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# U.S. Geological Survey Activities Related to American Indian and Alaskan Natives

## Fiscal Year 2002

U.S. Department of the Interior
U.S. Geological Survey

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**U.S. Department of the Interior**
**Gale Norton, Secretary**

**U.S. Geological Survey**
**Charles G. Groat, Director**



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# List of Tribes or Tribal Governments Mentioned in the Report



* Names in this report are the most accurate that could be readily determined from several sources. Any inaccuracies are unintentional. Corrections are welcome.

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# State Listing

# Introduction

# U.S. Geological Survey Activities Related to American Indians and Alaska Natives Fiscal Year 2002

## Introduction

Information is a resource for Native American governments, communities, organizations, and people. The U.S. Geological Survey (USGS) provides technical expertise, reports, and other impartial information sources that benefit Native Americans interested in subsistence issues, water, land use, and the health of many parts of the environment. Native self-sufficiency, economic development, and conservation are cultivated through Native decisions informed with USGS data and analyses.

The USGS works in cooperation with American Indian and Alaska Native governments, conducting research on water and mineral resources, animals and plants of environmental, economic, or subsistence importance, natural hazards, and geologic resources. Digital data on cartography, mineral resources, streamflow, biota, and other topics are available to American Indian and Alaska Native individuals and institutions. The USGS recognizes the need to learn from and share knowledge with Native peoples. This report describes most of the activities that the USGS conducted with American Indian and Alaska Native governments, educational institutions, and individuals during Federal fiscal year 2002. Some of these USGS activities were carried out in concert with the Bureau of Indian Affairs (BIA). Others were conducted by Tribes, Tribal organizations, professional societies, and the USGS.

A growing number of Tribal governments, educational institutions, and other Tribal organizations have begun using geographic information systems and other digital technologies in recent years. As Tribes become more interested in and more adept at managing digital information, they are seeking relevant data from the USGS more frequently. Using digital technologies provides Tribal governments with additional means of managing lands and resources for the benefit of current and future generations. The USGS recognizes the need to make its information available to Tribal governments, and to work with those governments and other institutions to advance data management capabilities. The USGS also recognizes that Tribal institutions have varying needs, interests, and capacities. The USGS strives to be sensitive to the unique circumstances of each of these institutions while supporting their self-driven evolution.

The USGS is responding to these needs by increasing the transfer of scientific information to American Indian and Alaska Native governments and by training employees of those governments to conduct scientific studies and improve scientific data management. The USGS is also encouraging American Indians and Alaska Natives to pursue careers in science and seeking ways to hire Indian and Native students. By identifying, improving, and disseminating information about available hiring mechanisms, the USGS is working to make hiring such students easier, and, therefore, more likely, for USGS managers.

The U.S. Geological Survey is the Federal science bureau within the Department of the Interior (DOI). The USGS is non-regulatory and is not a significant manager of Federal or Trust lands or assets. However, as described in this report, there are several types of USGS activities that involve American Indians, Alaska Natives, and their lands.

One type of activity is the course of formal studies, conducted through existing USGS programs, that involves collection of specific types of data as well as investigative and research projects. These projects typically last 2 or 3 years, although a few are parts of longer-term activities. Some projects are funded through cooperative agreements, from monies provided to the USGS by individual Tribal governments, or by the BIA. The USGS provides matching funds for cooperative projects. These formal projects may also receive funding from the U.S. Environmental

Protection Agency, the Indian Health Service (part of the Department of Health and Human Services), or other Federal agencies. The USGS routinely works with its sister bureaus in the Department of the Interior to provide the scientific information and expertise needed to meet the Department's science priorities. Within this context, the USGS and the BIA are cooperating to use USGS information resources to benefit American Indian and Alaska Native peoples and their lands.

The second type of USGS activity is less formal, based on initiatives designed and conducted by USGS employees. Frequently involving educational activities, these endeavors are prompted by employee interests, often as collateral issues, that result from one or more USGS employees identifying and responding to an observed need. In these activities, USGS employees help fulfill a mission of the USGS-to prove scientific relevance while helping their fellow citizens. Increasingly, some of the educational activities are becoming parts of formal USGS projects.

USGS employees have also taken the initiative in assisting American Indians and Alaska Natives through participation in several organizations that were created to foster awareness of science among Native peoples and to help build support and communication networks. One such group is the American Indian Science and Engineering Society (AISES). This group sponsors an annual national meeting in which USGS employees participate. USGS employees join this organization on a voluntary basis, bringing the benefits of this expanded network to the USGS, as many employees do with other professional organizations.

Each part of the USGS has identified an American Indian/Alaska Native liaison. The USGS has a regional organizational structure, with Western, Central, and Eastern Regions. The regions work in concert with specific scientific disciplines to conduct the scientific mission of the USGS. The regional structure is intended to bring us closer to our customers; we hope that Native Americans and Alaska Natives will use the contacts listed at the end of this report.

**How to use this report:** In the following pages, diverse USGS activities related to American Indians and Native Alaskans are grouped into several categories:

Highlights of Fiscal Year 2002; Educational Activities; Resource Activities; Technical Assistance; General Coordination, and; Future Opportunities. If you find an interesting activity that you think might be appropriate to undertake in your area, contact the person(s) listed to learn how the activity was carried out. Ask for suggestions as to who in the USGS could assist you in setting up a similar activity in your area. If in doubt as to how to proceed, contact the USGS employees listed on the inside of the back cover. Within the USGS, this report will help staff develop outreach, educational, and program documents for future use. It is hoped that USGS employees, American Indians, and Alaska Natives will adapt these activities in new settings and will use the USGS contacts to expand the relevance of the USGS to more Americans.

This document was prepared compiled by Susan Marcus, USGS American Indian/Alaska Native Liaison in cooperation with the Regional and Discipline Liaisons:

Gayle Sisler, Eastern Region
Gene Napier, Central Region and Geography Discipline
Elaine Padovani, Western Region
Bonnie Gallahan, Geographic Information Discipline
Hardy Pearce, Biological Resources Discipline
Lynne Sendejo, Office of Equal Opportunity
Sharon Swanson, Geologic Discipline
Tom Zembrzuski, Water Resources Discipline

Thanks to Jill Moebus for creating the graphic layout of the report, Vitmary Rodriguez for designing the cover page, and Patricia Packard for the center map.

USGS has a website dedicated to Native American contacts, activities, and information. Please visit this site at: http://www.usgs.gov/indian/

Contact information is also provided on the inside of the back cover of this report. A general point of contact is Susan Marcus, Director's Office, 703-648-4437; smarcus@usgs.gov

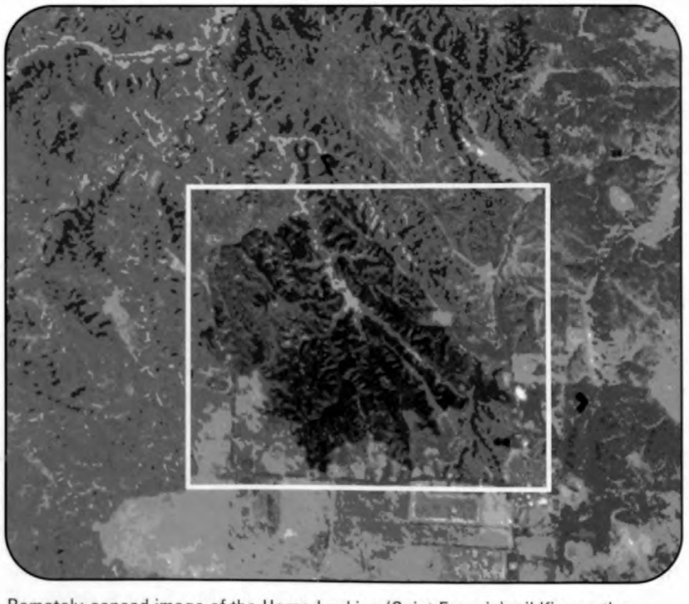
# Highlights of Fiscal Year 2002

# Highlights of Fiscal Year 2002

**Wildlife Mortality: Chronic Wasting Disease, West Nile Virus, and Other Diseases.** The USGS National Wildlife Health Center in Madison, Wisconsin, has responsibility for disease prevention, detection, and control in free-ranging wildlife. Species under Federal stewardship, such as migratory birds, endangered species and animals on Federal lands, are the focus of field investigations, diagnostic work, and research. Avian, mammalian, and amphibian wildlife carcasses from all over the country are submitted to the Center for diagnostic evaluation. When a wildlife mortality event is reported, potential responses include on-site assistance to contain the outbreak, diagnostic services to determine the cause, and research to better understand the ecology of the disease. Services are available to bureaus within the Department of the Interior and to Tribal organizations. During 2002, Center staff conducted two wildlife disease workshops with several tribes. In early June, the first workshop, entitled "Wildlife Disease: A Symposium for Tribal Biologists and Managers," was held in Brookings, South Dakota. South Dakota State University, the BIA, the USGS, and the Native American Fish and Wildlife Society sponsored the workshop, which was attended by representatives from the following Tribes: Oglala Sioux, Rosebud Sioux, Chippewa Cree, Coeur d'Alene, Mescalero Apache, Assiniboine, and Southern Ute. Since this symposium, the National Wildlife Health Center has received requests for information from several Tribal participants on testing for Chronic Wasting Disease in ungulates and West Nile virus in birds, and on developing disease contingency plans. Contact: Scott Wright, 608-270-2460, swright@usgs.gov or Kathryn Converse, 608-270-2445, Kathy_converse@usgs.gov

**Tribal Colleges Convene in Sioux Falls.** On October 15-16, 2002, 25 of the 33 Tribal Colleges and Universities (TCUsin the United States met at the USGS EROS Data Center (EDC) near Sioux Falls, South Dakota. The Tribal College Forum was co-hosted by the USGS and Sinte Gleska University (SGU) of the Rosebud Sioux Reservation. The Forum addressed how information and technologies from USGS can assist TCUs in providing economic opportunities to their students and communities. An outcome of the Forum was the creation of a consortium of TCUs that seek to share technologies and capabilities to improve career prospects for their students and service to their Tribes. The 57 participants included several tribal college presidents, their technical specialists, Federal and State agency representatives, non-profit and private groups. USGS Director Charles "Chip" Groat gave the keynote address. Vice Presidents of SGU, Albert White Hat, Leland Bordeaux, and Steve Emery provided presentations while James Rattling Leaf and Jhon Goes In Center facilitated the Forum. Senator Johnson and Congressman Thune, both of South Dakota, also sent representatives. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov; SGU contact: James Rattling Leaf, 605-856-4262, jamesrl@sinte.edu

**Horse Looking Fire (Saint Francis Fire).** The USGS EROS Data Center, working with Sinte Gleska University, provided a Landsat 7 image to the Rosebud Tribe to support a fire damage assessment of the Horse Looking Fire on lands of the Rosebud Sioux Tribe. This Landsat 7 image of the fire damage helped the Tribe in obtaining a grant from the Wildland Urban Fire Interface (WUFI). The grant will provide employment for 80 Rosebud tribal members. Lightening started the fire, originally called the St. Francis Fire, on July 29, 2002. The fire spread quickly



Remotely-sensed image of the Horse Looking (Saint Francis) wildfire on the Rosebud Reservation which burned about 3,032 acres in south-central South Dakota. USGS provided Landsat imagery of the fire and damage that helped the Rosebud Sioux Tribe earn money for jobs to mitigate the damage. Landsat 7 image provided by the USGS EROS Data Center.

due to drought conditions, destroying valuable timber resources of the Rosebud Tribe and causing the evacuation of 500 people. Tribal, BIA, State, and U.S. Forest Service sources deployed an estimated five hundred firefighters. The fire was contained on August 3 after burning roughly 3,032 acres. The satellite image of the Horse Looking fire was also used at the Indian Economic Summit in Phoenix, Arizona in September 2002, to demonstrate how USGS information can benefit Tribal communities. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov

**In-Situ Determination of Depth and Temperature Selection by Great Lake Fishes.** Scientists at the USGS Great Lakes Science Center, Hammond Bay Biological Station (HBBS), are conducting a study of the daily and seasonal temperature and depth preferences of various types of Great Lakes fish. The data from these studies will greatly increase the understanding of seasonal species overlap and will benefit management and restoration programs in Tribal agencies, eight States, Canadian provinces, and other Federal agencies throughout the Great Lakes basin. USGS scientists obtained the fish for the study with assistance from the Chippewa Ottawa Resource Authority (CORA). The fish were tagged during 2002 with archival tags that record both depth and temperature, producing daily and seasonal records of the habitats occupied by each fish. USGS scientists also assisted the Great Lakes Indian Fish & Wildlife Commission in implanting the same type of tags in lean lake trout in Lake Superior in October 2002. During 2002, USGS staff tagged 198 lake trout (160 in spring, obtained from tribal trap nets; and 38 in the fall, obtained from CORA assessment gill nets). Twenty of the lake trout (13%) tagged in spring 2002 were subsequently caught. Three were caught shortly after release and were re-released by tribal fishers. Data files were recovered from 16 trout (10%). Forty-three lake whitefish (from tribal trap nets) were tagged; none were recovered, possibly due to the effect of transporting the fish to the HBBS for tagging. In spring 2003, USGS and CORA scientists will work with tribal trap netters to tag whitefish on the water, a technique that has worked well with hook-and-line-caught chinook salmon. Fifty sea lampreys were also tagged. In related studies, USGS scientists tagged 91 chinook salmon caught with hook-and-line; seven (8%) were recovered in 2002. Only about a third of these were of a size expected to mature and run the streams. The recovery pattern suggests an eventual recovery of 25% or more. Twenty lake sturgeon, obtained from Canadian commercial trap nets, were tagged; two (10%) were recovered. Similar or greater numbers of fish are expected to be tagged in 2003. The results of an earlier archival tag study describing temperatures occupied by two strains of lake trout will be published in the Journal of Great Lakes Research. Contact: Roger Bergstedt, 989-734-4768, roger_bergstedt@usgs.gov

**Wildlife Health Alerts and Other Information on Wildlife Diseases.** The USGS National Wildlife Health Center (NWHC) in Madison, Wisconsin distributes Wildlife Health Alerts to Federal and State natural resource and conservation agencies, including the Bureau of Indian Affairs (BIA). Wildlife Health Alerts provide and promote an exchange of information on important threats to wildlife health. They are issued for specific wildlife diseases, not for human health issues. There were no Wildlife Health Alerts issued in 2002. A complete list of Wildlife Health Alerts and copies of each are available at www.nwhc.usgs.gov. Tribal governments are encouraged to contact the USGS to be added to the automated announcement list. Contact: Paul Slota, 608-270-2420, paul_slota@usgs.gov

**Southwest Strategy.** The USGS is an active partner in the Southwest Strategy, (SWS). SWS is an intergovernmental process that provides a forum for diverse entities to collaborate and resolve natural resource conservation, management, and community development issues affecting Arizona and New Mexico. Through cooperative planning and improved decision-making, SWS strives to maintain, restore, and enhance the cultural, economic, and environmental quality of life for the people of Arizona and New Mexico. SWS brings together Federal, Tribal, State, and local governments, as well as private landowners and other stakeholders, in a problem solving process. The USGS sponsors and chairs the Southwest Strategy's Scientific Information Work Group; the group has developed a database containing information acquired from research and natural resource, social, and economic data that is critical to natural resource management in the Arizona and New Mexico. The database will be available on the Internet in 2003. The SWS sponsored a Tribal Gathering in April 2002 that focused on cultural resources, economic development, and natural resources. The Gathering provided an opportunity for new collaborations to develop meaningful products. Recommendations from the Gathering will be addressed through FY 2003 Tribal Relations Work Group

Projects (see www.swstrategy.org/tribefed.html). In July 2002, USGS scientists briefed Work Group members on collaborative projects on Indian Lands in Arizona. Future projects include joint sponsorship of the Annual Tribal Soil and Water Conservation District Conference in Laughlin, Nevada in November 2002 and for a Tribal Relations Training workshop for mid-level managers in May 2003. Contact: Elaine Padovani, 520-670-5506, epadovani@usgs.gov

**Human Health and Contamination in the Penobscot River.** The Bureau of Indian Affairs brought together agencies including the USGS, the Environmental Protection Agency (EPA), and the University of Maine Water Research Institute to collect information regarding the occurrence, distribution, and ecological and human health risks associated with dioxins, furans, and PCBs in fish and sediment in the Penobscot River. The study area encompasses the Penobscot River main channel from the Milford Dam impoundment in Old Town to Grindstone, Maine. Concentrations of dioxins and furans in the riverbed sediment have been quantified to a limited degree through a 1995 sampling study by the Penobscot Indian Nation's Department of Natural Resources. In addition, the Maine Department of Environmental Protection maintains several fish sampling stations in the study area as part of their statewide dioxin-monitoring program. The USGS Maine Water Resources District conducted a field program in cooperation with EPA and the Penobscot Indian Nation's Department of Natural Resources that included a geophysical survey of sediments in the riverbed to identify areas of fine-grain sediment deposition, and the subsequent collection of fish tissues and fine-grained surficial sediment samples. These samples have been analyzed for dioxins, furans, and PCBs at the University of Maine Water Research Institute. EPA risk assessors are using the collected data to produce a report assessing human health and ecological risk. Contact: Robert Lent, 207-622-8201, rmlent@usgs.gov

**Hydrogeologic Analysis of Ground-Water Availability in Chippewa Township, Michigan, Saginaw Chippewa Indian Tribe.** Chippewa Township encompasses Tribal lands and buildings belonging to the Saginaw Chippewa Indian Tribe of Michigan. The Tribe and neighboring communities have a significant need for drinking water obtained exclusively from ground-water wells. The hydrogeology in this area is complex and good quality water can be difficult to obtain. In FY 2002, the USGS began a 2-year cooperative study with the Tribe and Chippewa Township to conduct a hydrogeologic analysis of the area. In FY 2002, water quality samples were collected to determine the feasibility of using a deep bedrock aquifer as a ground-water resource, and surface geophysical methods were employed to image glacial sediments that overlie bedrock. In FY 2003, additional geophysical analyses will be made, and a ground-water flow model will be constructed to aid in managing the area's ground-water resources. The goal of the study is to determine current and future ground-water availability so that the Tribe and the Township can use the information for the benefit of their communities. Contact: Chris Hoard, 517-887-8949, cjhoard@usgs.gov

# Educational Activities

# Educational Activities

**National Indian Education Association.** The USGS expanded its involvment in the annual conference of the National Indian Education Association (NIEA)by holding workshops for educators. USGS Rocky Mountain Mapping Center staff presented a workshop on using geographic information systems technology in the classroom, showing how this technique can make a variety of subjects, including history, geography, economics, and science, more relevant to Native students. USGS and Sinte Gleska University jointly sponsored an exhibit booth at both the October 2001 conference in Billings, Montana and the November 2002 conference in Albuquerque, New Mexico. Contact: Eugene Napier (exhibit), 605-594-6088, enapier@usgs.gov; Joseph Kerski (workshop), 303-202-4315, jjkerski@usgs.gov


John Goes in Center, left, Sinte Gleska University, Esther Worker, ESRI Inc., Joseph Kerski, USGS, and James Rattling Leaf, Sinte Gleska University, conducted a hands-on workshop in GIS at the NIEA conference. Photo by Deborah Rattling Leaf.

