than a dozen states with this necrotizing enteritis syndrome. Additional work to identify the virus with PCR and controlled studies are being planned.

Non-infectious mortality of Canada geese in the Midwest (IA, OH)--There were several die-offs from non-infectious causes, involving primarily Canada geese, over the past few months. Twenty Canada geese died from lead poisoning in Holmes County, near Cleveland, Ohio in October 2007. An additional 110 Canada geese were poisoned by lead at Blue Lake, Monona Co., Iowa during February and March 2008. Aflatoxicosis was confirmed as the cause of death in 20 Canada geese and mallards on the Cedar River in Cedar Rapids, Iowa in February 2008 and was suspected as the cause in a January die-off of 150 geese at Saylorville Reservoir in Polk County, Iowa.

H5N1 Highly Pathogenic Avian Influenza--The Federal, State and Tribal partnership formed to develop and implement the National Interagency Early Detection System for Highly Pathogenic H5N1 Avian Influenza in Wild Migratory Birds has continued into the third year of surveillance. Birds have been tested from all 50 states and 6 freely-associated states and territories. While the surveillance focused on waterfowl, shorebirds, gulls and terns, a total of 284 species were sampled. During the 2007 sampling year (April 1, 2007 – March 31, 2008) cooperating agencies collected and analyzed over 90,000 wild bird samples and the highly pathogenic avian influenza H5N1 virus was **not** detected. Samples from 28 birds were positive for low path H5N1 North American lineage avian influenza viruses. Since April 1, 2008, a total of 3,002 birds have been sampled for avian influenza at the NWHC. Of these, five have tested positive for low-path avian influenza based on molecular screening; none of these were H5 positive.

Up-to-date information on the U.S. wild bird surveillance program including the number of birds tested and the wide geographic distribution of samples collected, and information on the low path H5N1 virus isolates detected, can be seen at: http://wildlifedisease.nbii.gov/ai/. For the states included within the MAFWA region, 298 birds have been entered into this online recording system (this includes samples from live wild birds, hunter-killed birds and die-off events).

NWHC staff participated in avian influenza table-top exercises hosted by the Washington State Department of Agriculture and another hosted by the Alaska Department of the Environmental Conservation, and presented at international meetings in Moscow and Yakutsk, Russia and Barcelona, Spain.

Surveillance activities for highly pathogenic H5N1 avian influenza are also occurring in Canada. Current information on results of their sampling and testing can be found at the website of the Canadian Cooperative Wildlife Health Center: http://wildlife1usask.ca/en/aiv/index.php

Modeling the Dynamics of Avian Influenza in Wild Birds and Potential Transmission with Domestic Fowl--The objective of this project is to develop a simplified epidemiological model of AI transmission among wild birds and wetland ecosystems and to consider potential routes of transmission between wild and domestic birds. Currently little is known about the many factors that likely influence the dynamics of AI in wild birds. This project will focus on simple models that incorporate rates of virus shedding, infection, and recovery for wild bird populations; input and turnover of virus in wetland systems; and alternative routes of transmission between wild and domestic birds (e.g., common wetlands, use of contaminated water, exposure via field contamination). Model development, complexity, and initial parameter estimation will be based on information or data obtained from published and unpublished reports and on knowledge provided by wildlife disease experts.

Chronic Wasting Disease (CWD) Research

Susceptibility of various small rodent species to CWD--The susceptibility of various small rodent species to CWD has and is being examined by intra-cerebral challenge studies at the NWHC. Meadow voles (*Microtus pennsylvanicus*) are very susceptible to intra-cerebral CWD challenge, with 100% penetrance and a median post-challenge survival time of 270 days. The incubation period shortens significantly upon second passage. Deer mice (*Peromyscus maniculatus*) and white-footed mice (*P. leucopus*) have proven to be relatively resistant to the disease, although resistance is not complete. Red-backed voles (*Myodes gapperi*) challenge studies are still underway, but appear to be no more susceptible than meadow voles. Experiments are being initiated with the University of Wisconsin to further explore the implications of voles' susceptibility to CWD, especially the likelihood of voles acquiring infections via natural routes. Among other things, we will be examining whether soil minerals potentiate the oral infectivity of CWD in voles, as has been demonstrated by Aiken and Pederson for a prion/hamster model system.