**National Oceanic and Atmospheric Administration Coastal GIS and Metadata Training for American Indians.** National Oceanic and Atmospheric Administration (NOAA) and the USGS, through its support of the Federal Geographic Data Committee (FGDC), presented an annual training session on GIS/metadata and coastal issues for American Indians at the NOAA Coastal Services Center in Charleston, South Carolina. Topics included the National Spatial Data Infrastructure, water quality, and flora and fauna monitoring. The training session helped assure Tribal investment in data collection and maintenance and provided Tribal access to public data catalogs and clearinghouses. The course accommodates 15 American Indian students at each annual session. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Introduction to Metadata and GIS Courses for American Indian Conservation Professionals.** The USGS, through its support of the Federal Geographic Data Committee (FGDC), and the U.S. Fish and Wildlife Service (FWS) continue offering training sessions, approximately quarterly, to introduce American Indian students to the uses of GIS. The Native American students include Tribal, State, and Federal employees. Topics of the sessions include the National Spatial Data Infrastructure, metadata, spatial data themes and layers, constructing queries, and cartographic principles. The sessions offer best practices used and describe the effect of scale on mapped data. Training is held at the FWS National Conservation Training Center in West Virginia. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Water-Quality Workshop for Maine Tribes.** The USGS Maine Water Resources District conducted a two-day introductory water-quality workshop, held at the Houlton Band of Maliseet Indians Tribal headquarters in Houlton, Maine during July 2002. The Aroostook Band of Micmacs, Passamaquoddy, and Houlton Band of Maliseet Tribes were represented. Day 1 included an introduction and overview of the environmental database developed for the Penobscot Indian Nation, discussion of the purpose and site-selection criteria for water-quality data collection, discussion of quality-control and quality-assurance criteria, and discussion of field forms and the requisite information they should contain. Day 2 included discussions of basic water-quality instrumentation (dissolved oxygen, specific conductance, pH and temperature), the merits of Winkler titrations versus dissolved oxygen sensors for dissolved oxygen determinations, and demonstrations of Winkler and alkalinity titrations. Day 2 also included a field trip to a site on the Meduxnekeag River for instruction in calibrating and using water-quality sensors and multi-probes, protocol for measuring field parameters, and filling out field forms. Upon returning from the field trip, workshop participants were instructed on how to enter water-quality

data into the environmental database developed for the Penobscot Indian Nation (workshop participants were provided with copies of and the instruction manual for the database, with concurrence of the Penobscots). The workshop concluded with a question-and-discussion period followed by a course evaluation questionnaire. Given the responses in the questionnaire, next year plans are to expand the course to include standard colorimetric methods for nutrient determinations and chlorophyll-a measurements. Contact: Robert Lent, 207-622-8201, rmlent@usgs.gov

**La Crosse, Wisconsin, Native American Students.** A representative of the USGS' Upper Midwest Environmental Science Center (UMESC) has contacted the coordinator of liaisons for Native American, Asian, and African American students for the School District of La Crosse (Wisconsin) to arrange a meeting with the liaisons, two of whom are new to the program. Discussions will be held to showcase the Center's educational resources and how these resources could benefit Native American and other diverse students. Contact: Mike Dewey, 608-781-6206, Michael_Dewey@usgs.gov

**Coordinating with Haskell Indian Nations University.** The USGS, through the Kansas Water Resources District Office, established and maintained a GIS lab at Haskell Indian Nations University (Haskell). This programreached a successful conclusion in FY2002, when the GIS equipment was transferred to Haskell that has the capability to use and maintain it. Contact: Walt Aucott, 785-832-3505, waucott@usgs.gov

**Water-Resources Training for Chippewa Cree.** The USGS Montana Water Resource Disctrict conducted a 3-day workshop for water-resources technicians of the Chippewa Cree Tribe of the Rocky Boy's Indian Reservation. The seven technicians who attended were introduced to the principles of hydrologic data collection and computation techniques. Contact: Norman Midtlyng, 406-457-5900, nmidtlyn@usgs.gov

**Water Technician Training Course.** The Bureau of Indian Affairs sponsored its annual Water Technician Training Course sessions at New Mexico State University in Las Cruces, New Mexico, at Central Washington University in Ellensburg, Washington, and at the University of Alaska in Fairbanks, Alaska. Tribal representatives from throughout Indian Country, including Alaska, participated in the course with about 30 students participating in the New Mexico session. The 5-week earth sciences course utilized instructors from several Federal agencies and academia. USGS personnel taught a 4-day module titled, "Introduction to Hydrologic Data Collection Techniques." USGS instructors were provided by the Alaska and New Mexico Water Resources Districts, along with active and retired USGS scientists from the Washington Water Resources Science Center. Instruction included classroom and field activities on ground-water concepts and data collection, surface-water data collection, and water-quality data collection. The New Mexico session is coordinated by New Mexico State University. Contact: Edward (Nick) Nickerson (New Mexico), 505-646-7618, nickerso@usgs.gov; Robert Kimbrough (Washington and Alaska), 253-428-3600 ext.2608, rakimbro@usgs.gov

Water Resources Technician Training Program. Photo by Tracey Jaglowitz, USGS Volunteer.

**National States GIS Council (NSGIC).** In cooperation with the Federal Geographic Data Committee, the National States GIS Council (NSGIC) plans and develops regional Tribal-State workshops with the USGS, Bureau of Land Management, Bureau of Indian Affairs, the Intertribal GIS Council (IGC), and other Tribal entities. The workshops teach GIS and metadata usage for the governing bodies to use in their planning processes. In August 2002, the Bureau of Land Management hosted a NSGIC Tribal-State Federal meeting in Billings, Montana. Workshops and discussions were held on the availability of metadata, who is using what data and methods, how to partner to share data

and GIS expertise, solutions to developing effective partnerships to better communicate data requirements, opportunities for more cost sharing, and strategies for building stable, effective GIS programs. Eleven American Indian Tribal governments and the States of Montana and Washington participated along with the Federal representatives. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov; Gene Napier, 605-594-6088, enapier@usgs.gov

**Sinte Gleska GIS Lab.** USGS personnel are working with Sinte Gleska University (SGU) to develop a sustained SGU laboratory for geographic information systems research and applications. The effort has two primary components: programmatic development and infrastructure development. Programmatic development involves identifying spatial analysis needs within the Rosebud Sioux community and defining pilot projects with groups such as the Rosebud Sioux Tribal housing authority, the Tribal Land Enterprise, and University constituents. The second component, infrastructure development, addresses the physical infrastructure such as computers and networking, data needs, and human resource development (training, internships, staff exchanges, and workshops). Significant accomplishments in FY 2002 include developing a work plan, conducting training sessions in the use of global positioning systems (GPS) methods for field data collection and organization, and conducting ESRI-certified ArcView training. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov

Mike Coan (right), contract scientist at the EROS Data Center, demonstrates the use of consumer-grade global positioning system receiver to collect geolocated field data on the Rosebud Reservation. Observing from left to right are Kenny Haukus (Rosebud Tribal housing authority), and Steve Sweigert and James Rattling Leaf of Sinte Gleska University. Photo by David Meyer, USGS Contractor.

**Geographic Information Systems Workshop for Sinte Gleska University Students Training to Become Geography Teachers.** In August 2002, a USGS geographer, conducted a 2-day GIS workshop at Sinte Gleska University for educators who were taking a geography-teaching course. Through the use of GIS, teachers and students had the opportunity to investigate real-world data in a problem-solving environment, utilizing the same tools and techniques that Tribal planners, wildlife biologists, and other professionals use on the job. Contact: Joseph Kerski, 303-202-4315, jjkerski@usgs.gov

**Oglala Lakota College Advisory Board.** Oglala Lakota College (OLC) is an accredited 4-year college offering baccalaureate and master's degrees on the Pine Ridge Reservation of the Oglala Sioux Tribe. It is a member of the Oyate Consortium, a group of five colleges and universities in the Dakotas that share educational goals, some faculty and staff, and technologies. OLC has about 1,400 students enrolled in courses at nine locations on the Pine Ridge Reservation. Oglala Lakota College is participating in the National Science Foundation's Model Institutions of Excellence (MIE) program to build curricula to train an increasing number of students in mathematics, science, engineering, and technology (MSET). As a member of the OLC-MIE advisory board, the USGS has been invited to help identify courses and faculty for the curricula, and internship and job possibilities for the students. OLC has a special interest in developing curricula to teach the analytical chemistry of water samples because the Oglal Sioux Tribe is planning a new facility at Pine Ridge to process several thousand water samples collected on reservations each year. Offering students the option of staying on the Reservation while continuing their formal education makes it likely that more students will choose to stay in college. Once they complete their formal education, they may apply the skills learned on the Reservation to enhance Native American economic development, health, and culture. The USGS is working with OLC to develop internships with the National Water Quality Laboratory, Fort Collins Science Center, and other offices to provide training, mentoring and on-the-job experience for OLC students in scientific fields. Contact: Douglas Posson (USGS), 970-226-9398, dposson@usgs.gov; Dan Fitzpatrick (USGS), 605-355-4560, ext. 220, djfitzpa@usgs.gov; Greg Mohrman (USGS), 303-236-7500, gmohrman@usgs.gov; Stacy Phelps (Oglala Lakota College), 605-455-6001, sphelps@olc.edu

**Southwestern Indian Polytechnic Institute.** Southwestern Indian Polytechnic Institute (SIPI) and the USGS, through its support of the Federal Geographic Data Committee (FGDC), are conducting quarterly satellite broadcasts from SIPI for participating Tribal colleges and universities. The broadcasts, entitled "GIS in Indian Country," have been popular with students and faculty. They provide a good connection to the Indian community, a means of including field work in the curriculum, and an excellent school-to-career opportunity. These broadcasts are dedicated to promoting Tribal self-sufficiency by improving management of geographic information and building intertribal communication networks while maintaining national standards of data quality through the National Spatial Data Infrastructure. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Endangered Species Training for Tribes and BIA.** In May 2002, an ecologist at the USGS Southwest Biological Science Center assisted the Bureau of Indian Affairs with a training session on techniques for surveying the endangered southwestern willow flycatcher. The training session, held in Albuquerque, New Mexico, included biologists from more than a dozen southwestern Tribes and Pueblos. Lectures were presented on the status, distribution, ecology, and habitat use of the flycatcher. The USGS scientist also lead a field trip to known flycatcher breeding sites along the Rio Grande. Contact: Mark Sogge, 928-556-7466 ext. 232, mark_k_sogge@usgs.gov

**Developing a Curriculum for Ute and Navajo Students.** Soil crusts are important features of arid and semiarid ecosystems throughout the Southwest. In addition to stabilizing surfaces and increasing water absorption, living organisms in soil crusts contribute nitrogen and organic matter to ecosystems, functions that are especially important in desert ecosystems. As is the case with the general public, many Native Americans are not aware of the relationship of soil crust to an ecosystem. In addition, soil crusts on lands of the Ute Mountain Ute Tribe and the Navajo Nation have suffered significant damage from grazing animals. In 2002, USGS scientists completed and distributed a curriculum that integrates biological and earth sciences for Ute and Navajo grade school students. The curriculum is focused on teaching students about biological soil crusts and the crucial roles they play in the ecosystems of the Four Corners region. Government scientists hope to pass along knowledge that is being gained through USGS research on soil crusts to the next generation of land stewards. The curriculum for Indian students will engage them in the workings of basic scientific concepts. Through this study of biology and earth science as it relates to their local environment, students will be encouraged to further their education in these disciplines and to consider careers in resource management. This project of the USGS Canyonlands Field Station is intended to inspire students to bring their expertise to the community as resource managers, ranchers, and better-informed community members. Contact: Jayne Belnap, 435-719-2333, jayne_belnap@usgs.gov; Tim Graham, 435-719-2339, tim_graham@usgs.gov

**Educational Outreach to Native American Children.** The USGS Flagstaff Field Center provided several educational presentations on geology to school groups visiting Flagstaff primarily from the Navajo Nation. The Solar System program was presented to students from Pinon Elementary and Tonalea Day School. A maps and mapping program was presented to students from Rocky Ridge School. The rocks and minerals program was presented to students from Rough Rock High School. Students from Tonalea Day School also learned about volcanoes. Contact: Sue Priest, 928-556-7148, spriest@usgs.gov

**Coordination with the Navajo Nation.** USGS staff from the Arizona District held outreach meetings with the Navajo Nation on educational assistance in support of the Nation's energy programs. They also cooperated with the Navajo Water Resources Department and the University of Arizona in support of graduate students. Contact: Christopher Smith, 520-670-6671 ext. 251, cfsmith@usgs.gov

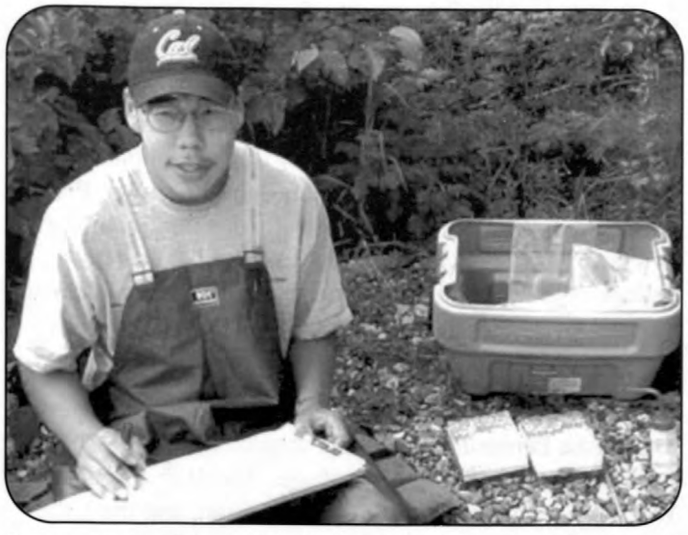
**Explorer's Club-Outdoor Science Education Outreach on San Diego County Reservations.** A retired USGS scientist has channeled her enthusiasm for earth science education into an outreach project for Indian Tribes in southern California. Working in partnership with the Tribes, the USGS, San Diego State University, the University of California at San Diego, and the San Diego Science Alliance, she has expanded a series of successful outdoor science activities originally developed under USGS auspices into a set of "Explorer's Club" programs for children age 6 to 12. The format of each program can be adapted to suit the needs of the Education Director of each Tribe.

Tribal elders participate as program instructors. The programs include activities such as panning for gold and magnetite, collecting rocks, coring soil, and learning outdoor photographic techniques. Water-related activities are particularly important to help the students understand water issues in their semi-arid area that has suffered four years of drought. For Earth Science/National Water Monitoring Week, a scientist from the USGS Water Resources Discipline's California District, San Diego Office joined the team to teach Native American children how to measure parameters such as pH, temperature, water clarity, and oxygen content. Equipment from prior USGS funding was shared with children from the Campo Band and the Pala Band of Mission Indians, and from the Jamul Indian Village. Contact: Eleanora I. (Norrie) Robbins, 619-303-9095, norrierobbins@cox.net

**Alaska Native Internship Program.** The USGS Alaska Science Center collaborates with other Department of the Interior bureaus in Alaska and the University of Alaska Anchorage to maintain the "Internship for Native Student Training and Education Program" (INSTEP) for Alaska Natives. The program gives interns six college credits and 10 weeks of work experience in DOI bureaus. The USGS hosted one intern during the summer of 2002. Contact: Steven Frenzel, 907-786-7100, sfrenzel@usgs.gov

**Marine Science Opportunities.** The USGS Alaska Science Center Glacier Bay Field Station continued a student internship (Student Career Education Program) in 2002 with a member of the Sitka Tribe of Alaska. She hopes that her experiences conducting natural resource research will inspire other Alaska Natives to pursue science careers. This student has been assisting scientists who are performing oceanographic research and mapping the ocean floor. She has also been learning spatial analysis and the use of geographic information systems. She will complete her graduate education in 2003. Contact: Philip Hooge, 907-786-3512, philip_hooge@usgs.gov

**Science Education Outreach.** A fisheries biologist from the USGS Alaska Science Center, attended the April 2002 Career Day Fair in Minto Village, a remote village about 100 miles west of Fairbanks, Alaska. Tanana Chiefs Conference Youth Opportunities Program and the Minto School District sponsored the event. Students learned about opportunities and careers as fish and wildlife biologists with the USGS. In addition, the USGS scientist



Gerald Anelon (Iliamna) recording scientific data, collecting genetic samples, and preserving them in vials with alcohol. Photo by Carol Ann Woody, USGS.

met with upper class students (grades 9-12) at the Minto School to give a presentation on his USGS Yukon River salmon research program and on other scientific studies at the USGS Alaska Science Center. Contact: Jim Finn, USGS Alaska Science Center, 907-786-3450, jim_finn@usgs.gov

**Native Alaskan Internship Program.** A USGS fisheries biologist continued an internship program in the Bristol Bay region of Alaska during the summer of 2002 to recruit Native Alaskans into the field of fisheries science. Six students from Newhalen, Nondalton, and Port Alsworth, Alaska, learned what it was like to be a fish biologist. Three of the students were also part of the 2001 interns

Dr. Carol Ann Woody (Project Investigator), and Interns Shavela Stickman, Crystal Wassillie, Janell Kakaruk, and Julia Vinciguerra load the boat with gear and get ready to collect otolith samples from local subsistence fishers on Lake Clark, Alaska. Photo by Kristy Baluta, USGS intern.

program. The students learned how to count migrating adult salmon, capture, anaesthetize and radio-tag salmon, track them to their final spawning destinations, and collect, measure, and record data. The USGS coordinated this internship program in partnership with the National Park Service at Lake Clark National Park and Preserve. Plans are being developed to recruit more teens into the program as a way of encouraging Native Alaskans to pursue a college degree and to consider a career in science. Contact: Carol Woody, 907-786-3512, carol_woody@usgs.gov

**Alaskan Natives Learn the Science of Ecosystems.** In September 2002, students from Native Alaskan villages on the Alaska Peninsula attended a science field camp at Becharof National Wildlife Refuge. The U.S. Fish and Wildlife Service, the Bristol Bay Borough, and the Lake and Peninsula Borough sponsor the camp. The students were introduced to principles of ecosystem science and participated in a unique field experience. A USGS scientist instructed students in bear and caribou ecology, plant community mapping, animal tracking, and nature observation skills, and demonstrated lithic knapping (stone tool making), primitive fire-starting techniques, and the traditional uses of native plants. The Native community has strongly supported this outreach effort, which has stimulated considerable interest in the natural sciences among Alaskan Native students. Contact: Tom Smith, 907-786-3512, tom_smith@usgs.gov