Statistical spatial-temporal epidemiological models of CWD--In conjunction with the Wisconsin Department of Natural Resources and other partners, the NWHC has been developing statistical spatial-temporal epidemiological models of CWD epidemics in free-ranging cervids. Substantial progress has been made in developing new statistical "backcasting" models based on dynamic process theory that allow the estimation of the rates at which the disease is growing and spreading. The analyses have discovered that substantial fine-scale spatial heterogeneity exists in infectivity, and spatial patterns in infectivity seem quite stable over time.

Persistence of CWD prions and factors affecting their degradation--An environmental reservoir of infectivity contributes to the natural transmission of chronic wasting disease (CWD) and a growing number of studies suggest that soil serves to preserve infectivity and potentially spread disease. A general paucity in the understanding of the fate of CWD agent (prions) in the environment as well as the mechanism of environmental CWD transmission limits disease management and control efforts. The goal of this study is to test the hypothesis that the fate of prions in the environment is affected by soil, plants and microbes. Results from these studies can provide insight into the mechanisms of CWD transmission in the environment and potentially provide methods for bioremediation of prion-contaminated soil.

CWD Meeting Announcements--Alberta Fish and Wildlife and Saskatchewan Ministry of Environment will co-host a CWD Workshop August 8 & 9 in Edmonton, Alberta. The workshop will immediately follow the Wildlife Disease Association Conference (August 3-8) in Edmonton and will focus on agency responses to detection of CWD.

The Third International CWD Symposium will be held in July 2009 in Park City Utah. The Utah Division of Wildlife Resources has graciously agreed to host the meeting. Conference dates, details and a call for papers are forthcoming.

The USGS is currently planning a CWD surveillance workshop to be held in July 2007. Attendance will be by invitation and the workshop will focus on providing guidance to states, provinces, tribes and federal agencies conducting CWD surveillance. The major questions to be addressed are (1) how to best conduct detection surveillance in a more efficient

and cost-effective manner, and (2) how to best conduct outbreak (monitoring) surveillance in a more efficient and cost-effective manner.

Sage Grouse and West Nile Virus (CO, ID, MT, NV, ND, OR, SD, WY, UT, CA)--Overall, West Nile virus (WNV) mortality has now been reported in sage-grouse in California, Colorado, Idaho, Montana, Nevada, Oregon, North Dakota, South Dakota, Utah and Wyoming, as well as Alberta, Canada. Experimental studies at the USDA National Wildlife Research Center have shown that WNV is usually fatal to sage-grouse, resulting in death within 6 days of infection, although antibody to the virus has been found in live wild sage-grouse. In FY-08, the National Wildlife Health Center is continuing the investigation of WNV in greater sage-grouse, passerines, and wild horses in Nevada and Oregon, as part of a USGS sagebrush biome research program.

Plague Outbreak in Conata Basin, South Dakota--On May 15, 2008 sylvatic plague, which is transmitted by fleas, was confirmed in prairie dog colonies in the Conata Basin Area. U.S. Fish and Wildlife Service indicated that about 4,000 acres of prairie dog habitat have been affected as of May 27, and that some of the affected areas include colonies occupied by black-footed ferrets. Prairie dogs are the main food source for the black-footed ferrets. Strategies to control the outbreak include applying insecticide to reduce the flea populations in prairie dog colonies that have high value to black-footed ferrets, but that have not yet experience plague die-offs. Another strategy is vaccinating some of the ferrets. As of June 15, 19 ferrets have been captured and given the vaccine, which was developed at the USGS National Wildlife Health Center. NWHC staff have been participating in conference calls regarding this outbreak and are closely following events.

White-Nose Syndrome in Bats (MA, NY, VT, NH, CT)--Investigations continue into the cause of a mysterious illness that has resulted in the deaths of thousands of bats since March 2008. At more than 25 caves and mines in the northeastern U.S, bats exhibiting a condition now referred to as "white-nosed syndrome" have been dying. The USGS National Wildlife Health Center recently issued a Wildlife Health Bulletin, advising wildlife and conservation officials throughout the U.S. to be on the lookout for the condition known as "white-nose syndrome" and to report suspected cases of the disease. A Wildlife Disease Specialist from the USGS National Wildlife Health Center (NWHC) met with biologists in some affected areas in March 2008 and collected environmental samples from affected caves and mines in Vermont, New York and Massachusetts. Live, dead and dying bats were documented in and outside of their hibernacula.

Since February 2008, the NWHC has received over 100 bat carcasses, both euthanized and recently dead. Species include little brown, big brown, northern long-eared and eastern pipistrelle bats, and most of these bats have been from New York, Vermont, Massachusetts, and Connecticut.