**Yupik Students Assist in Biological Research.** USGS scientists in Alaska are continuing to enhance communication between government researchers and Native Alaskans. To demonstrate the kind of research being conducted, the USGS recruited 22 Yupik Eskimo students in 2002 to assist in a waterfowl study on the Yukon-Kuskokwim Delta. The students captured geese and swans and fitted them with leg bands and neck collars. Movements of these waterfowl are being monitored as part of a large, multi-year study to determine annual survival rates, migration pathways, and important staging and winter habitats. The year 2002 marks the 17th consecutive year of involvement by Alaska Native students from the Native village of Chevak in this project: More than 160 Native youths have participated in this program since 1986. This effort supports a regional need for information on the population biology of a species of interest to indigenous people, wildlife enthusiasts, and sport hunters. Contact: Craig Ely, 907-786-3512, craig_ely@usgs.gov

# Resource and Environmental Activities

# Resource and Environmental Activities

**Real-Time, Water-Quality and Quantity Data-Collection Network for the Maliseet Indians.** The USGS Maine Water Resources District is working closely with the Houlton Band of the Maliseet Indians to develop a real-time data-collection and data-dissemination network on the Meduxnekeag River in northeastern Maine. The Meduxnekeag River is an integral cultural resource for the Maliseet Indians as well as an important source of irrigation water for farmers in the predominantly agricultural watershed. In particular, the Tribe is concerned about the quality of the water and condition of riparian plants that are harvested on the riverbanks. Point and non-point sources of nutrients to the river appear to be contributing to algal blooms that have degraded the quality of the river, adversely affecting the habitat for aquatic and riparian organisms. The USGS is working with the Maliseet Indians to identify funding for the proposed work. Contact: Robert Lent, 207-622-8201, rmlent@usgs.gov

**Support for Passamaquoddy Water Management Plan.** The USGS Maine Water Resources District is working with the Passamaquoddy Indians to collect real-time streamflow information critical to the development of a water management plan for Tribal land in southeastern Maine. The watershed includes important blueberry barrens and Atlantic salmon habitat. Careful stewardship of the land requires accurate streamflow information. The USGS operated two streamflow gages in FY 2000-01 and is committed to long-term operation of one gage. Contact: Robert Lent, 207-622-8201, rmlent@usgs.gov

**Environmental Database for the Penobscot Nation.** As part of the contaminant study of the Penobscot River, the USGS Maine Water Resources District has developed an environmental database for use by the Penobscot Nation's Department of Natural Resources (PIN DNR). The PIN DNR conducts a variety of ongoing biological and water-chemistry studies on Tribal lands and the Penobscot River. The database will provide a systematic method of data storage, enabling the PIN DNR to consolidate their existing data and manage new data as they are collected. The database is capable of storing data on a variety of sample media and constituents. The database's open-ended design allows for future modification and additions as new constituents, agencies, and study areas are included in future studies. The database was presented at the Fifth Annual New England Tribal Environmental Conference, May 21-23, 2002, in Misquamicut, Rhode Island, and has been made publicly available. Several Maine Tribes (Maliseet, Passamaquoddy, and Penobscot) are currently using the database. Contact: Robert Lent, 207-622-8201, rmlent@usgs.gov

**Penobscot Indian Nation**. The USGS Conte Andadromous Fish Lab began an adult Atlantic salmon migration project on the Penobscot River in cooperation with the Penobscot Indian Nation (PIN) and the Maine AtlanticSalmon Commission. The PIN has treaty-reserved sustenance fishing rights in a large part of the watershed. Thus, the PIN has great interest in the ongoing efforts to restore Atlantic salmon to the Penobscot River, including improving understanding of the current migration success of adult salmon through the multiple fish ladder system. This project was driven by a document produced by the Maine Atlantic Salmon Commission's Technical Advisory Committee and reflects the PIN's input to that document. The Penobscot's interest in the passage rates, behavior, and performance of other migratory species such as alewives and American shad may influence the future direction of this project. Contact: Alex Haro (USGS), 413-863-3806, Alex_Haro@usgs.gov; Clem Fay (Penobscot Indian Nation), 207-827-7776, pinfish@penobscotnation.org

**Tribal Fisheries Restoration and Enhancement.** The USGS Great Lakes Science Center's Tunison Laboratory of Aquatic Science continued assisting Tribes in restoring and enhancing their fisheries. Tunison staff stocked 455 catchable rainbow trout, reared at the Tunison facility, in waters of the Onondaga Nation. Tunison scientists continued assisting The St. Regis Mohawk Tribe by examining the feasibility of restoring Atlantic salmon in St. Lawrence River tributaries. Salmon restoration activities included stocking 21,500 salmon fry in tributaries of the St. Regis and Little Salmon rivers and assessing survival through the fall. Survival of salmon fry was lower than in previous years, possibly due to drought conditions during summer. Over-winter survival of salmon was also lower than in previous years. The Environmental Division of The St. Regis Mohawk Tribe and Tunison Laboratory continue cooperating on a pilot project that focuses on the American eel

population in the St. Lawrence River. The project involves field collecting American eels, ecological assessments, and laboratory analysis of eel health and life history of this population. Tunison staff are also working with Mohawk Tribal groups along the St. Lawrence in New York, Ontario, and Quebec concerning river water level studies carried out under the International Joint Commission. Contact: James H. Johnson, 607-753-9391, ext. 30, james_h_johnson@usgs.gov

**South Florida Ecosystem Program, Internal Surface Water Flows.** As part of the Everglades Restoration Programs, the Army Corps of Engineers (ACE) and South Florida Water Management District (SFWMD) propose modified water deliveries to The Seminole Tribe of Florida, Big Cypress National Preserve, and other parts of Florida's interior. The proposal is intended to provide net flood protection and water delivery to agricultural lands as well as partial restoration of historic ecosystem conditions within the Seminole lands. A baseline of current data is needed to help determine the effects that proposed water delivery changes will have on Seminole lands. The USGS has installed and is obtaining data from strategically located streamflow gaging sites to help define future surface-water flow requirements and decompartmentalization efforts through the Comprehensive Everglades Restoration Program. Subsequent studies based on accurate flow calibrations generated by data from these sites may then be used by other agencies for computation of nutrient and other contaminant loadings in the canal system. Data from continuous flow gages, at selected impact points for interior basins, will also compliment the existing eastern flow canal discharge network and allow more accurately timed surface-water releases. USGS biologists are using the hydrological restoration of a wetland that had been drained for cattle pasture to test several hypotheses about the invasion of wetlands by non-native species, including methods that may discourage their use of such wetlands. Contact: Mitch Murray (USGS, water), 305-717-5827, mmurray@usgs.gov; Bill Loftus (USGS, biology), 305-242-7835 Loftus@usgs.gov; Craig Tepper (Seminole Tribe of Florida), 954-966-6300, ext. 1120, water@gate.net

**Mapping Bottom Substrates in the Detour Area of Northern Lake Huron.** The USGS Great Lakes Science Center's Lake Superior Biological Station completed a benthic mapping survey of near-shore habitats in the Detour region of Lake Huron for the Chippewa-Ottawa Resource Authority (CORA) in November 2001. Detailed data on depths and bottom substrate composition were provided in GIS (geographic information system) mapping format and will be used by CORA to better understand the relationships between nearshore habitat and spawning and rearing of lake whitefish and other commercially important food fish. An interesting result from the hydrographic survey was the realization that the data could be used to detect and map the distribution of aquatic vegetation and invasive zebra mussels. USGS scientists also generated overlays of CORA's fish sampling data in the final GIS product to facilitate future research by Tribal fishery biologists. This work was part of an ongoing inventory of near-shore aquatic habitats within the 1836 ceded territorial waters of lakes Superior, Huron, and Michigan. Previous mapping work for CORA was conducted by the Center in Whitefish Bay of Lake Superior. Since five Tribes in the upper Great Lakes region were given fishing rights within the 1836-ceded territorial waters, CORA has sought to protect these areas for sustainable commercial fisheries. CORA is particularly interested in near-shore habitats that are used for spawning and rearing of lake whitefish. Increasing development of shorelines for vacation homes and resorts potentially will have deleterious effects on the quality of near-shore spawning and rearing habitats. Understanding the relationship between habitat and the success of whitefish spawning and recruitment will provide Tribal natural resource managers with information needed to protect and enhance these areas for economically sustainable fisheries. Contact: Owen Gorman, 715-682-6163, owen_gorman@usgs.gov

**Juvenile Lake Trout Assessment in Keweenaw Bay.** The Great Lakes Science Center's Lake Superior Biological Station continues to cooperate with the Keweenaw Bay Indian Community in restoring lake trout stocks in Keweenaw Bay. The Community is concerned with low levels of reproduction and abundance of juvenile lake trout in lower Keweenaw Bay; a management plan was developed to restore that stock. The Center uses a research vessel to conduct bottom trawl assessments of fish communities of the lower Keweenaw Bay and adjacent management areas to assist the Community in evaluating the success of the lake trout restoration effort. From annual spring trawl assessments of the bay, the Center provides the following items to the Community's fishery biologists: catch data on stocked and wild lake trout, specimens of stocked lake

trout with imbedded coded wire tags, and comparisons of fish community composition in the Bay with that in nearby Lake Superior fishery management units. Contact: Owen Gorman, 715-682-6163, owen_gorman@usgs.gov

**Source-water Assessments and Protection Plans, Keweenaw Bay Indian Community.** In 2001, the USGS completed an assessment for the L'Anse, Michigan water supply as part of a 5-year cooperative agreement with the Michigan Department of Environmental Quality. The Keweenaw Bay Indian Community's (KBIC) Zeba Community lies immediately north of L'Anse and is in the same watershed. In November 2001, the USGS completed a source-water assessment for the Zeba Community water supply. In 2002, based on the results of the Zeba source-water assessment, KBIC asked USGS to complete an assessment of the ground-water supply at the Kawbawgam Road Community near Marquette, and to prepare source-water protection plans for both the Zeba and Kawbawgam Road Community water supplies. A cooperative agreement was implemented in FY2002 to conduct this work, and an assessment of the Kawbawgam Road supply was completed in September 2002. In FY2003, the USGS will prepare source-water protection plans for both supplies. Contact: Mike Sweat, 307-778-2931, ext. 2748, mjsweat@usgs.gov

**Ecosystem Reconstruction and Effects of Past Ecosystem Perturbations in Lac Courte Oreilles.** The purpose of this study was to reconstruct the Musky Bay ecosystem history and an additional site within Lac Courte Oreilles. The USGS Wisconsin Water Resources District project was completed in FY 2001 within lands of the Lac Courte Oreilles Band of Lake Superior Chippewa Indians. The project emphasized the possible effects of cranberry farming and shoreline development using the sediment record. Studies focused on the nutrient history (input and burial rates) that reflects management practices and possible watershed degradation. The modeled nutrient history was interpreted in concert with reconstructed algal (mainly diatom) communities preserved in the sediments. Another objective of the project was to search for possible cranberry farming characteristics in the sediment, including sulfur, uranium, and potassium associated with fertilizers, and copper associated with pesticides. Biogenic silica profiles provided complimentary data for algal community reconstructions. The sediment record is likely to preserve trends in nutrient biogeochemical cycling and ecosystem character over the last few hundred years, a timeframe that includes a background period and the period of cranberry farming. The project was completed with publication of a report in FY 2002: Fitzpatrick, F.A., Garrison, P.J., Fitzgerald, S.A., and Elder, J.F., 2003, Nutrient, Trace-Element, and Ecological History of Musky Bay, Lac Courte Oreilles, Wisconsin, as Inferred from Sediment Cores: USGS Water-Resources Investigations Report 02-4225. Contact: Faith Fitzpatrick, 608-821-3818, fafitzpa@usgs.gov

**Lake Sturgeon Enhancement in Menominee Waters.** The Menominee Reservation Lake Sturgeon Enhancement Committee, composed of personnel from the Menominee Indian Tribe of Wisconsin, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, and the USGS, is coordinating ongoing efforts to re-establish lake sturgeon in waters on the Menominee Reservation. One of these efforts involves evaluating success of stocking juvenile and fingerling lake sturgeon in Reservation impoundments. A USGS fishery biologist at the Upper Midwest Environmental Sciences Center provided training and assistance to Menominee employees in the implantation of sonic transmitters into juvenile lake sturgeon in Legend Lake near Keshna, Wisconsin. These efforts will help resource managers determine habitat requirements of stocked lake sturgeon in Reservation impoundments. In another part of the sturgeon restoration project, the USGS Leetown Science Center is continuing support for research on a spiral fish ladder by assessing the efficiency of this method for the passage of lake sturgeon and riverine fishes. Tests are continuing to evaluate whether the second loop of the spiral of the fish ladder adds to its usefulness. The Tribe is interested in determining whether two ladders are needed to get fish to their waters. The fish ladder project is supported by the Great Lakes Fishery Trust. Contact: Brent Knights (coordination), 608-781-6221, brent_knights@usgs.gov; Boyd Kynard (fish ladder), 413-863-3807, kynard@usgs.gov

**Ground Water and Water Quality of Lakes and Springs on Lands of the Grand Portage Band of Lake Superior Chippewa.** The USGS Minnesota Water District Office is delineating the direction of ground-water flow on lands of the Grand Portage Band of Lake Superior Chippewa. The Grand Portage Band will use the information to help them evaluate recharge areas of the Tribal water resources. Land use may particularly affect recharge areas. Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov

**Moose Population Dynamics, Northeastern Minnesota.** The USGS Minnesota Field Station of the Northern Prairie Wildlife Research Center is conducting moose research with the Minnesota Department of Natural Resources, the Fond du Lac Band of Lake Superior Chippewa, and the 1854 Authority. The objectives of the study are to determine survival rates of adult moose, causes of mortality, and to improve aerial surveying of the moose population. Twenty-four moose have been captured, fitted with radio-collars, and aerially radio-tracked once per week. From January 2002 to January 2003, four moose died of malnutrition, one was killed by wolves, and another was shot during the hunting season. The five non-hunting mortalities were all females. This information will help the Tribes and the State improve moose management by providing information critical to the long-term welfare of moose in Minnesota. Forty additional moose will be captured in FY 2003 to add to the population and replace the study animals that have died. Contact: Michael Nelson, 218-365-4505, michael_nelson@usgs.gov

Moose with radio collar. Photo by Brian Borkholder, Fond du Lac Resource Management Division

**Hydrologic and Lake Level Changes, Long Lost Lake, White Earth Band of the Minnesota Chippewa Tribe.** Long Lost Lake is a 480-acre land-locked lake, within the boundaries of the White Earth Indian Reservation. The lake is approximately 6 miles west of Lake Itasca, the source of the Mississippi River, in northwestern Minnesota. The water level (stage) of Long Lost Lake has risen approximately 20 feet since about 1990. Twelve Tribal residences, several roads, and 50 acres of Tribal lands are submerged, and thirty Tribal members have been displaced from their homes. The USGS Minnesota Water Resources District is working with the Tribe to document historical changes in the stage of Long Lost Lake to determine the cause-and-effect relationships that have resulted in increased lake stage, and to develop a general understanding of the hydrology of lakes that experience rapid and dramatic changes in lake stage. Climatological changes and human modifications within the watershed will be considered as potential contributing factors. This study also will develop the monitoring network needed to understand the hydrologic setting and hydrologic budget of the Long Lost Lake and information about the lake's setting relative to other lakes in the area. The study began in FY 2002 and is expected to conclude in FY 2005. Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov

**Water Resources Investigation for the Prairie Island Indian Community.** The Prairie Island Indian Community asked the USGS Minnesota Water District Office to conduct a bathymetric survey of Sturgeon Lake and to collect bottom sediment samples from the Lake. The Community is concerned about potential water quality effects of dredging of the lake for pleasure boat traffic. These investigations are expected to be completed in FY2005. Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov

**Lake Traverse Reservation Pesticide Management Plan Support.** The USGS South Dakota Water Resources District, in cooperation with the U.S. Environmental Protection Agency, compiled and analyzed data that will be used as part of the scientific basis for a Pesticide Management Plan being developed by the Sisseton-Wahpeton Sioux Tribe for their lands. Numeric and geospatial datasets included: pesticide concentrations in ground- and surface-water, precipitation, soil information, topographic data, geohydrologic features, land cover and use, and pesticide use in the area. Contact: Ryan Thompson, 605-352-4241, ext. 225, rcthomps@usgs.gov

**Flandreau Water Supply Assessment.** USGS hydrologists with the South Dakota Water Resource District compiled and summarized water-quality data in order to describe a water source for the Flandreau Santee Sioux Tribe and the Bureau of Indian Affairs Flandreau Indian School. USGS employees also collected water samples from selected ground- and surface-water sites relevant to an

aquifer that is a possible Tribal water source. The samples were analyzed for many compounds including emerging contaminants. The USGS studies found little evidence of widespread water-quality problems in the aquifer, which has been used to supply past and local water needs. In FY 2002, the report was completed and published as USGS Open File Report 02-074 by Bryan Schapp entitiled, "Reconnaissance-Level Assessment of Water Quality near Flandreau, South Dakota." Contact: Bryan Schaap, 605-352-4241, ext. 226, bdschaap@usgs.gov

**Water-Quality Monitoring of the Missouri River with the Yankton Sioux Tribe.** The Missouri River in southeastern South Dakota constitutes the southern boundary of the Yankton Sioux Reservation (YSR) and is a valuable resource to the Yankton Sioux Tribe as well as to the States of South Dakota and Nebraska. Several miles downstream from the western boundary of the YSR, the flow of the Missouri River is impounded by Fort Randall Dam to form Lake Francis Case. Downstream from Fort Randall Dam, the river is free-flowing for several miles until it contacts backwater from Lewis and Clark Lake. Thus, within the YSR boundaries, the Missouri River is both impounded as well as free flowing, which results in a diversity of habitat critical to numerous fish and wildlife species. Beginning in 2002, a water-quality monitoring program for the Missouri River within the YSR was initiated. The program consists of a cooperative effort between Yankton Sioux Tribe and the USGS South Dakota Water Resource District. Water-quality samples are collected six times per year at three different stations. The samples are analyzed for certain field-measured properties, major ions, nutrients, selected trace elements, and suspended sediment. The monitoring program is intended to be a long-term effort. Contact: Steven Sando, 605-352-4241, ext. 230, sksando@usgs.gov

**Hydrogeology of the Ogallala and Arikaree Aquifers for the Rosebud Sioux Tribe.** The Ogallala and Arikaree aquifers are important water resources for the Rosebud Sioux Tribe and are used extensively for agricultural, municipal, and domestic water supplies. Water-resource tools are needed to evaluate management and environmental issues such as planning for source-water protection, describing potential impacts of contamination, and estimating sustainable aquifer withdrawals. A numerical ground-water flow model of the Ogallala and Arikaree aquifers underlying the Rosebud Reservation has been developed, calibrated, and documented by USGS hydrologists from the South Dakota Water Resources District in cooperation with the Rosebud Sioux Tribe. A GIS interface for the model is currently being developed to aid the Tribe in using the model to test the effects of various hydrologic conditions such as drought or increased water use. Contact: Andy Long, 605-355-4560, ext. 237, ajlong@usgs.gov

**Rosebud Total Maximum Daily Load.** The USGS South Dakota Water Resources District and the Rosebud Sioux Tribe began a water-quality assessment in support of Total Maximum Daily Load (TMDL) development for the Little White River in Todd County, South Dakota. Parts of this study include compiling and reviewing historical data, sampling water-quality further define conditions of the Little White River and its tributaries, and analyzing and modeling selected data. The Rosebud Sioux Tribe will use the data and analysis to write a TMDL for the Little White River. Technology transfer, a major part of this project, will aid the Tribe with TMDL development for other-streams within its lands. Contact: Joyce Williamson, 605-355-4560, ext. 219, ewillia@usgs.gov

**Potentiometric Map for the Arikaree Aquifer Pine Ridge Reservation.** The USGS South Dakota Water Resources District, in cooperation with the Oglala Sioux Tribe, is conducting a study to map the potentiometric surface of the Arikaree aquifer. The potentiometric surface is the "hydraulic head," or upper surface, of an unconfined aquifer (in other words, the water table) or, on a confined aquifer it is the upper water surface in a well. The aquifer is present near the surface in approximately 80 percent of the Oglala Reservation and is the single largest source of ground water for the Tribe. The objective of this study is to provide the Oglala Sioux Tribe with a map depicting the potentiometric surface of the Arikaree aquifer and a compilation of well locations and construction information. The map will be used by several Tribal departments and could help identify the best locations for new wells, predict ground-water movement, and assess aquifer vulnerability to contamination. Contact: Allen Heakin, 605-355-4560, ext. 216, ajheakin@usgs.gov

**Water Quality on the Lands of the Prairie Band Potawatomi Nation.** Water quality is a major concern for the Prairie Band of Potawatomi Nation because creeks on their lands provide sources of subsistence hunting and fishing for Tribal members. Ground water is used in domestic wells on the reservation and is being considered

as a source for water supply as the Tribe develops its economic base. Surface water on Tribal lands has been sampled on a quarterly basis since June 1996 and two reports have been published as a result of this monitoring. In 2002, a ground-water component was added to the study and eleven wells completed on the reservation will be sampled on a yearly basis to assess ground water quality. Tribal personnel assist USGS scientists with the Kansas Water Resources District in collecting and preparing samples for analysis in conjunction with the water quality aspects of this study. As part of the capacity building, Tribal personnel have also attended training courses at the USGS National Training Center in Denver as well as training with USGS personnel on other water quality studies in the Kansas District. The study is scheduled to continue through 2004, with a cumulative interpretative report on the water quality of the Potawatomi lands to be released at the conclusion of the study. Contact: Heather Ross, 785-832-3575, hross@usgs.gov

**Historical Channel Change along Soldier Creek, Northeast Kansas.** In a cooperative study with the Prairie Band of Potawatomi Nation, USGS Kansas Water Resources District scientists analyzed information from eight USGS streamflow-gaging stations to assess historical channel change along Soldier Creek, northeast Kansas. At each gaging station, channel change was assessed using channel-bed elevation as the primary indicator. Changes in channel-bed elevation were inferred from changes in the stage associated with the mean annual discharge at each station. Other variables (channel width, channel area, and streamflow velocity) were used as additional indicators of change. Results indicated that the most substantial channel changes occurred downstream from Rocky Ford at the Soldier Creek streamflow-gaging stations located near Topeka and Delia. The available evidence indicated that the channelization of Soldier Creek, completed in 1961, was likely to be the primary cause of the channel changes at these locations. The decreasing base level provided by the Kansas River also may have been a contributing factor. At the Soldier Creek gaging station near Topeka, immediate effects of the channelization included a decrease in channel-bed elevation of about 5 feet and an increase in channel width of about 35 feet. The instability introduced by the channelization caused channel-bed degradation that moved upstream at the rate of about 0.7-1.2 miles per year. At the Soldier Creek gaging station near Delia, located about 12 miles upstream from the upstream end of the channelized section, channel-bed degradation began during the 1970s and resulted in a net decrease in channel-bed elevation of about 5 feet by 1999. The available evidence indicated that Soldier Creek at and upstream from Rocky Ford has not been substantially affected by the upstream-progressing channel-bed degradation as of 2001. In this part of the basin, other causes of channel change, such as land use and floods, may be relatively more important. A report on the study results is being prepared and will be available in FY 2003. Contact: Kyle Juracek, 785-832-3527, kjuracek@usgs.gov

**Effects of Past Mining on Aquatic Resources Important to Native Americans of Northeast Oklahoma.** The Tri-States Mining District, which comprises parts of Jasper and Newton Counties in Missouri, Cherokee County, Kansas, and Ottawa County, Oklahoma, was mined for lead and zinc for more than a century. Although mining has ceased, mine wastes remain distributed throughout the District and there is evidence of surface-water and ground-water contamination throughout the region. The Quapaw Tribe of Oklahoma and other Native American groups have expressed concern about health risks associated with the consumption of fish and other aquatic organisms from waters in the Tri-States District. Late in 2001, a study was initiated to determine the extent of metal contamination from historical mining on fishes and other aquatic organisms. USGS scientists collected fish and crayfish from selected locations in the Spring and Neosho River systems of northeast Oklahoma. Samples of crayfish are being analyzed for concentrations of lead, cadmium, zinc, and iron to identify important pathways of metal exposure in stream food webs and potential risks to Native American consumers of aquatic organisms. Fish and invertebrates were prepared for human consumption, as they would have been by Native Americans. Blood was obtained from each fish and analyzed for metals and for biochemical responses (biomarkers) indicative of exposure to and effects of lead and other toxic metals. Contact: Michael J. Mac, 573-876-1900, michael_mac@usgs.gov

**Trace Metals in Grand Lake of the Cherokees, Northeastern Oklahoma, for the Seneca-Cayuga Tribe.** The Seneca-Cayuga Tribe is concerned that trace metals from the Tri-State Mining District may transport contaminated sediments into the northern part of Grand Lake of

the Cherokees. Part of the Tri-State Mining District encompasses the EPA's Tar Creek Superfund Site, which covers an area of approximately 40 square miles; this area includes several tributaries of Grand Lake of the Cherokees. In April 2002, USGS Oklahoma Water Resources staff collected surface-water and bed-sediment samples at two locations determined by Seneca-Cayuga Tribe's environmental staff. Both samples were analyzed for concentrations of lead, zinc and cadmium. Elevated concentrations of the analyzed metals were detected in the water and bed-sediment samples. A summary of the data was prepared for the Tribe. Contact: Kyle Davis, 918-254-6651, kcdavis@usgs.gov

**Osage-Skiatook Petroleum Environmental Research Project.** USGS scientists are leading the Osage-Skiatook Petroleum Environmental Research (OSPER) Project in which research is being conducted to investigate the transport, fate, and biologic effects of produced water and hydrocarbon releases from oil production at two sites on Skiatook Lake, on the Osage Nation. Environmental research began in FY 2001 and continued in FY 2002 with geologic mapping, drilling of observation wells, geophysical surveys, microbial studies, and geochemical sampling of soils, bedrock, and ground and surface waters. This work focuses on the impacts of produced water and hydrocarbon releases from oil production on soils, ground and surface water and the ecosystems they support. Skiatook Lake serves as flood control, water supply, and a major recreational fishery in the Tulsa, Oklahoma, metropolitan area. Personnel from the Osage Nation Environmental and Resource Department participated in the field investigations. The USGS provided training to Osage Nation personnel on surface-water flow measurement and sampling methods. Collaborating partners include the Osage Nation, U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), Bureau of Indian Affairs, U.S. Army Corps of Engineers (ACE), University of Tulsa, Oklahoma State University, University of Oklahoma, and USGS research scientists from Oklahoma, Virginia, Colorado, and California. A field conference was held in September 2002 to review the early results of these field investigations. At this conference, an Osage Nation investigator presented results of a survey of surface water conductivity and chloride concentrations in streams entering Skiatook Lake. Conference attendees included personnel and managers from the USGS, the Osage Nation, the DOE, and the ACE. Contact: Jim Otton, 303-236-8020, jkotton@usgs.gov

**Availability of Water in Arkansas River Alluvial Aquifer, Osage Nation.** The USGS Oklahoma Water Resources District conducted a coopertive project with the Osage Nation that included using direct-push drilling, lithostratigraphic and hydrologic analysis, and water-quality sampling to evaluate the quantity and quality of water in alluvial and terrace aquifers along the Arkansas River in Osage County. Two Native American student hydrologists are conducting the project under USGS supervision as part of their Masters of Science program requirements for Oklahoma State University. Contact: Marvin M. Abbott, 405-810-4411, mmabbott@usgs.gov

Native American Graduate Students Shana Mashburn and Caleb Cope conducting drilling and sampling of the Arkansas River Alluvium, in cooperation with the Osage Nation, April, 2002. Photo by Marvin Abbott, USGS.

**Overview of Water Resources for the Wichita and Affiliated Tribes.** The USGS Oklahoma Water Resources District completed a study in cooperation with the Wichita and Affiliated Tribes on the surface and ground water, water use, availability, and quality in northern Caddo County and northwestern Grady County, Oklahoma. The study area covers about 900 square miles and extends from the Canadian River on the north to the Washita River on the south. The report will be published in FY 2003. Contact: Marvin M. Abbott, 405-810-4411, mmabbott@usgs.gov

**Monitoring of Nitrate and Pesticides for the Chickasaw Nation.** The Chickasaw Nation is concerned about potential contamination of groundwater by nitrate and pesticides leaching from cropland and pastures in their Tribal Jurisdictional Area. As part of a water-resource assessment, USGS Oklahoma Water Resources District staff, assisted by Chickasaw Nation Environmental staff, sampled 17 wells in south-central Oklahoma in August 2002 for water properties, nitrate concentration, and 86 commonly-used pesticides, at parts per trillion reporting limits. Only one well had a nitrate concentration exceeding the drinking water standard; 4 wells had detectable concentrations of organophosphate or triazine pesticides. A summary of the study is posted at http://ok.water.usgs.gov/chickasaw. Contact: Jason Masoner, 405-810-4407, masoner@usgs.gov

**Ground-Water-Quality Monitoring for the Fort Peck Assiniboine and Sioux Tribes.** Recent studies by the USGS in cooperation with the Fort Peck Assiniboine and Sioux Tribes identified two significant ground-water-quality problems: saline-water contamination and large nitrate concentrations in ground- water. Several studies identified more than 12 square miles of saline-water contamination in the East Poplar oil field. Another study found that nitrate concentrations were greater than the U.S. Environmental Protection Agency drinking water standard (10 mg/l) in ground water from more than 50 percent of wells completed in the Flaxville and underlying aquifers. Additional monitoring was needed to determine if the salt water plumes in the East Poplar oil field have migrated since the last sampling period (1993). Additional sampling was also needed to determine if nitrate concentrations vary seasonally or over longer periods of time. A long-term ground-water-sampling network was needed to determine changes in ground-water quality for these areas of concern. Wells in the East Poplar oil field and wells screened in the Flaxville aquifer were selected by the USGS in consultation with the Fort Peck Tribes for additional monitoring over a 3-year period. Wells selected in the East Poplar oil field were sampled annually to detect plume migration. Wells selected in the Flaxville and underlying aquifers were sampled quarterly to determine seasonal and temporal trends in nitrate concentrations. Data and interpretations will be published in a report. Contact: Joanna Thamke, 406-457-5900, jothamke@usgs.gov

**Northern Divide Grizzly Bear Project.** The USGS Northern Rocky Mountain Science Center in Montana, in cooperation with the Confederated Salish and Kootenai Tribes, the Blackfeet Nation, and Federal and State agencies, is leading a multi-year research project to determine the number of grizzly bears in the Northern Continental Divide Ecosystem of the United States. This project, requested by the Governor of Montana and supported by Senator Burns (MT), is expected to produce a scientifically valid estimate of the size of the grizzly bear population for the entire ecosystem. The study area is immense, encompassing 7.9 million acres from the Salish-Kootenai lands in the west to the Blackfeet Reservation lands in the east and from the Canadian border in the north to Montana Highway 200 in the south. Much of the project is on Tribal lands. Representatives from both Tribal governments have been actively involved in all stages of the planning process and will serve as project sub-area leaders. Contact: Kate Kendall (USGS), 406-888-7994, kkendall@usgs.gov; Dale Becker (Salish-Kootenai), 406-675-2700, ext. 1278 daleb@cskt.org; Dan Carney (Blackfeet), 406-338-2430, dcarney@3rivers.net

**Flood-Frequency at Gaged and Ungaged Sites in Montana.** Reliable flood-frequency information for streams is essential for design and operation of various water control structures such as dams, levees, and water-supply systems. In addition, reliable flood-frequency data are required for proper design of stream-crossing transportation structures, such as bridges and culverts, and for identification of flood-prone areas for land-use management and flood-insurance purposes. The USGS Montana Water Resources District is conducting this study in cooperation with the Confederated Salish and Kootenai Tribes, BIA, and State, and Federal. It is intended to update flood-frequency information for all gaged sites in Montana that have at least a 10-year record of unregulated flow record; it will use the updated flood-frequency information, together with geomorphic and climatic data compiled at each gaged site, to develop regional regression equations and a region-of-influence computer model for the estimation of flood-frequency at ungaged sites; and as well as a Web-based program to help users apply the estimation methods at ungaged sites. Contact: Charles Parrett, 406-457-5900, cparrett@usgs.gov

**Hydraulic Characteristics and Flood-Limit Delineation of the Jocko River on Part of the Flathead Reservation.** The objective of this cooperative project is to delineate the flood limits and hydraulic floodway for 100- and 500-year events for a 20-mile reach of the Jocko River from near Arlee, Montana, to the river's mouth near Dixon on the Flathead Reservation of the Confederated Salish and Kootanai Tribes. USGS hydrologists from the Montana Water Resources District surveyed channel-geometry (cross-section) data for the Jocko River and are using the data in a hydraulic model to calculate water-surface profiles and other hydraulic parameters such as flow area, conveyance, flow widths, mean flow depths, and velocities. The hydraulic data will be used to delineate the flood plain and floodway. Determination of hydraulic characteristics is a prerequisite to the delineation of flood limits and a hydraulic floodway for the 100-year flood. The 100-year flood is commonly used as a regulatory flood for flood-plain management and flood insurance purposes. Adoption of flood-plain management regulations for the Jocko River would enable land-use and fishery managers for the Salish and Kootenai Tribes to better plan and guide future development to minimize riverine impacts and would also enable citizens to purchase subsidized flood insurance. Contact: Charles Parrett, 406-457-5928, cparrett@usgs.gov

**Northern Cheyenne Tribe and Coalbed Methane.** In FY 2002, the Northern Cheyenne Tribe began a partnership with the USGS to core drill several Fort Union coal beds and evaluate the potential of coalbed methane resources on the Northern Cheyenne Reservation (NCIR). Coring was performed in conjunction with drilling seven wells to monitor water in the southern part of the Reservation. The Bureau of Indian Affairs, and the USGS Montana Water Resources District cooperatively supported the drilling project. Personnel from the USGS Central Region Geology Team, Bureau of Land Management, and the Northern Cheyenne Natural Resource Department collected coal cores from three wells and desorbed and measured gas on the drill site. Additional desorption was performed in USGS laboratories in Denver, Colorado. Retrieval of continuous cores of the coal beds, which include the Knobloch, Wall, Pawnee, and Flowers-Goodale coals, permitted gas desorption, adsorption (isotherm), gas composition (chemistry and isotopic), coal quality, and coal petrology analyses. The data will be used to estimate the gas-in-place resources on the Northern Cheyenne lands. This information is critical for the Northern Cheyenne Tribal Council to use in making policy decisions on the possible development of coalbed methane, especially with the onset of development off the Reservation. The information will also provide baseline data for determining the effects of gas drainage from future coalbed methane development off the Reservation. Contact: Romeo M. Flores (USGS-geology), 303-236-7774, rflores@usgs.gov; Mike Cannon (USGS-water), 406-457-5900, mcannon@usgs.gov; Jason Whiteman (Northern Cheyenne Tribe), 406-477-6503

From left: Floyd Fisher, Stephanie Whitegrass, Jason Whiteman (Northern Cheyenne Tribe), Patty Morrison (Department of the Interior), Art Clark (USGS), and Leland Pine (Northern Cheyenne Tribe) discussing coalbed methane development on lands of the Northern Cheyenne Tribe. Photo by Robert Davis, USGS.

**Water Quality Studies for the Southern Ute Indian Tribe.** The Southern Ute Indian Tribe has rights to 1/6 of the storage capacity of the Vallecito Reservoir and has supported water-quality investigations there with the USGS Colorado Water Resources District. The Vallecito Dam and Reservoir were constructed to furnish supplemental water to about 54,000 acres. The Vallecito Dam prevents the flooding of crops, farmland, and structures along the Vallecito River during spring runoff by storing the floodwater for controlled releases to benefit irrigation. The Southern Ute Tribe is supporting a USGS study that is characterizing current water-quality conditions in the Vallecito Reservoir watershed over five years beginning in 2000. These data will be used to establish a baseline of major ions, metals, nutrients, and dissolved oxygen concentrations in reservoir

inflows, in the reservoir itself, and in the reservoir outflow. Current conditions will form the baseline for comparisons with later years, to assess the affects of future population growth and land-use changes on reservoir water quality. Monitoring is planned to continue for 10 to 20 years after the initial 5-year characterization of existing water-quality conditions to determine water-quality trends. In June 2002, the Missionary Ridge wildfire completely burned areas of the Vallecito Reservoir watershed adjacent to the reservoir and, to a limited degree, the valleys of the two major inlets to the reservoir, Vallecito Creek and Los Pinos River. The Missionary Ridge wildfire also burned large areas adjacent to Los Pinos River downstream from the reservoir. The USGS, in cooperation with the Southern Ute Indian Tribe, will be collecting water-quality samples on a monthly basis from Vallecito Reservoir, its two inlets, and its outlet, monthly from April-October 2003 and analyzing the samples for dissolved major ions, total and dissolved metals, total and dissolved nutrients, and total and dissolved organic carbon. The water-quality data collected this year will be compared with pre-wildfire water-quality data collected since 2000 to 1) determine if a change in the seasonal distribution of the concentration of the measured parameters has occurred within Vallecito Reservoir, its inlets, and its outlet as a result of the Missionary Ridge wildfire, and 2) determine if a change in the trophic status has occurred in Vallecito Reservoir as a result of the Missionary Ridge wildfire. The USGS and the Southern Ute tribe will need to assess the changes in water quality measured this year to determine the sampling frequency needed in future years to assess the effects of this major disturbance on the long-term water quality of Vallecito Reservoir. Contact: Tony Ranalli, 303-236-4882, ext. 313, tranalli@usgs.gov

**Mapping Exotic Plants in the Southwest.** In conjunction with land managers, biologists at the USGS Forest and Rangeland Ecosystem Science Center's Colorado Plateau Field Station are developing a database on exotic plants in the Southwest. The database is an important regional tool for inventorying, monitoring, and sharing data on exotic (non-native) plant species that are invading the area. USGS scientists are gathering data on the plants and compiling it according to Federal standards. The database can also be used to generate maps of locations of the plants. The goals of this effort include developing and maintaining the Southwest Exotics Plant Database, maintaining a distribution system that integrates educational, management, and scientific information to aid in control of the exotic plant species, and facilitating a collaborative partnership among Tribal, Federal, State, and private land managers. Contact: Kathryn Thomas, 520-556-7327, ext. 235, kathryn_a_thomas@usgs.gov