The most common findings in the bats have been emaciation and poor body condition. Many of the bats examined had little or no body fat. A subset of the bats examined also exhibited changes in the lung that have been difficult to characterize. A majority of bats had microscopic fungal hyphae on the external surfaces of their bodies. The white substance observed on some bats may represent an overgrowth of normal fungal colonizers of bat skin during hibernation and could be an indicator of overall poor health, rather than a primary pathogen. Investigations into the cause of the morbidity, including underlying environmental factors, potential secondary microbial pathogens and/or toxicants, are underway.

THANK YOU

The NWHC thanks all the state, federal and tribal agencies who worked with us the past year. We are at your service to provide technical support, field investigation assistance and diagnostic capabilities as your needs dictate.

Field Investigations Team

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USGS
science for a changing world

Wildlife Health Bulletin 2008-01

To: Natural Resource/Conservation Managers
From: Leslie Dierauf, Director, USGS National Wildlife Health Center
Title: White-Nose Syndrome in Bats in the Northeastern U.S.
Date: April 30, 2008

Contributors to this Bulletin include Cornell University, New York State Department of Environmental Conservation, New York State Department of Health, US Fish and Wildlife Service, and Disney's Animal Kingdom.

The condition in bats known as 'white-nose syndrome' (WNS) was first noted among dead and hibernating bats found in caves near Albany, New York, by the New York State Department of Environmental Conservation beginning in February 2007. Affected bats appeared to have a white substance on their heads and wings. In early 2008, "white-nosed" bats were once again seen in hibernaculae. Since March 2008, biologists and cavers have documented thousands of dead and dying bats at over 25 caves and mines in New York, Vermont, Massachusetts and Connecticut.

A Wildlife Disease Specialist from the USGS National Wildlife Health Center (NWHC) met with biologists in some affected areas in March 2008 and collected environmental samples from affected caves and mines in Vermont, New York and Massachusetts. Live, dead and dying bats were documented in and outside of their hibernacula.

Since February 2008, the NWHC has received nearly 100 bat carcasses, both euthanized and recently dead. Species include little brown, big brown, northern long-eared and eastern pipistrelle bats, and most of these bats have been from New York, Vermont, Massachusetts, and Connecticut.

The most common findings in the bats have been emaciation and poor body condition. Many of the bats examined had little or no body fat. A subset of the bats examined also exhibited changes in the lung that have been difficult to characterize. A majority of bats had microscopic fungal hyphae on the external surfaces of their bodies. The white substance observed on some bats may represent an overgrowth of normal fungal colonizers of bat skin during hibernation and could be an indicator of overall poor health, rather than a primary pathogen. Investigations into the cause of the morbidity, including underlying environmental factors, potential secondary microbial pathogens and/or toxicants, are underway.

Report WNS observations to your state conservation agency, the U.S. Fish and Wildlife Service or the USGS National Wildlife Health Center.

To report wildlife mortality events to USGS, please visit: http://www.nwhc.usgs.gov/mortality_events/reporting.jsp or contact a member of NWHC's Field Investigations Team: Anne Ballmann, 608-270-2445, aballmann@usgs.gov; Krysten Schuler, 608-270-2447, kschuler@usgs.gov; or Nathan Ramsay, 608-270-2443, nramsay@usgs.gov.

Web sites for additional information:
USGS National Wildlife Health Center: http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/
U.S. Fish and Wildlife Service: http://www.fws.gov/northeast/white_nose.html
Bat Conservation International: http://www.batcon.org/news/news_item.asp?NewsID=346

WILDLIFE HEALTH BULLETINS are distributed to natural resource/conservation agencies to provide and promote information exchange about significant wildlife health threats in their geographic region. If you'd like to be added to or removed from the mailing list for these bulletins, please contact Gail Moede Rogall at 608-270-2438 or e-mail: gmrogall@usgs.gov.

Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007–2017

Executive Summary

In order for the U.S. Geological Survey (USGS) to respond to evolving national and global priorities, it must periodically reflect on, and optimize, its strategic directions. This report is the first comprehensive science strategy since the early 1990s to examine critically major USGS science goals and priorities.