**Geologic Framework of Rio Grande Basins, New Mexico.** The USGS is conducting geologic and geophysical studies to provide a framework for understanding aquifers in several critical ground-water basins along the Rio Grande, which extends from Colorado to Mexico. The current focus of this project is the Española ground-water basin in the greater Santa Fe, New Mexico, region, which includes lands belonging to the Pueblos of Cochiti, Nambe, Pojoaque, Tesuque, San Ildefonso, San Juan, and Santa Clara. A major project goal is to develop a three-dimensional geologic model of the ground-water basin that will eventually improve the understanding of ground-water flow and resources. The project includes geologic mapping in cooperation with the New Mexico Bureau of Geology and Mineral Resources and the University of New Mexico; geophysical mapping of the subsurface in cooperation with Los Alamos National Laboratory and the Summer of Applied Geophysics Experience educational program; investigations into how faults affect the aquifer system; and studies of geologic history to predict the distribution of underground aquifers. Geologic and geophysical maps of Pueblo areas provide information that aids in ground-water protection and assessment of water and other natural resources. In April 2002, the Rio Grande basins project hosted a workshop in Santa Fe to foster communication among scientists working in the Española basin and communicate the results of the studies to the 85 workshop attendees, several of whom were members of Pueblo Nations. Contact: Mark Hudson, 303-236-7446, mhudson@usgs.gov; Tien Grauch, 303-236-1393, tien@usgs.gov

**Consultation with Santa Clara Pueblo.** USGS scientists are working with the Forestry Department at the Santa Clara Pueblo in the Pueblo's development of an Integrated Resource Management Plan. The USGS scientists are participating in discussions of possible study designs for field data collection, as well as sharing protocols used by USGS social scientists to improve understanding of the relationships between people and the landscape. USGS research at the Cerro Grande burn, which occurred partly

on Pueblo land, has led to acquisition of satellite images and development of data in a geographicinformation system (GIS); all data and products are being provided to the Tribe. In addition, USGS scientists support the Pueblo's efforts to increase expertise in GIS, using global positioning systems (GPS) and remotely sensed data, by providing technical advice and assistance on request. Contact: Sandra Haire (USGS), sandy_haire@usgs.gov; Dave Lambert (Santa Clara Pueblo), dlambert@santaclarapueblo.org

**Geohydrologic and Water-Quality Assessment of the Pueblo of San Ildefonso.** The Pueblo of San Ildefonso needs geohydrologic and water-quality information to help care for the people of the Pueblo. To provide that information, the USGS New Mexico Water Resources District, in cooperation with the Pueblo's Department of Environmental and Cultural Preservation (DECP), is conducting a multi-year study to determine the surface- and groundwater quality, and characteristics of the Pueblo's water resources. The work is identifying environmental impacts to the geohydrologic system from internal and external sources. Resulting information will be used by the DECP as the basis for health risk assessments and potentially for establishing water-quality standards for the Pueblo. The cooperative project is also providing training for Pueblo of San Ildefonso staff in the collection of surface-water, ground-water, and water-quality data, and in basic interpretation of water-quality data. Contact: Dale Rankin, 505-830-7965, drrankin@usgs.gov

**USGS/Albuquerque Seismological Laboratory Seismic Test Facility Lease with the Pueblo of Isleta.** The USGS recently signed a 10-year lease with the Pueblo of Isleta for use of seismometer test tunnels and boreholes on Isleta lands, south of Albuquerque, New Mexico. The USGS Albuquerque Seismological Laboratory (ASL) has used these facilities since 1961 for low-noise testing of modern seismic instruments in support of global seismograph networks used for monitoring seismic activity worldwide. This site is notable for its low noise characteristics. Seismic equipment manufacturers want their instruments to be tested here as a key step in qualifying the instruments for use in seismic networks. The USGS/ASL also operates a standard Global Seismograph Network (GSN) station at this location, one of 120 such stations operating worldwide in more than 80 countries and islands. GSN stations support earthquake monitoring and research at the USGS National Earthquake Information Center, tsunami warning efforts by the National Oceanic and Atmospheric Administration, and monitoring efforts for the Comprehensive Test Ban Treaty. The Pueblo of Isleta and the general public receive occasional educational talks and presentations on how the seismic equipment functions for monitoring earthquakes. Contact: Charles R. (Bob) Hutt, 505-462-3201 bhutt@usgs.gov Additional information: http://aslwww.cr.usgs.gov
Live Seismograms: http://www.liss.org/

**Inventory of Vascular Plants and Vertebrate Animals.** In collaboration with the Navajo Nation, Ute Mountain Ute, and Southern Ute Tribes, USGS scientists from the Colorado Plateau Field Station initiated a comprehensive inventory of vascular plants and vertebrate animals in ten National Parks and National Monuments within and adjacent to Navajo and Ute Tribal lands. The purpose of the inventory is to document overall species diversity, collect data on distribution and abundance of rare species, and identify non-native, weedy species. Canyon de Chelly National Monument, Hubbell Trading Post National Historic Site, and Navajo National Monument include lands of the Navajo Nation. The USGS, National Park Service, and tribal cooperators conducted vegetation surveys in FY 2002 at Canyon de Chelly and Navajo National Monument. Amphibian, reptile, and mammal surveys were conducted at Mesa Verde and Yucca House. All of these projects will continue in 2003. Also, new inventory studies of birds and mammals will begin in 2003 on mammals and birds at Canyon de Chelly, Hubbell Trading Post, and Navajo National Monument. The southwest has been experiencing severe drought, and effects of this drought were evident in all aspects of the inventory during 2002. This still provides insight into the range of conditions seen in this part of the west, though more rainfall would increase plant and animal populations. Haskell Indian Nations University students assisted with mapping and vegetation description in FY 2002, and their participation is anticipated to continue in FY 2003. The studies provide students with hands-on experience in field research and technologies such as geographic information systems. Contact: Charles Drost, 928-566-7466 ext.233, charles_drost@usgs.gov

**Geo-Ecological Studies of Land Use, Climate Change, and Landscape Vulnerability on the Navajo Nation.** Work is underway to examine the history of land-use impacts in

the ecologically sensitive Hopi Buttes region of the Navajo Nation, and the relationships between human health and water quality in an environment with known uranium and arsenic contamination. Collaboration with offices and people of the Navajo Nation is crucial to the project, with the ultimate goal of providing information for education and community-based land-use planning. Research on separate aspects of the ecosystem includes bedrock geology, surficial processes, soil and water quality, plant ecology, as well as the history of human habitation. Geologic controls on water quality are being examined to outline areas where water of good quality can be found. Changes in surface stability and erosion and arroyo development are being examined with the aid of existing photographic records. Regional work on sand dune stability encompasses eolian deposits within the entire Navajo Nation. Recent drought years have resulted in reactivation of sand dunes, threatening agriculture and grazing, destroying one home and threatening others. The distribution of eolian deposits is being mapped and classified according to the amount and type of stabilizing vegetation. Dunes that are mostly active are closely associated with Russian Thistle (tumbleweeds), an invasive annual that requires minimal moisture to germinate. The relationship between dune mobility and vegetation may be altered due to the recent appearance of this plant, as it dies off and becomes detached during dry, windy periods. Vegetation mapping, repeat photography, and consultations with Navajo plant experts are providing information on conditions that promote the spread of invasive species. Presentations of this work have been given at a meeting of the Southwest Strategy Native Working Group and to the Arizona Geological Society. USGS scientists will be meeting with Tribal dignitaries from the U.S. and Canada to highlight work on the Navajo Nation in January 2003. This work will also be presented at the American Indian Science and Engineering Society's conference in April 2003, and at a workshop on Science and Native Communities to be held in Fairbanks, Alaska, in July 2003. Contact: Margaret Hiza (project leader), 928-556-7366, mhiza@usgs.gov; Kathryn Thomas (vegetation studies), 520-556-7466, ext.235, Kathryn_a_Thomas@usgs.gov Additional information: http://climchange.cr.usgs.gov/hopibuttes/

**Drought, Land Use, and Sand Movement, Navajo Nation.** Sand dunes cover extensive areas (approximately one-third) of the 70,000 km$^2$ Navajo Nation. Assessment of dune fields, combined with meteorological data, indicates that specific regions of the Navajo Nation are especially susceptible to dune reactivation. Reactivation of stabilized sand is occurring in many areas. Dune mobility can lead to transportation problems, lower air quality from periodic dust storms, and possible contributions to the loss of native plants and grazing land. Reactivation of sand dunes as a result of the current drought has serious consequences for human and animal populations, agriculture, grazing, and infrastructure. Areas covered with dunes and sand sheets have been mapped and classified according to present conditions of stability/mobility. These areas are evaluated by comparison to parameters of the dune mobility index (precipitation /evapotranspiration), variations in summer versus winter precipitation, grazing practices, and the type of vegetation cover. This evaluation provides information on the processes responsible for initiation of eolian sand movement, including controls from source sediment availability, climate, vegetation, and land use. The mapped distribution of sand dunes, in conjunction with meteorological information, provides data to the Navajo Nation for drought mitigation and emergency management. The drought of 2002 was the most severe in the past 1450 years and caused the deaths of more than 20,000 cattle and sheep. Navajo Nation officials are using information from USGS research to identify the most crucially sensitive areas that have been and will be impacted by the ongoing drought and by including this work in the Navajo Nation Drought Mitigation Handbook. Information on dune stability and susceptibility produced from this study is also of value to Navajo Chapter grazing officials who are in the process of evaluating grazing guidelines. Contact: Margaret Hiza, 928-556-7366, mhiza@usgs.gov

**Black Mesa Monitoring Program.** The N aquifer is the major source of water for the 5,400-square-mile Black Mesa area of northern Arizona. The Hopi Tribe and Navajo Nation use N-aquifer water for municipal purposes and Peabody Western Coal Company uses N-aquifer water to operate a coal-slurry line. The USGS has been conducting a monitoring program in the Black Mesa area since 1971 to document long-term effects of ground-water pumping. The USGS Arizaona Water Resources District is monitoring ground-water levels, discharge, chemistry and withdrawals, along with streamflow, on an annual basis in cooperation with the Hopi Tribe, the Navajo Nation, the Bureau of Indian Affairs, the State of Arizona, and Peabody Coal Company. In addition to hydrologic

monitoring, the USGS has used simulations of the N aquifer to evaluate the effects of ground-water withdrawals. A numerical model of the N aquifer developed in 1988 has been used to simulate effects of withdrawals up through 2051. The performance and sensitivity of that model were recently analyzed and results were published in 2002. The performance analysis demonstrated how well the model has simulated 15 years of new water-level data (1985-99). The sensitivity analysis showed limitations of the model and determined relations among the model parameters, observation data, and simulated values. Contact: Blakemore E. Thomas, 928-556-7255, bthomas@usgs.gov

**Geochemical Analysis of Ground-Water Ages, Recharge Rates, and Hydraulic Conductivity of the D Aquifer, Black Mesa.** The N aquifer is the most heavily used aquifer for water supply in the Black Mesa area of northern Arizona by both the Hopi Tribe and the Navajo Nation. Concern exists that increasing withdrawals of water from the N aquifer to slurry coal will cause excessive declines in water levels or will cause poor-quality water from the overlying D aquifer to infiltrate the N aquifer. (The D aquifer overlies the N aquifer in the Black Mesa area.). The USGS Arizona Water Resources District continues characterizing the ground-water geochemistry of the D aquifer through the use of naturally occurring inorganic constituents and stable and radio isotopes. Differences in geochemical signatures between the D and N aquifers will help determine whether leakage is occurring to the N aquifer from the overlying D aquifer as a result of pumping ground water from the N aquifer. D aquifer geochemistry will also be used to estimate ground-water age and recharge regimes in comparison to the N aquifer. Water users in the Black Mesa area, including the Hopi and Navajo, will use the information from this study to make informed decisions on how best to manage available water resources. Contact: Margot Truini, 520-556-7352, mtruini@usgs.gov

**Golden Eagle Studies.** USGS staff from the Snake River Field Station in Idaho cooperated with the U.S. Fish and Wildlife Service (USFWS) and indirectly with Tribes regarding golden eagles. The USFWS implements the Federal Indian trust responsibility for contacts with Tribes involving protected species and the taking of those species by Native Americans for ceremonial uses. Contact by USGS staff with the Hopi Tribe and Navajo Nation was limited by legal circumstances. USGS staff recommended to USFWS basic demographic research and aerial surveys for monitoring western golden eagle status. Contact: Mark Fuller, 208-426-4115, mark_fuller@usgs.gov

**USGS Evaluates Riparian Habitat for Navajo Nation.** In May 2002, a research ecologist from the USGS Southwest Biological Science Center traveled to Canyon de Chelly, Arizona, to meet with staff of the Navajo Nation to discuss an upcoming saltcedar/Russian olive removal demonstration project within the Canyon de Chelly National Monument. The USGS scientist visited the demonstration site to evaluate whether the riparian habitat there might be suitable habitat for the endangered southwestern willow flycatcher. The possibility of expanded willow flycatcher surveys for National Monument projects was also discussed. Contact: Mark Sogge, 928-556-7466, ext. 232, mark_sogge@usgs.gov

**Aquifer Sensitivity on Navajo Nation Lands and Ground-Water Vulnerability to Pesticide Contamination on the Navajo Indian Irrigation Project.** This cooperative study between the USGS New Mexico Water Resources District and the Navajo Nation determined the sensitivity of aquifers to impacts from activities occurring on the overlying land surface, and estimating the effects of irrigated agriculture and attendant pesticide use on ground water underlying the Navajo Indian Irrigation Project. GIS coverages were developed that describe recharge areas, areas of unconsolidated deposits, soil hydrologic group, topography, and precipitation. The aquifer sensitivity assessment consisted of combining these coverages and interpreting the results. The assessment of ground-water vulnerability to pesticide contamination on the Navajo Indian Irrigation Project consisted of combining the results of the aquifer sensitivity assessment with pesticide leachability ratings for each pesticide used during 2000. Leachability ratings were estimated on a field-by-field basis. The study results were published in 2002, as Water Resources Investigations Report 02-4051, entitled "Assessments of Aquifer Sensitivity on Navajo Nation and Adjacent Lands and Ground-Water Vulnerability to Pesticide Contamination on the Navajo Indian Irrigation Project, Arizona, New Mexico, and Utah." Contact: Paul Blanchard, 505-830-7947, pblanch@usgs.gov

**Air Quality on the Navajo Nation.** Indoor air pollution is hypothesized to contribute significantly to severe respiratory disease on the Navajo Nation. The source of this pollution may be residential coal burning for heating and

cooking, and ambient air pollution resulting from indus trial coal burning in large power plants. USGS geologists have proposed a 3-year study entitled, "Relationship of Indoor and Ambient Air Quality to Respiratory Diseases in the Navajo Nation," to examine this issue in an epidemiological framework. The study would use geochemical analytical techniques to characterize the coal in the Shiprock Chapter of the Navajo Nation. Navajo students would participate in the project and USGS scientists would work closely with Navajo Nation Environmental Protection Agency personnel. Seeking final approval to proceed with the project, a USGS investigator, along with collaborators from the Navajo Nation's Uranium Education Program, will present the proposal before the Navajo Nation's Institutional Review Board in FY 2003 in Window Rock, Arizona, capital of the Navajo Nation. Contact: Bob Finkelman, 703-648-6412, rbf@usgs.gov

**Coal Health, and the Navajo Nation.** Domestic use of coal for heating and cooking has led to human health problems in many parts of the world. USGS geologists have documented the effects on health of domestic coal use as well as environmental concerns of industrial coal use in foreign countries. Many families on the Navajo Nation use coal domestically, and live near and may work in coal mines and coal-burning power plants. USGS scientists are interested in collaborating on an epidemiological study of the Navajo Nation to examine those health effects. The primary issue is assessing the health impacts of residential coal combustion on Navajo lands. A secondary issue is the environmental impact of coal-burning power plants near the reservation. As part of their project development, USGS scientists presented several workshops at the Navajo Nation's Diné College and for the Navajo Nation's Uranium Education Program. These activities were well received and a team of local geologists, atmospheric scientists, and epidemiologists are working with the USGS on the project. The USGS is preparing a proposal to the Indian Research Council to obtain permission for the study of the Shiprock area. Contact: Bob Finkelman, 703-648-6412, rbf@usgs.gov

**Parasites of Native and Non-Native Fishes in the Lower Little Colorado River.** Scientists from the USGS National Wildlife Health Center studied parasites in fishes in the lower 21 km of the Little Colorado River, Grand Canyon, Arizona, an area administered by the Navajo Natural Heritage Program (Navajo Nation) and the National Park Service (Grand Canyon National Park). Fish populations were sampled by the USGS in FY 2000 and FY 2001. In FY 2001, a total of 1,235 fish representing seven species (all four native and seven non-native species) were captured and examined for internal parasites. Results from both years indicate that between 50-60 per cent of the endangered humpback chub (Gila cypha) were infected with the Asian tapeworm (Bothriocephalus acheilognathi). Such infections can cause disease and retard growth. The disease could be severe enough to cause mortality. A reduced growth rate could increase the time that fish are susceptible to predation and also cause the fish to be small when they enter the main stem of the Colorado River during monsoon season. Smaller fish do not survive as well as larger fish in the cold waters of the main stem. In addition, zooplankton (critical to tapeworm transmission) were collected, identified, and counted. Temperature was monitored in various tributaries of the Little Colorado River to evaluate environmental conditions involved in the transmission of the tapeworm. Laboratory infections of bony-tailed chub, a surrogate for the endangered humpback chub, were initiated in FY 2001 and completed in 2002. These experiments were designed to assess the impact of the Asian tapeworm on fish growth, body condition, and ability to withstand thermal stress. The results indicate that the tapeworm did affect growth, causing infected fish to grow more slowly. Other parameters such as body condition and affects of thermal stress were not significantly different than control fish. Contact: Rebecca Cole, 608-270-2468, rebecca_cole@usgs.gov

**Vegetation Surveys on Native Lands.** The USGS Colorado Plateau Field Station's vegetation team is developing land cover map products for most of Arizona and some surrounding areas. As part of the USGS Southwest Regional GAP project's regional conservation assessment of biota, a land cover map of the southwest is being developed. With Tribal permission, USGS scientists conducted vegetation surveys on the Navajo Nation, San Carlos Tribal lands, and Hualapai Tribal lands in FY 2002. Tribal governments will be involved in the land cover mapping process by reviewing the draft map and will be given results and products of the overall project. Accuracy assessment of the draft land cover maps is planned for the summer of 2004. Contact: Kathryn Thomas, 928-556-7327, kathryn_a_thomas@usgs.gov

**Terrestrial Monitoring.** The Grand Canyon Monitoring and Research Center is leading a project in Grand Canyon National Park to monitor and evaluate the effects of water releases from Glen Canyon Dam on terrestrial resources. The Hopi Tribe, Hualapai Tribe, and the Southern Paiute Consortium participated in a project by providing Tribal input to USGS biologists and participating in monitoring activities. FY 2002 was the second year of the project, which is planned to continue for three years. In FY 2003, the Navajo Nation and the Pueblo of Zuni will be offered the opportunity to begin participating in the project. Contact: Ruth Lambert, 928-556-7285, rlambert@usgs.gov

**Geoenvironmental Effects of Glen Canyon Dam.** The environment in Grand Canyon has been affected by Glen Canyon Dam. The USGS is collaborating with other researchers to provide information for policy decisions concerning the management of water flow from Glen Canyon Dam. Under the post-dam flow regime, which limits floods and impounds sediment, sandbars have degraded, campsites and riparian habitat have been lost, and species have become endangered. Congress passed the Grand Canyon Protection Act, requiring the Bureau of Reclamation to alter discharge from the dam to enhance the environment downstream in Grand Canyon National Park. Representatives of seven Tribes or Pueblos (Havasupai, Hopi, Hualapai, Navajo, San Juan Southern Paiute, Southern Paiute Consortium, and Zuni) are among more than two dozen stakeholders who participate in the Adaptive Management Program or regularly receive reports on the progress of this project from USGS Coastal and Marine Team and the Grand Canyon Monitoring and Research Center. The USGS has provided marine survey technology including side-scan sonar, rotating sonar, seismic reflection profiling, and underwater video equipment. USGS scientists are interpreting sedimentary structures to provide explanations for sediment transport, particularly for use in determining sediment transport prior to the dam, and developing new approaches to sediment-transport modeling. Contact: David Rubin, 831-427-4736, drubin@usgs.gov

**Geologic Mapping at Pipe Spring National Monument.** A three-year project was begun to conduct geologic mapping of the Pipe Spring National Monument west of Fredonia, Arizona, and the surrounding the lands of the Kaibab Band of Paiute Indians. The mapping includes four USGS 7.5' quadrangles and encompasses the western two-thirds of the Kaibab Paiute Indian Reservation. This USGS project is being conducted from FY 2002 through FY 2004 in association with National Park Service hydrological studies and in cooperation with the Kaibab Band of Paiute Indians. The geologic map will provide baseline geologic data for this part of the Uinkaret Plateau in northern Arizona in support of USGS/National Park Service hydrological studies involving Pipe Spring National Monument, the Kaibab Paiute Tribe, and the town of Moccasin, a private community of about 200 that is surrounded by Tribal lands. All three land-managing agencies have a limited water source that all must share and use. The geologic mapping is also in conjunction with USGS seismic profile studies and USGS Water Resource studies structured to reach a common goal: a better understanding of the water resources of this unique and historical area of the Arizona Strip. Contact: George Billingsley, 928-556-7198, gbillingsley@usgs.gov

**Verde River Headwaters Aquifer Framework Study.** The objectives of this project were to collect geophysical and geochemical data and use those data to delineate major flow paths, determine rates of travel, and accurately measure relative source contributions from Big and Little Chino Basins to perennial springs in the Upper Verde River. The springs provide water for downstream water users (including the Yavapai-Prescott Indian Tribe in Verde Valley) and sustain riparian habitat for abundant wildlife, including several native fish species such as the threatened spikedace minnow (Medafulgida). This project was funded by the Arizona Water Protection Fund, which is administered by the Arizona Department of Water Resources. The project had three technical components. First, the latest advancements in airborne geophysics were used to identify subsurface features that serve as conduits or obstacles to ground-water movement. Second, water chemistry, including isotopes, was used to determine major ground-water flow paths and to determine the age and travel time of the ground water. Last, project personnel conducted a tracer dilution study to determine the contribution of base flow from multiple spring networks in the upper Verde River. The product of this study will be technically reliable information on ground-water flow paths, ground-water travel times, and relative contributions from different aquifer sources. The data for the project have been collected and study results are being prepared. Ground-water modelers and water-resource managers in the Prescott Active Management Area, Yavapai County,

and the Verde River Watershed need study results to oversee the resource more accurately. Contact: Laurie Wirt, 303-236-2492, lwirt@usgs.gov

**Hydrogeologic Study of the Upper and Middle Verde River Watershed, Arizona.** The population of Yavapai County, Arizona, is growing rapidly, resulting in an increased demand on water resources in the upper and middle Verde River watershed. The watershed contains a thriving riparian zone and is the primary water supply for the county, as well as for large populations further downstream, including the Yavapai-Prescott Indian Tribe and the Fort McDowell Yavapai Nation. The hydrogeologic system in the watershed has not been comprehensively studied, and the effects of historic and present development on regional water resources are poorly understood. Beginning in 2001, this study was funded by the Yavapai County Water Advisory Committee to improve hydrologic and geologic information. This 3-year effort will use geophysical and geologic methods to better define the geometry of and internal structures in the basins and the composition and architecture of the basin fill. As part of the study, USGS personnel will establish and operate a microgravity network to measure changes in ground-water storage. Precipitation and streamflow data will also be collected from new rain gages and a new stream gage on a tributary to Big Chino Wash. USGS scientists will collect and analyze ground-water samples to help delineate ground-water flow paths, and conduct surface resistivity surveys to delineate the thickness and extent of alluvial sediments in selected reaches of the Verde River. All of these investigations will produce data that can be directly used in the regional hydrogeologic investigation and will provide parameters for the conceptual model of the system. A new open-file report describes the geophysical data. The reference is Langenheim, V.E., Hoffmann, J.P., Blasch, K.W., Dewitt, Ed., and Wirt, Laurie, 2002, Preliminary Report on Geophysical Data in Yavapai County, Arizona: U.S. Geological Survey Open-File Report 02-352. The report is available on the Web at http://geopubs.wr.usgs.gov/open-file/of02-352/ Contact: Victoria Langenheim, 650-329-5313, zulanger@usgs.gov or John Hoffman, 520-670-6671, ext. 265, jphoffma@usgs.gov

**Copper Mines Under Review.** Ground-water withdrawals associated with two new copper mines proposed for southern Arizona has the potential to affect existing water rights and water supplies of the area. At the request of the Secretary of the Interior, the USGS Arizona Water Resources District is working with the Bureau of Land Management (BLM) and Bureau of Indian Affairs (BIA) on a plan to monitor impacts to the ground-water system caused by mine-related pumping. The USGS is also providing technical expertise to develop a mitigation strategy. The proposed project could affect the claims to water of the Gila River Indian Community and the San Carlos Apache Tribe, for whom the Federal government has trust responsibilities. At a meeting in June 2002, representatives of the USGS, BLM, the Gila River and San Carlos Tribes, and the BIA discussed USGS recommendations on specific components of the plan. Contact: James G. Brown, 520-670-6671, ext. 280, jgbrown@usgs.gov

**Vegetation and Animal Population Monitoring Program at ´Ahakhav Preserve.** The USGS Colorado Plateau Field Station is providing assistance to the Colorado River Indian Tribes (CRIT) in a vegetation- and animal- population monitoring program to assess the progress and success of riparian restoration projects on the ´Ahakhav Tribal Preserve belonging to the CRIT near Parker, Arizona. This work has included overall design of the monitoring protocols for vegetation, amphibians, reptiles, and mammals, as well as assistance on preliminary fieldwork for the monitoring. USGS scientists, working in coordination with CRIT personnel, have completed the population monitoring protocols and sampling of sites. The monitoring program will provide information on changes in vegetation and animal populations' response to riparian restoration efforts carried out on the ´Ahakhav Tribal Preserve, along the Colorado River near Parker. The monitoring sites and protocols cover vegetation, amphibians, reptiles, and mammals. Contact: Charles Drost, 928-566-7466, ext. 233, charles_drost@usgs

**White Sturgeon Habitat Simulations to Assess the Feasibility of Enhancing Spawning Substrate in the Kootenai River.** In 1999, the USGS Idaho Water Resources Disctrict, in cooperation with the Kootenai Tribe of Idaho, began examining Kootenai River white sturgeon spawning substrate habitat to evaluate the feasibility of various recovery actions on improving substrate conditions in Kootenai River white sturgeon spawning areas. The Kootenai River Sub-Basin is an international watershed that encompasses parts of British Columbia, Montana, and Idaho. The Kootenai River is the second

largest tributary to the Columbia River. During the last 80 years, the hydraulic, sediment transport, and substrate characteristics of the Kootenai River have been altered as a result of the construction of Libby Dam, dike construction, and wetlands drainage. The operation of Libby Dam has altered the river ecosystem, resulting in the decline of many resident fish populations including the Kootenai River white sturgeon (listed as an endangered species in 1994). One limitation to white sturgeon spawning success may be the change from the natural fluctuations in flow and sedimentation in sturgeon spawning areas resulting from the operation of the dam. To aid in white sturgeon recovery efforts, the USGS has been conducting studies to characterize bed-sediment conditions in the Kootenai River, including 30 kilometers of seismic sub-bottom profiles in and beyond the spawning reach, 3.5-meter cores of river bottom sediments at 30 locations within the spawning reach, and sampling sediment from the riverbed. Data from these studies were integrated with data defining pre- and post-dam water-surface and riverbed elevations and the river's sediment load to develop a conceptual model describing the sedimentation history of the spawning substrate habitat. The integrated analysis helped characterize how sedimentation processes in the river have changed over time and whether changes have affected the quality of the habitat area as it relates to spawning conditions. During FY 2002, the USGS, with assistance from the U.S. National Geodetic Survey and the Canadian Geodetic Survey, collected global satellite positioning survey (GPS) data at benchmarks along the Kootenai River from Libby Dam, Montana, to Kootenay Lake in British Columbia, including the white sturgeon spawning reach along the Kootenai Tribal Lands in Idaho. These benchmarks are reference points for detailed mapping of the bathymetry and levees of the Kootenai River. During the summer of 2002, USGS scientists mapped the bathymetry throughout the white sturgeon spawning reach. Since April 2002, the USGS has collected numerous suspended-sediment samples from the river's water column at the upstream and downstream extents of the spawning reach and at the mouths of the two tributaries in this reach. Suspended-sediment samples were collected during the two large snowmelt runoff events that took place during the spring of 2002. Sediment samples from the riverbed also were collected throughout the spawning reach. Streamflow velocity and discharge were monitored intermittently at various locations in this spawning reach. These data will be used to develop and calibrate one-dimensional and multidimensional digital models that simulate streamflow and sediment transport. The sediment transport models will identify sedimentation characteristics under various flow regimes and help evaluate the feasibility of various recovery actions on improving substrate conditions in sturgeon spawning areas. Contact: Gary Barton, 253-428-3600, ext. 2613, gbarton@usgs.gov

**Mining Contamination.** From 1998 through 2002, geologists in the USGS Western Mineral Resources Spokane Field Office have worked in cooperation with the Coeur d'Alene Tribe to make digital geologic and geochemical maps of the floodplain of the Coeur d'Alene River valley. Sediments containing high concentrations of lead and associated heavy metals (in forms that are bio-available and bio-transferable) cover most of the floodplain. USGS maps and reports demonstrate the distribution, character, and quantity of lead-rich sediments on the floodplain. These maps and reports have been used in support of a Natural Resource Damage Assessment, and an environmental-damage lawsuit filed by the Coeur d'Alene Tribe (and joined by the U.S. Departments of Interior and Justice) against mining companies. The Companies released large volumes of lead-rich tailings into upstream tributaries between 1886 and 1968. Frequent floods continue to transport lead-rich sediment, eroding from the bed and banks of the river and its tributaries, down-valley and onto the floodplain. In 2002, the USGS completed a report on rates of sedimentation and lead deposition on the floodplain during a series of time-stratigraphic intervals that span mine-tailings disposal history, from before 1886 to about 1993. This report, which includes estimates of background, historic, and baseline rates of sedimentation and lead deposition in representative depositional settings on the floodplain, has important implications for alternative remediation strategies being considered by the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service, as well as for Coeur d'Alene Lake management strategies being considered by the Coeur d'Alene Tribe and the States of Idaho and Washington. Contact: Art Bookstrom, 509-368-3119, abookstrom@usgs.gov

**Western U.S. Phosphate and the Shoshone-Bannock Tribes.** The eastern half of the Fort Hall Reservation,home of the Shoshone-Bannock Tribes and part of the Southeast Idaho Phosphate Resource Area in the Western Phosphate Field, is included in the study area of the USGS project

"Geologic and Geoenvironmental Studies of the Western Phosphate Field." Although the project was initially focused on evaluating the resource potential of the region, research efforts have been extended to include multidisciplinary geoenvironmental studies of selenium and other potentially toxic elements. Selenium, an element released from phosphate waste piles, has had a detrimental effect on local livestock. The study area includes the Gay Mine, one of the largest open-pit mines in southeastern Idaho. The mine was operated by commercial entities on the Shoshone-Bannock lands from 1946 to 1993. The site now consists of numerous mine pits, waste dumps, and mill shale piles spread over an area of nearly 25 square miles. After initial contacts and meetings with the Bureau of Indian Affairs (BIA) and the Tribal Land Use Committee, USGS staff visited the Gay Mine site, and conducted geologic mapping to support resource estimates for the Chesterfield Quadrangle. Samples were also collected for chemical and petrographic analysis. In fiscal years 2000-2002, staff from the BIA and the USGS participated in regular meetings of the Interagency Area-Wide Technical Group and the SeleniumWorking Group Advisory Committee. This project was completed in FY 2002. Contact: James R. Hein, 650-329-5287, jhein@usgs.gov

**Salmonid Genetics.** Biologists at the USGS Alaska Science Center are researching the genetic population structure of Lahontan cutthroat trout, in collaboration with the U.S. Fish and Wildlife Service. The scientists are examining the genetics of Snake River steelhead for the State of Idaho. Results of this research will have significant implications for Tribes that comprise theNevada Indian Fish Commission and other Tribes in the interior of the Great Basin. Project results were published as: Nielsen, Jennifer L. and George K. Sage, 2002, "Population Genetic Structure in Lahontan Cutthroat Trout," Transactions of the American Fisheries Society, 131:376-388. Contact: Jennifer Nielsen, 907-786-3512, jennifer_nielsen@usgs.gov

**Cui-ui in Pyramid Lake, Nevada.** The cui-ui is an endangered fish of the sucker family that is found only in Pyramid Lake, Nevada. The Pyramid Lake Paiute Indians and other Northern Paiutes historically relied upon annual spawning runs of cui-ui for food. Since the Tribe controls use of Pyramid Lake and fully supports efforts to restore the cui-ui population, the Tribal Council has passed resolutions prohibiting harvest of cui-ui by non-Indians and Tribal members. The USGS is continuing studies of the population dynamics and reports results to the Tribal Chairman. Adult cui-ui are netted at the south end of Pyramid Lake in the spring and are marked to determine the mortality rate. Fish are recaptured in the fall at selected stations around the lake to determine juvenile population size and estimate mortality over the summer. Contact: Gary Scoppettone, 702-784-5451, gary_scoppettone@usgs.gov

**Fallon Basalt Aquifer.** The Fallon Paiute Shoshone Tribe, the U.S. Navy, the Bureau of Reclamation, and the Nevada Division of Water Resources are cooperating with the USGS Nevada Water Resources District on a study to better define sources of water, controls on its use, and the water quality in the Fallon Basalt Aquifer. This aquifer is the sole source of drinking water for the Fallon Paiute Shoshone Tribe, the City of Fallon, and the Fallon Naval Air Station. The Fallon Tribe is contributing data and funding to the project and is providing access to Tribal lands for this study. Work on the Fallon Basalt Aquifer study is progressing, with a report on in-situ arsenic treatment recently published as a book chapter "In Situ Arsenic Remediation in a Fractured, Alkaline Aquifer" by Alan H. Welch, Kenneth G Stollenwerk, Douglas K. Maurer, and Lawrence S. Feinson, in a book titled "Arsenic in Ground Water, Geochemistry and Occur-rence," Alan H. Welch and Kenneth G. Stollenwerk, eds., Kluwer Academic Publishers, Boston, 2003. A report summarizing work on the potential for conjunctive use in the basalt aquifer has been drafted. That summary discusses potential geochemical reactions from injection of surface water into the basalt aquifer. This report will be published as a USGS Water Resources Investigation Report (WRIR) in 2003. A new study has begun to determine the potential for formation of chlorination by-products from injection of treated surface water into the basalt aquifer. A summary of the results of USGS chlorination by-products work is expected to be published as a USGS Fact Sheet in 2004. In addition, work to characterize the basalt aquifer by drilling deep test holes is continuing. Four holes have been drilled, with the final, fifth hole to be completed once sufficient funding is obtained from either from the Bureau of Reclamation or the Fallon Naval Air Station. Available data will be compiled in a report summarizing the deep test drilling. Remaining work includes developing a numerical groundwater flow model and a final report. Contact: Douglas Maurer, 775-887-7631, dkmaurer@usgs.gov

**Susceptibility of Pacific Salmon to Infectious Salmon Anemia Virus.** The Northwest Indian Fisheries Commission, in collaboration with the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service (USFWS), is supporting research at the USGS Western Fisheries Research Center (WFRC) on the effects of an exotic virus on Pacific salmon. Infectious salmon anemia virus (ISAV) was initially identified as a major pathogen of Atlantic salmon marine aquaculture in Norway. The virus has received increasing attention following the identification of the virus in Atlantic salmon reared in marine netpens in Scotland, in New Brunswick, Canada, and in Chile. More recently, the virus has been identified in Maine as the cause of losses in Atlantic salmon netpen aquaculture, resulting in the mandated destruction of several hundred thousand valuable fish. The virus was also recovered from Atlantic salmon returning to a USFWS hatchery in Maine that supports recovery of these endangered wild-spawning stocks. The potential for the virus to affect various species of Pacific salmon is of significant interest to the USFWS fish health program as well as Tribal and State fisheries managers in the western U.S. Using the specially constructed Biosafety level 3 laboratory at the WFRC, USGS scientists challenged stocks of juvenile chinook, chum and coho salmon, steelhead trout, and Atlantic salmon with isolates of ISAV from Norway and Chile. Mortalities among groups of Atlantic salmon were about 20 per cent with the Norwegian strain and 98 per cent with the Canadian strain (delivered at a higher dose). No Pacific salmon or steelhead died during the challenge periods although transient infections were detected in most species. These results suggest Pacific salmon are at substantially less risk than previously suspected. A manuscript presenting the results of this study has been accepted for publication by the Journal of Fish Diseases. Contact: James Winton, 206-526-6587, jim_winton@usgs.gov

**Transport and Fate of Bacteria and Nitrate in Ground Water, Lower Nooksack River Basin.** The Nooksack Indian Nation desires an improved understanding of the fate and transport of fecal coliform and nitrate contaminants as they move from agricultural fields to the groundwater system and eventually to surface-water systems in the lower Nooksack River Basin. Additional information about the extent of denitrification is also needed to provide realistic constraints on water-quality models that are used to make water-resource management decisions. In FY 2002, the USGS Wasington Water Resources District began a study of the interaction between surface and ground water in the shallow aquifer of the lower Nooksack River Basin. Stream locations where ground- and surface-water exchanges occur were identified, and flow directions between the ground- and surface-water systems were determined. In FY 2003, discharging ground water will be sampled and analyzed for concentrations of fecal-coliform bacteria and a suite of nutrients and other constituents related to ground-water denitrification. Ground-water ages will also be determined. Ground- and surface-water samples will be collected over the course of a storm hydrograph to determine the relative proportion of surface runoff that constitutes streamflow during periods when surface-water bacteria concentrations are significantly elevated. Lastly, a laboratory microcosm experiment will be conducted to determine if ground-water denitrification can be enhanced by the addition of carbon. Contact: Steve Cox, 253-428-3600, ext. 2623, secox@usgs.gov