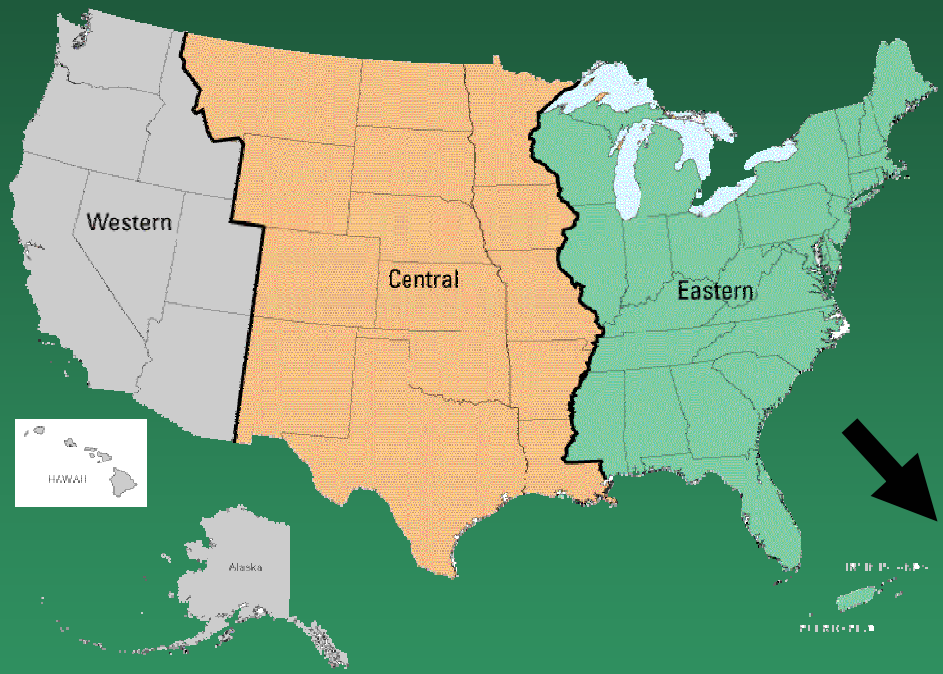
The development of this science strategy comes at a time of global trends and rapidly evolving societal needs that pose important natural-science challenges. The emergence of a global economy affects the demand for all resources. The last decade has witnessed the emergence of a new model for managing Federal lands—ecosystem-based management. The U.S. Climate Change Science Program predicts that the next few decades will see rapid changes in the Nation's and the Earth's environment. Finally, the natural environment continues to pose risks to society in the form of volcanoes, earthquakes, wildland fires, floods, droughts, invasive species, variable and changing climate, and natural and anthropogenic toxins, as well as animal-borne diseases that affect humans. The use of, and competition for, natural resources on the global scale, and natural threats to those resources, has the potential to impact the Nation's ability to sustain its economy, national security, quality of life, and natural environment.

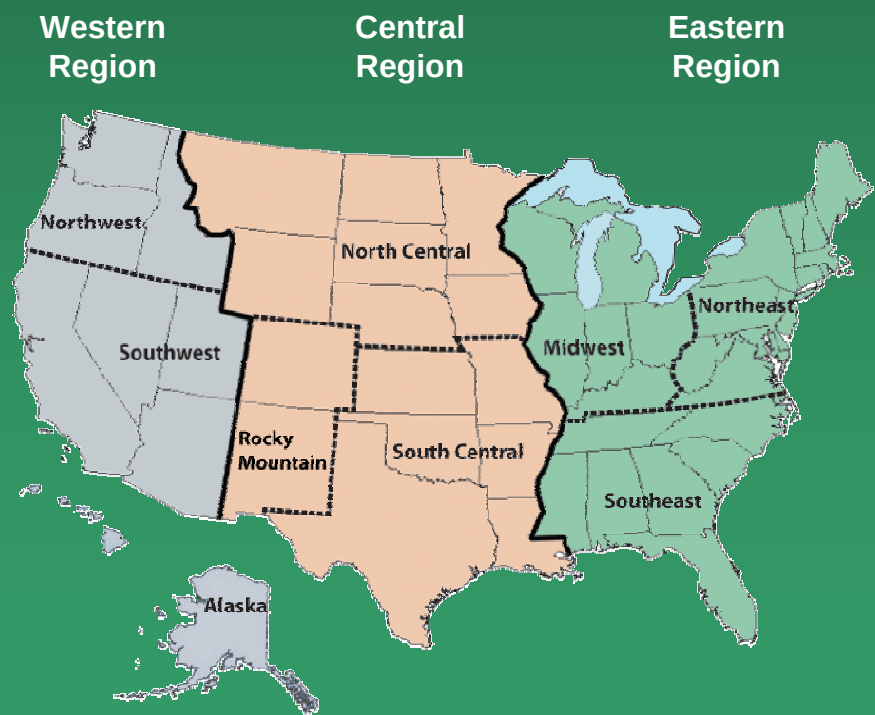
Responding to these national priorities and global trends requires a science strategy that not only builds on existing USGS strengths and partnerships but also demands the innovation made possible by integrating the full breadth and depth of USGS capabilities. The USGS chooses to go forward in the science directions proposed here because the societal issues addressed by these science directions represent major challenges for the Nation's future and for the stewards of Federal lands, both onshore and offshore.