**Trace Metal Concentrations in Shallow Sediments along Lake Roosevelt.** The Confederated Tribes of the Colville Reservation are concerned about the potential threat to human health of trace metals in exposed bottom sediment from Lake Roosevelt. Lake Roosevelt is a 125-mile-long reservoir in eastern Washington State that extends from Grand Coulee Dam to near the Canadian border where the Columbia River is free flowing. During periods when the water level of the reservoir is lowered, large areas of contaminated sediment are exposed. Upon drying, the

Robin Smith, USGS, and Patti Stone, Colville Nation, observing sediment coring on Franklin D. Roosevelt Lake. Photo by Bob Drzymkowski, USGS.

fine-grained portion of these sediments, including trace metals, becomes airborne due to high winds and can be inhaled by area residents and visitors. USGS scientists with the Washington Water Resources District have studied two different, though related, aspects of the potential human health issues involving trace metals in fine-grained sediments: the sediment themselves, prior to disturbance, and the airborne characteristics of these sediments. Sediment samples were collected to determine the concentrations of trace metals in the fine-grained sediment exposed during the spring 2001 drawdown. The results of the sediment study will be published in FY 2003. Once airborne, the dust particles can be carried downwind various distances depending on their size and the magnitude and duration of the prevailing winds throughout the Lake Roosevelt airshed. In FY 2002, the USGS began monitoring air quality at several locations along Lake Roosevelt to determine the occurrence, concentrations, distribution, and seasonal variability of selected trace elements on airborne dust particles, and, to the extent possible, the fraction of airborne trace element originating from exposed lake bed sediments. This work is anticipated to continue through FY 2004. Contact: Sue Kahle, 253-428-3600, ext. 2616, sckahle@usgs.gov

**3D Acoustic Telemetry Study.** USGS researchers at the Columbia River Research Laboratory are cooperating with the Confederated Tribes of the Colville Indian Reservation to determine the efficacy of using strobe lights to reduce entrainment of kokanee salmon through turbines at Grand Coulee Dam, Washington. Kokanee salmon and rainbow trout were tagged and released into the forebay of Grand Coulee Dam. When fish enter the area of the hydrophone receivers, their spatial location in three dimensions is recorded. The scientists examined how fish responded to strobe lights when the lights were on, off, and on for 1 hour, then off for 1 hour. We found that kokanee salmon appeared to be repelled by the strobe lights, but rainbow trout were attracted to them. The Confederated Tribes of the Colville Indian Reservation will use this information to reduce entrainment of fish and to meet their fishery enhancement goals. Contact: Jim Petersen,509-538-2299, ext. 236, jim_petersen@usgs.gov

**White Sturgeon Restoration in the Columbia River.** USGS fishery biologists are participating with the Spokane Tribe of Indians, the Confederated Tribes of the Colville Reservation, and Columbia River Inter-Tribal Fish Commission fishery biologists in an effort to restore declining white sturgeon populations in the Columbia River basin. Restoration of this species is especially important because of the cultural significance of these fish. Federal scientists and Tribal representatives worked together on the Upper Columbia River White Sturgeon Recovery Team and collaborate on research projects funded by the Bonneville Power Administration. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Water Resources of The Tulalip Tribes.** Future increases in population and development of lands of The Tulalip Tribes and neighboring areas could lead to increased pumping of ground water both on and off the Native lands. Such pumping may decrease baseflows of streams and could affect fish-rearing operations in the Tulalip Creek watershed. To help address these issues, the USGS Washington Water Resources District is conducting a study to evaluate the ground-water and surface-water resources of The Tulalip Tribes. To date, 252 wells have been inventoried and 15 wells have been sampled. Selected streams and wells are being monitored in FY 2002 and FY 2003 for flow and water level, respectively. The geohydrologic system has been mapped, a water budget will be determined, and future ground-water use will be estimated. The results of this study will be published in FY 2004. Contact: Lonna Frans, 253-428-3600, ext. 2694, lmfrans@usgs

**Salmon Life History.** USGS fishery biologists are continuing to assist the Skagit System Tribal Cooperative in studying the life history of chinook salmon in the Skagit River, Washington. The study is funded by Seattle City Light, Skagit System Cooperative, and the USGS, and investigates the importance of intertidal estuarine habitats in the life cycle of chinook salmon. The length of time spent in this ecosystem is determined, and the daily growth of juvenile chinook salmon measured, by studying the changes in "ear stone" (otolith) microstructure. The USGS is contracted to provide the staff, specialized equipment, supervision, technical assistance, and expertise in conducting the study. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Salmon River Watershed Analysis, Quinault Indian Nation.** The Quinault Indian Nation collaborated with the USGS Washington Water Resources District and several other agencies to conduct an analysis of the Salmon River watershed. The Salmon River watershed covers 3 square miles

of forested land, much of which has been affected by timber harvesting. The river has native runs of chinook and coho salmon, as well as steelhead trout. The Quinault Nation also operates a salmon hatchery on the river. The watershed analysis will serve as a tool to support decision-making processes in managing the river system and restoring salmon runs. Under two separate projects, the USGS led efforts for two modules-hydrology and geomorphology of the watershed analysis. As part of the hydrology module, USGS staff measured and described low-flow discharge at selected sites on the Salmon River and correlated low-flow discharges with nearby continuous-discharge records to estimate low-flow magnitudes and recurrence intervals on the Salmon River. As part of the geomorphology module, USGS scientists investigated channel-migration processes, including interactions among channel migration, large woody debris, floodplains, and the surrounding forest. Historic channels and logjams were also mapped. The results of these studies were written as chapters of a watershed analysis that is expected to be published in FY 2003. Contact: Bill Bidlake, 253-428-3600, ext. 2641, wbidlake@usgs.gov or Jim O'Connor, 503-251-3222, oconnor@usgs.gov.

**Tsunami Ready Community, Quinault Indian Nation.** The Quinault Indian Nation became an official "Tsunami Ready Community" on May 30, 2002. The Tsunami Ready Community recognition is part of the mitigation component of the National Tsunami Hazard Mitigation Program overseen by NOAA. Considerable local initiative is required to be designated Tsunami Ready. Activities that the community completes include: inundation mapping of low-lying areas, posting of tsunami evacuation routes, community meetings on the hazard, access to NOAA Weather Radio, and a local response plan. The Quinault Indian Nation is the first Native American group to be designated Tsunami Ready. The USGS attended the award ceremony, gave a short presentation, and met with local Quinault Indian Nation officials. The Quinaults received official signs from NOAA announcing that the community is Tsunami Ready. Additionally, all Tsunami Ready communities are also certified as "Storm Ready," so the Quinaults are also the first Native American group to be so designated. The USGS is working with the National Tsunami Hazard Mitigation Program by improving seismic networks along the coasts of Alaska, Hawaii, and the Pacific Northwest to provide real-time notification of possible tsunamagenic earthquakes and to improve the number and quality of seismic signals being received at the Tsunami Warning Centers in Alaska and Hawaii (operated by NOAA). The USGS is working with the State of Washington to improve the access that the Tribes, including the Quinaults, have to seismic information. Contact: Craig Weaver, 206-553-0627, craig@ess.washington.edu

**Concentrations of Dissolved Oxygen in the Lower Puyallup and White Rivers.** The Puyallup Tribe of Indians is concerned that wasteload allocations for biochemical oxygen demand and ammonia, based on a modeling study conducted in the early 1990s, will not protect the quality of water in the lower Puyallup and White Rivers. The USGS Washington Water Resources District, in cooperation with the Tribe and the Washington State Department of Ecology, monitored specific conductance, temperature, pH, and concentrations of dissolved oxygen in the Puyallup and White Rivers during August and September 2001 and 2002. USGS scientists analyzed factors affecting concentrations of dissolved oxygen in the lower Puyallup and White Rivers and published a report on their findings in FY 2002. The analysis was based on data collected in 2001 and on data previously collected by the Puyallup Tribe and the Department of Ecology in August and September 2000. A similar report analyzing the 2002 data will be published in FY03. The Washington State Department of Ecology will use the data to determine if wasteload allocations need to be revised. Contact: Gary Turney, 253-428-3600, ext. 2626, glturney@usgs.gov

**Trends in Streamflow in the Lower Puyallup River Basin.** The lower part of the Puyallup River traverses the Puyallup Indian Reservation and is an important resource to the Puyallup Tribe of Indians for direct water uses and for fish that help sustain the Tribe. To improve understanding of the river's resources, the USGS Washington Water Resources District and the Tribe are conducting a cooperative study of flow trends of the Puyallup River, and comparing those flows to regulatory in-stream flows for the river. Various streamflow statistics will be evaluated, including annual mean discharge, monthly mean discharge for summer months, and annual minimum 7-day mean flows. Streamflow records will also be evaluated to determine the fraction of time minimum in-stream flows were not met. The impacts of water use will be evaluated using data from USGS 5-year compilations and water rights permits. Contact: Steve Sumioka, 253-428-3600, ext. 2645, ssumioka@usgs.gov

**Coastal Erosion in Willapa Bay, Washington.** The USGS, the Bureau of Indian Affairs, and the Army Corps of Engineers are cooperating in a study of coastal erosion on lands of the Shoalwater Bay Indian Tribe, located in Willapa Bay, Washington. Tribal lands are rapidly eroding, increasing the frequency of flooding and the loss of valuable intertidal habitat. The joint study will allow the Tribe to make informed decisions to remedy this coastal problem. This study is benefiting from the recently completed "Southwest Washington Coastal Erosion Study" carried out by the USGS and the Washington State Department of Ecology. This cooperative project used fundamental and applied studies to develop a regional perspective and understanding of coastal processes, sediment transport, and associated shoreline changes. The study examined the effects of man-made influences (enhanced runoff, dredging operations, Columbia River dams) and natural processes (climate variability, subsidence caused by earthquakes, coastal dune development) on sediment budgets and on the long-term shoreline change trends of the southwest Washington coast. During FY 2002, USGS scientists collected wave, current, and sediment transport data during several winter storms. The field data are being used to calibrate and test a 2D numerical model of circulation, sediment transport, and morphological change in the estuary. The modeling is being used to help determine the spatial patterns and causes of erosion and deposition in the estuary, and will eventually be used to evaluate alternative solutions to erosion problems. Contact: Guy Gelfenbaum, 650-329-5483, ggelfenbaum@usgs.gov

**Hydrogeologic Issues of the Shoalwater Bay Indian Tribe and Tokeland Peninsula.** The Shoalwater Bay Indian Tribe obtains water from an artesian aquifer underlying its lands and the Tokeland Peninsula. The Tribe is concerned about the effects of increasing population and commercial activities on the quantity and quality of water in the aquifer. Specific water-quality concerns include seawater intrusion, contamination from septic tanks, and contamination from pesticides applied in nearby forests. The USGS Washington Water Resources District conducted a study describing the general hydrology and water chemistry of the aquifer, including concentrations of nitrate and selected pesticides. An interpretive report describing the findings was published in FY 2002, completing this project. Contact: Gary Turney, 253-428-3600, ext. 2624, glturney@usgs.gov

**Ground-Water Resources of the Yakima River Valley, Confederated Tribes and Bands of the Yakama Nation.** Surface water in the Yakima River Basin is under adjudication. The amount of surface water available for appropriation is not known, but there are increasing demands for water for municipal, fisheries, agricultural, industrial, and recreational uses. These demands must either be met by ground-water withdrawals and/or by changes in the way water resources are allocated and used. Ongoing management of water in the basin also may be affected by rules to protect salmonid fish under the Endangered Species Act. In FY 2000, the USGS Washington Water Resources District began a study of the ground-water system in the basin, in cooperation with the U.S. Bureau of Reclamation and the Washington State Department of Ecology, and working with the Confederated Tribes and Bands of the Yakama Nation. The study describes the geologic framework and ground-water flow system in the Yakima River basin, as well as the interaction between ground water and surface water. A ground-water model will be constructed as a tool to improve understanding of the system and to help estimate the effects of selected management strategies. As part of this project about 2,000 wells were visited to verify locations and measure water levels. Water levels were measured five times at about 800 of these wells. Information about all inventoried wells was added to the USGS National Water Information System. Lithologic information for each inventoried well has been stored digitally for use in constructing maps of the hydrogeologic units. Concurrently, the interaction of ground water and surface water along selected river reaches is being monitored on an hourly basis by collecting continuous water-level and temperature data. Historical municipal ground-water withdrawal data were collected and compiled, and agricultural withdrawal data were collected in FY 2002. Work began on estimating ground-water recharge, with recharge being estimated for the upland, forested areas in the basin using four previously constructed watershed models. New methods were developed to thermally profile long river reaches to locate areas of large ground-water contributions and to identify potential areas of good salmonid habitat. Contact: John Vaccaro, 253-428-3600, ext. 2620, jvaccaro@usgs.gov

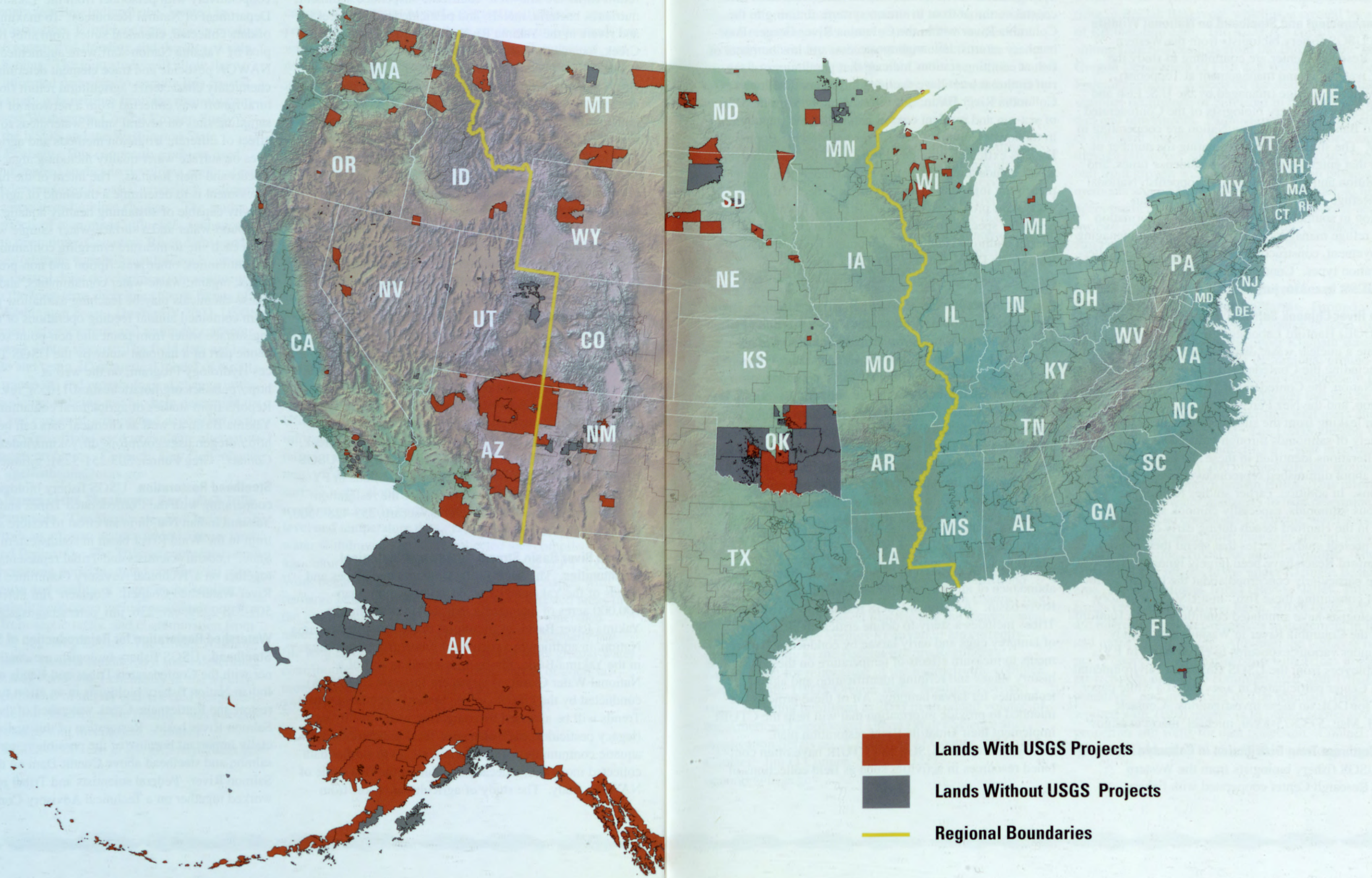
**Restoration Monitoring of Satus Creek and the Satus Wildlife Area, Yakama Nation Reservation.** Agricultural return flows are known to contribute suspended sediment, nutrients, bacteria, metals, and pesticide loads to creeks and rivers in the Yakima River Basin. In particular, Satus Creek, located on lands of the Confederated Tribes and Bands of the Yakama Nation, receives loads from the North Drain return flow, resulting in increases of sediment, nutrients, bacteria, and pesticides, both in the water column and in streambed sediments. In addition, the deposition of suspended sediment from the North Drain return flow has created barriers to the migration of fish protected under the Endangered Species Act (ESA). A large-scale restoration effort by the Yakama Nation and the Army Corps of Engineers (ACE) is being conducted to improve the aquatic ecosystem associated with Satus Creek and the Satus Wildlife Area. Several salmonids that are listed under the ESA have historically used Satus Creek for parts of their lives. A large part of the production in the basin of one of these species (anadromous steelhead trout) occurs in Satus Creek. The Satus Wildlife Area also is an important component in the restoration of habitat for wildlife and fish in the lower Yakima River Basin. The USGS, with funding from the USACOE, is monitoring the hydrologic, water-quality, and possible biologic effects of the North Satus Drain Ecosystem Restoration to identify temporal and spatial changes in the system. The USGS is also compiling selected historical data for Satus Creek, local shallow ground water, and North Drain. The USGS began monitoring the current baseline conditions in FY 2002 and will continue monitoring after the restoration work is completed. Contact: John Vaccaro, 253-428-3600, ext. 2620, jvaccaro@usgs.gov