The six science directions proposed in this science strategy are listed as follows. The ecosystems strategy is listed first because it has a dual nature. It is itself an essential direction for the USGS to pursue to meet a pressing national and global need, but ecosystem-based approaches are also an underpinning of the other five directions, which all require ecosystem perspectives and tools for their execution. The remaining strategic directions are listed in alphabetical order.

- Understanding Ecosystems and Predicting Ecosystem Change: Ensuring the Nation's Economic and Environmental Future
- Climate Variability and Change: Clarifying the Record and Assessing Consequences
- Energy and Minerals for America's Future: Providing a Scientific Foundation for Resource Security, Environmental Health, Economic Vitality, and Land Management
- A National Hazards, Risk, and Resilience Assessment Program: Ensuring the Long-Term Health and Wealth of the Nation
- The Role of Environment and Wildlife in Human Health: A System that Identifies Environmental Risk to Public Health in America
- A Water Census of the United States: Quantifying, Forecasting, and Securing Freshwater for America's Future

Regions and Areas Before and After

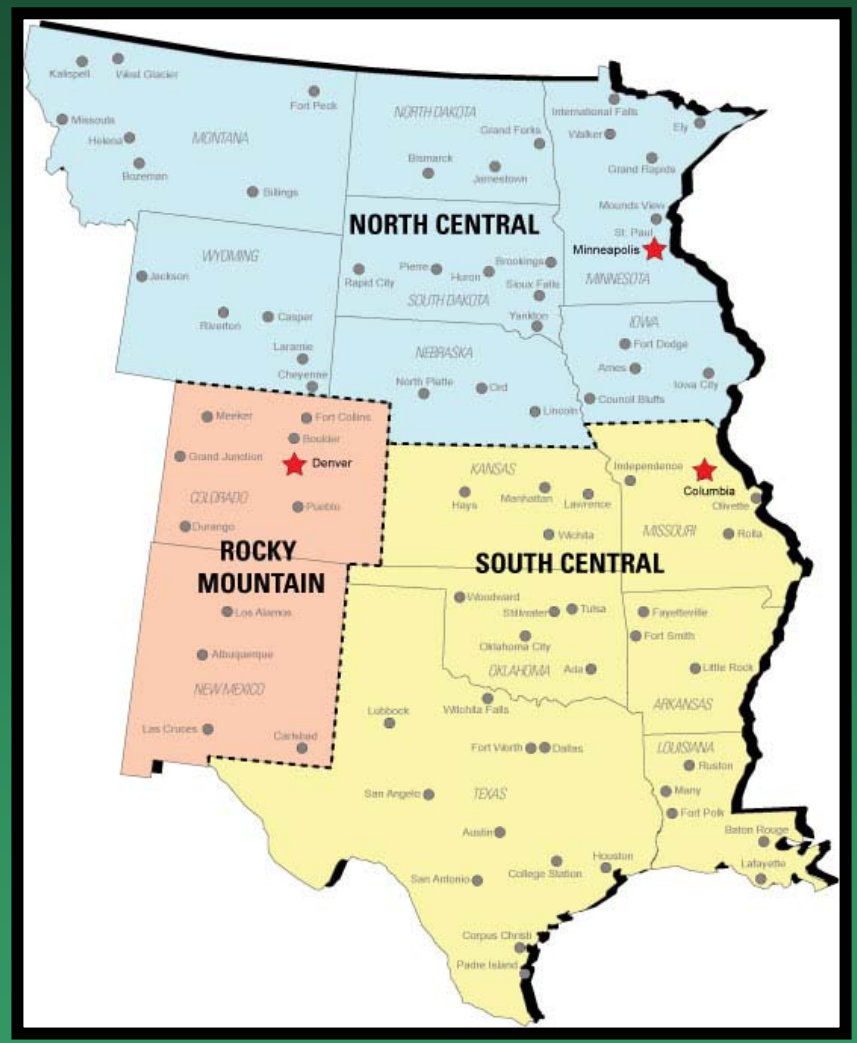




USGS

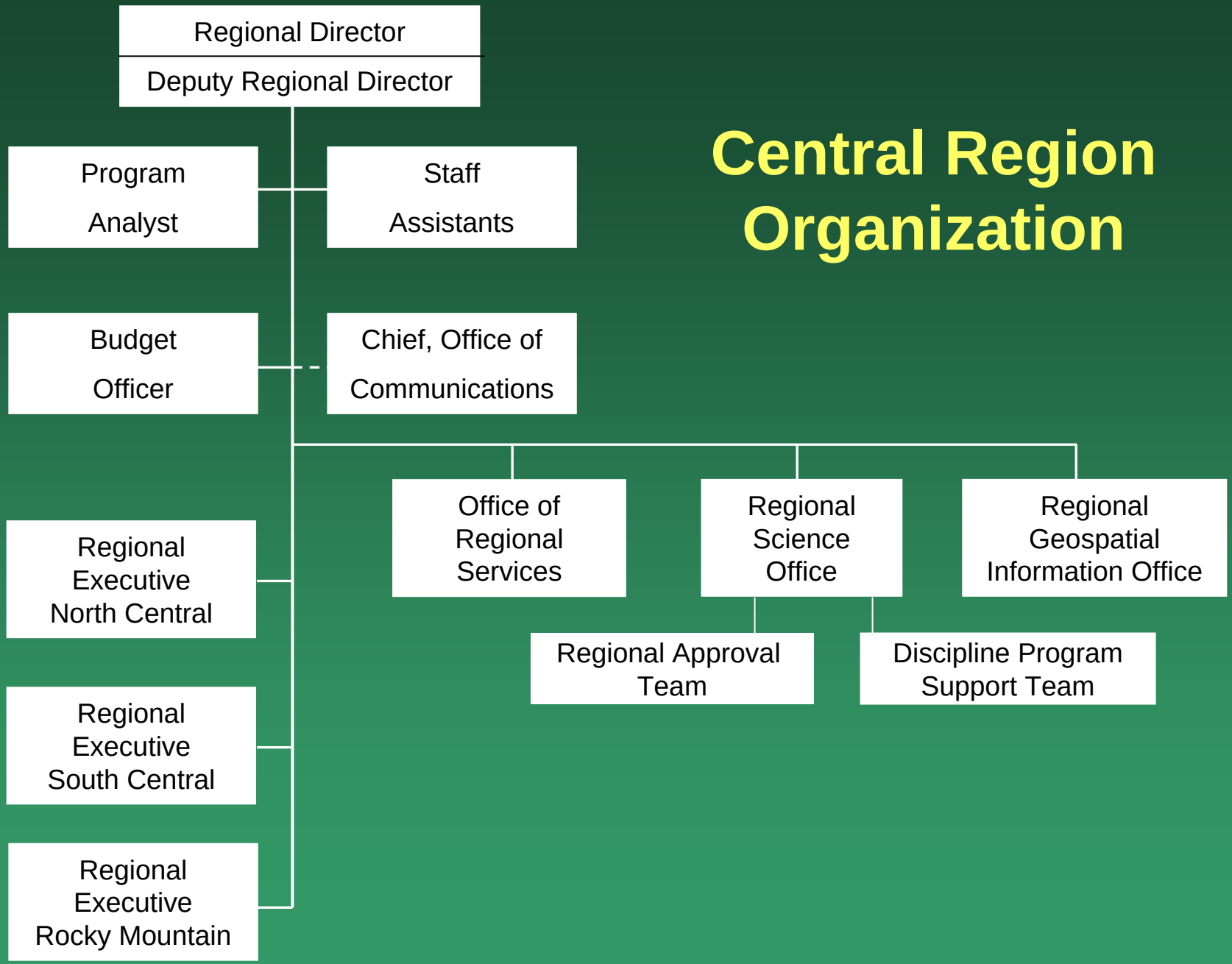
Central Region Transition

- Began in July at Managers Meeting
- Transition during FY08
- National Capabilities remain as they are
- Science/Cost Centers report to REx
- Drilling Project / Labs report to REx
- Focus Area Staff report to REx
- Transition Teams created



USGS

Central Region Organization



Geographic Areas