**Yakima River Basin Stream Quality and Biological Communities.** The lands of the Confederated Tribes and Bands of the Yakama Nation encompass more than 100,000 acres of intensively irrigated land within the Yakima River Basin. Agricultural runoff from the Yakama Nation, in addition to agricultural runoff from other areas in the Yakima Basin, has been assessed as part of a National Water Quality Assessment Program (NAWQA), conducted by the USGS Oregon Water Resources District. Trends will be assessed by comparing water-quality data (legacy pesticides, trace elements, fecal indicator bacteria, aquatic communities of insects and algae) to similar data collected more than a decade ago during the first cycle of NAWQA study. The study of agricultural runoff from small watersheds includes several drainages within the Yakama Nation. NAWQA program personnel worked cooperatively with personnel from the Yakama Nation's Department of Natural Resources. To maximize the level of data collected, chemical suites from sites routinely sampled by Yakama Nation staff were augmented with NAWQA pesticide and trace element determinations to chemically characterize agricultural return flow. Agricultural runoff was collected from a network of biological sampling sites on several small watersheds to assess the effect of different irrigation methods and agricultural practices on surface water quality including algae and aquatic insects and their habitats. The intent of the biological assessment is to determine a threshold of agricultural activity capable of sustaining healthy aquatic communities. A ground-water and a surface-water sample were collected from each site to measure emerging contaminants, including antibiotics, other prescription and non-prescription drugs, organic-waste-water contaminants, and steroids. These chemicals may be leaching to shallow ground-water from combined animal feeding operations or may be entering surface water from point and non-point sources. This is one part of a national study by the USGS Toxic Substances Hydrology Program, on the web at http://pubs.acs.org/hotartcl/est/es011055j_rev.html Reports from studies of agricultural contaminants in the Yakima Basin as well as chemical data can be obtained at http://oregon.usgs.gov/projs_dir/yakima/index.html. Contact: Greg Fuhrer, 503-251-3231, gjfuhrer@usgs.gov

**Steelhead Restoration.** USGS fishery biologists continue cooperating with the Confederated Tribes and Bands of the Yakama Indian Nation in an effort to restore steelhead trout in the Wind River basin in southwestern Washington State. Federal scientists and Tribal representatives worked together on a Technical Advisory Committee to the Wind River Watershed Council. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Watershed Restoration for Reintroduction of Salmon and Steelhead.** USGS fishery biologists are continuing to partner with the Confederated Tribes and Bands of the Yakama Indian Nation fishery biologists in an effort to assess and restore the Rattlesnake Creek watershed of the White Salmon River basin. Restoration of this watershed is especially important because of the possible reintroduction of salmon and steelhead above Condit Dam on the White Salmon River. Federal scientists and Tribal representatives worked together on a Technical Advisory Committee to the

# U.S. Geological Survey Fiscal Year 2002 Activities on American Indian/Alaska Native Lands



White Salmon Watershed Management Council. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Water Management and Steelhead on National Wildlife Refuges.** USGS fishery biologists from the Western Fisheries Research Center are continuing to study the effects of water and land management at Toppenish NationalWildlife Refuge (managed by the U.S. Fish and Wildlife Service). Fishery biologists of the Confederated Tribes and Bands of the Yakama Nation are cooperating in this study. The study involves estimating the number of steelhead that enter the refuge, their residence times, and their condition and growth rate. The Toppenish National Wildlife Refuge is adjacent to the Yakama Indian Reservation in southern Washington State. Information will help refuge managers make decisions about managing water movement, constructing or removing dikes, or altering vegetation types. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Columbia River Chinook Salmon.** The U.S. Department of Energy (DOE) Hanford Laboratory in Washington State has become a nuclear waste disposal site. Tribes in the region, including the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Umatilla Reservation, and the Nez Perce Tribe, are concerned that chromium leaking from the site might adversely affect a wide variety of salmonids through reduced survival. Gender alterations identified in these stocks also raised concerns about diminished reproductive capacity of natural populations. In addition, earlier studies focused on anadromous salmonids, especially chinook salmon, that only live in the Hanford Reach during early development. Until the present study, species that spend their entire lives in the Hanford Reach have been largely ignored. The Tribes are particularly concerned about the human health aspects of consuming these fish. In a USGS laboratory, USGS biologists have simulated conditions of the Hanford Reach of the Columbia River in Washington to study impacts under various exposures to chromium. In FY 2002, employees from the USGS Columbia Environmental Research Center participated in a review of a white paper prepared for DOE on these investigations. Contact: Michael J. Mac, 573-875-5399, michael_mac@usgs.gov

**Coastal Cutthroat Trout Distribution in Columbia River Gorge.** USGS fishery biologists from the Western Fisheries Research Center cooperated with fishery biologists from the Confederated Tribes and Bands of the Yakama Nation and the Confederated Tribes of the Warm Springs Reservation to describe current distribution of coastal cutthroat trout in stream systems draining to the Columbia River within the Columbia River Gorge. Poor hatchery returns, low angling success, and low numbers of fish at counting stations indicate that populations of sea-run cutthroat trout have declined throughout the lower Columbia River Basin. Information on the current status of sea-run and resident coastal cutthroat trout populations in the lower Columbia River, especially above Bonneville Dam, is extremely limited. Products of the cooperative work include a report and a website (under development) presenting information and portraying species distribution. This effort provides a necessary first step toward assessing needs for specific management and recovery goals for coastal cutthroat trout in the Columbia River Basin above Bonneville Dam. Contact: Patrick Connolly, 509-538-2299, ext. 269, Patrick_Connolly@usgs.gov

**Pacific Lampreys.** The USGS is assisting Columbia River Treaty Tribes in their effort to study the status and needs of Pacific lamprey in the Columbia River basin. The USGS is continuing to assist the Confederated Tribes of the Umatilla Reservation (CTUIR) in their endeavor to reestablish Pacific lampreys in the Umatilla River. USGS biologists from the Western Fisheries research Center are cooperating with the CTUIR to conduct research on several aspects of the life history and habitat needs of lampreys in the Columbia River basin. The USGS is continuing a CTUIR-funded investigation of the olfactory sensitivity of Pacific lampreys to pheromones released by other lampreys and lampreys' use of these pheromones as a migratory cue. The USGS is cooperating with the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) in research to examine the distribution and abundance of all lamprey species found in the Deschutes River basin. Additional USGS research to assist these Tribes includes a study to define critical habitat needs of lamprey eggs and early larvae by conducting experiments to measure effects of temperature on these early life history stages and refining identification and aging techniques for larval lamprey. All of these projects are intended to provide information that will help the CTUIR implement their Umatilla River restoration plan. Biologists from the USGS and CTUIR have often combined resources in activities such as field collections of

larval lapreys, and laboratory dissections of larval lampreys for identification and aging studies. Additionally, USGS, CTUIR, and CTWSRO biologists have routinely shared information from cooperative studies; for example, USGS researchers presented results of two studies on olfactory sensitivity and temperature effects on larvae at the 19th Annual Pacific Regional Conference of the Native American Fish and Wildlife Society, which was hosted by the CTUIR. Contact: Jennifer Bayer, 509-538-2299, ext. 299, jennifer_bayer@usgs.gov

**Spring Chinook Salmon on the Deschutes River, Oregon.** USGS fishery biologists continue cooperating with the Confederated Tribes of the Warm Springs Reservation in the second year of a study on the Deschutes River in Oregon. The study will help to determine the distribution, migration behavior, habitat use, and species interactions of juvenile spring chinook salmon raised in hatcheries and released in the fall on the Deschutes River. Juvenile spring chinook salmon are tagged with radio transmitters or passive integrated transponder tags and then tracked throughout the lower Deschutes River as they migrate downstream from the Warm Springs National Fish Hatchery. Information from tracking devices will help determine the winter locations of juvenile salmon released during fall and how they might impact wild salmon in the Deschutes River. Working together, scientists from the Confederated Tribes of the Warm Springs Reservation and the USGS are sharing the responsibilities for trapping, tagging, tracking, and instream sampling during this study. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Geomorphology of the Deschutes River, Oregon.** This project was intended to describe the overall geologic and geomorphic context of the Deschutes River system in a way that will help evaluate the effects of the Pelton-Round Butte hydroelectric complex on downstream channel morphology. Portland General Electric and the Confederated Tribes of the Warm Springs Reservation are currently applying jointly to the Federal Energy Regulatory Commission for relicensing of the hydroelectric complex. Results of the USGS Oregon Water Resources District study are being published in 2003 in an edited volume of the American Geophysical Union (Water Science and Application Series no. 7, edited by O'Connor and Grant). Contact: Jim O'Connor, 503-251-3222, oconnor@usgs.gov

**Bull Trout in Beulah Reservoir, Oregon.** In 2001, USGS fishery biologists from the Western Fisheries Research Center began a study of the condition and growth of bull trout in Beulah Reservoir, which was created by a Bureau of Reclamation dam. The study is a collaborative effort among fishery biologists from the Burns Paiute Tribe, Oregon Department of Fish and Wildlife, and other Federal agencies. Aspects of the study include the seasonal occurrence of bull trout in the reservoir and their diet and movements. Parameters for a bioenergetics model of sub-adult and adult bull trout are being developed through laboratory studies. The bioenergetics model of bull trout growth will be used, along with physical measurements and a reservoir temperature model, to help managers predict whether a minimum pool level is necessary for bull trout survival in the reservoir. Contact: Jim Petersen, 509-538-2299, ext. 236, jim_petersen@usgs.gov

**Quantifying the Ground-Water Resources of the Upper Klamath Basin, Oregon and California.** Ground water has long been considered a possible source to meet the increasing demands for water in the upper Klamath Basin. A quantitative understanding of the regional ground-water system is crucial to managing water resources in the basin. However, the amount of ground water that can be pumped without adversely affecting existing well users and streamflow is not well understood. The USGS Oregon Water Resources District is conducting a 7-year investigation that continues through FY 2005 to quantify the ground-water resources of the upper Klamath Basin. This information will be used by water managers to help determine how ground water can contribute to solving water-supply problems and, at the same time, maintain ground-water discharge to streams critical for aquatic wildlife. The Klamath Tribe resides in the upper Klamath Basin study area. Three additional Tribes (Hoopa Valley, Yurok, and Karuk) reside in the lower basin. All of these Tribes are interested in water-resources management in the basin and in the present study. Although the USGS is not formally cooperating in partnership with Tribes in the basin, project personnel have communicated with Tribal representatives, and in the case of The Klamath Tribes, have worked with Tribal members to obtain access to certain properties and wells for data collection. Contact: Marshall Gannett, 503-251-3233, mgannett@usgs.gov

**Anadromous Fishery Restoration.** USGS biologists and hydrologists participated in the Klamath River Fishery Restoration Program, a cooperative effort among the Yurok, Karuk, and Hoopa Valley Tribes, the U.S. Fish and Wildlife Service, and California Department of Fish and Game. The USGS Fort Collins Science Center improved the System Impact Assessment Model (SIAM) to provide a better understanding of water quality and quantity management problems that limit anadromous fish restoration in the Klamath River below Iron Gate Dam. Scientists collected data for the model and performed the required analyses. The SIAM has been completed and is available through the USGS Fort Collins Science Center website http://www.fort.usgs.gov/products/software/siam/siam.asp as is the user's guide: Bartholow, J., Heasley, J., Hanna, B., Sandelin, J., Flug, M. Campbell, S. and Douglas, A., 2002, Evaluating Water Management Strategies With The Systems Impact Assessment Model (SIAM, version 3): Fort Collins, CO, U.S. Geological Survey. Contact: Dave Hamilton, 970-226-9383, dave_hamilton@usgs.gov

**Upper Klamath Lake Water-Quality Conditions.** In 2002, the USGS Oregon Water Resources District Office began a multi-year study to determine the behavioral response of endangered Lost River and shortnose suckers to poor water-quality conditions in Upper Klamath Lake. These fish have great cultural significance to The Klamath Tribes and were an historically important food source for Native Americans in the Klamath Basin. As one of the reasonable and prudent alternatives in the 2001 Biological Opinion, the U.S. Fish and Wildlife Service asked the Bureau of Reclamation to begin a study on the role that "water-quality refuges" play in the survival of the endangered suckers during periods when much of the lake is characterized by poor water-quality conditions. Two main parts of the study include installing a network of continuous water-quality monitors to determine the spatial and temporal extent of water-quality refuges in the lake, and tracking radio-tagged suckers in the lake throughout the summer. The first of three field seasons was completed in 2002. An interim report is due in spring of 2003. Contact: Tammy Wood, 503-251-3255, tmwood@usgs.gov

**Traditional Management Techniques on Mesquite Tree Stands at Death Valley.** A planning effort is underway to attempt to evaluate and quantify the effects of the reinstitution of traditional natural resource usage on stands of mesquite trees in Death Valley National Park. The Timbisha Shoshone Tribe will use traditional methods of wood gathering, stand maintenance, and collection of mesquite bean pods on plots in a pattern designed to improve understanding of how such management practices effect individual trees and the mesquite tree population. USGS scientists intend to determine the effect that traditional management practices have on various measures of plant production, plant physiology, and population demography. This project will integrate diverse factors including elements of cultural anthropology. Contact: Todd C. Esque, 702-914-2206, ext. 226, todd_esque@usgs.gov

**Mercury in Vegetation and Soils at Abandoned Mercury Mines in Southwestern Alaska.** Mercury toxicity is an issue to Alaska Natives, particularly those who rely on fishing for sustenance. USGS scientists collected and analyzed vegetation (willow and alder) and soil samples from three abandoned mercury (Hg) mines and from background sites in southwestern Alaska. The Hg concentrations, speciation, and distribution from the two types of sites were then compared. Total Hg and methylmercury (MeHg) concentrations were higher in vegetation and soil samples from all of the mine sites than in samples from the background sites. There was no correlation between total Hg concentrations in vegetation and total Hg concentrations in soil or between total Hg and MeHg concentrations. However, the percent MeHg of the total Hg was higher in samples from the background sites compared to samples from the mine sites and is higher in vegetation samples than in corresponding soil samples. The percent MeHg is an order of magnitude higher in the willow samples than in corresponding alder or soil samples. The percent of divalent Hg [Hg(II)] is highest in soil samples from the retort and background areas. The higher percent MeHg in vegetation and soil in samples from background sites may be explained by the higher proportions of reactive Hg species, such as Hg(II), at these sites compared to the surface mined and tailings areas where most of the Hg is in the elemental and cinnabar (HgS) forms. Dissolved gaseous Hg species are more readily accumulated in vegetation and are more readily methylated than solid phases like HgS (mercury sulphide) and liquid Hg. Contact: Elizabeth Bailey, 907-786-7442, eabailey@usgs.gov

**Water Quality Sampling of Peterson Creek.** In the summer of 2001, the Central Council of Tlingit and Haida Indian Tribes of Alaska entered into a 2-year cooperative agreement with the USGS to collect baseline water-quality data for Peterson Creek, a valuable salmon fishery located

on north Douglas Island near Juneau, Alaska. Peterson Creek, with a drainage basin of less than five square miles, will be affected by a large development project that is scheduled to begin in the near future. Field crews consisting of two Tlingit-Haida staff, an Alaska Department of Fish and Game employee, and two USGS Alaska Science Center personnel divided the basin into nine sub-basins and completed a rigorous sampling and measuring program for each sub-basin over a variety of flow conditions. Data from this project are currently being prepared for publication. Contact: Bruce Bigelow, 907-586-7287, bbigelow@usgs.gov

**Water Quality Sampling of the Taku River.** The Douglas Indian Association (DIA), the Alaska Department of Environmental Conservation, and the USGS Alaska Science Center continue implementing a 5-year cooperative water-quality project to collect baseline water-quality data for the Taku River, an important salmon fishery. Although the watershed is undeveloped, a new mine is proposed in the watershed on the Canadian side of the border. The Taku River is also subject to glacial outburst floods that affect the River's water quality. The USGS is conducting the field sampling and the U.S. Environmental Protection Agency is analyzing the samples. The DIA has provided an intern to assist USGS researchers with the sampling for part of the project. During FY 2002, USGS scientists continued working with the Water Survey of Canada and the Canadian part of the DIA by providing logistical support and discharge measurements for the collection of water quality samples on the Taku River and several of its tributaries on the Canadian side of the border. Contact: Bruce Bigelow, 907-586-7287, bbigelow@usgs.gov

**Stream Gaging of Sinona Creek.** The USGS Alaska Science Center operates a relatively new stream flow monitoring station on Sinona Creek near Chistochina Village (between Glenallen and Tok) for the Cheesh'na Tribal Council. Sinona Creek is an important subsistence fishery. Tribal members have noticed a marked decrease in streamflow over the past few years. The USGS has offered to train Tribal members to measure streamflow. Contact: Steven Frenzel, 907-786-7100, sfrenzel@usgs.gov

**Aniak Mining District Geologic Map Compilation.** The USGS is cooperating with Bureau of Land Management (BLM) on a 5-year regional study in southwest Alaska that will benefit two Alaska Native Regional Corporations-Calista and Doyon. BLM's "Aniak Mining District" study encompasses 360,000 km2 of Federal, State, and Native Corporation land in an area of past gold and mercury production that is may contain additional undiscovered gold and other resources. The USGS brings local expertise to the cooperative project, having previously performed 1:250,000-scale geologic mapping and assessment of undiscovered resources for about half of the area. The USGS has agreed to provide a digital geologic map of the mining district as an underlay for the BLM studies. This map is being compiled from existing published maps and from new USGS data in the central part of BLM's study area. In FY 2003, BLM will release the results from a 1000-mi2 geophysical survey in the center of the mining district. The USGS will assist in interpreting these data and will incorporate new information into the geologic compilation. Contact: Marti L Miller, 907-786-7437, mlmiller@usgs.gov

**Stream Gaging of Eklutna River.** In cooperation with the Native Village of Eklutna, the USGS Alaska Science Center operates a streamflow monitoring station on the Eklutna River near Eklutna, Alaska. USGS employees make periodic discharge measurements on the Eklutna River above the confluence with Thunderbird Creek. The Eklutna River, a subsistence fishery for the village, has been adversely impacted by water withdrawal in the headwaters and gravel mining near the mouth. The village is interested in reclaiming the fishery and applying for instream-flow water rights. USGS personnel have been teaching tribal members how to measure streamflow and archive data. USGS staff also trained tribal fisheries employees to characterize streambed sediments. Contact: Steven Frenzel, 907-786-7100, sfrenzel@usgs.gov

**Geochemical Landscape of Alaska Native Corporation Lands.** Geologists from the USGS have developed collaborative plans with Alaska Native Corporations to conduct projects with the goal of understanding the geochemical landscape (that is, the spatial variations in the distribution of chemical elements within media such as stream sediment and soil) of Native and adjacent lands. The study areas comprise the southwestern quadrant of Alaska, including the Aleutian Islands. Part of the project includes collecting one sample per 289 km2 (20 km cell) and analyzing each sample for 43 chemical elements of both geological and environmental significance (e.g., mercury, arsenic, and selenium). Geologists from the Calista

Corporation and the Bristol Bay Native Corporation participated in acquiring samples for analysis. In FY 2001, sampling was completed in the Bristol Bay area; sampling in the Calista area will be completed in FY 2003. The geochemical data will be used to create interpretive derivative maps involving watersheds, lithologies, geology, mineral deposits, and political boundaries. As part of this project, topical study of the distribution of metals in native vegetation comprises a Master's thesis for the associate land manager of the Calista Corporation. The products of the project are designed to assist the Native Corporations in managing their lands. Contact: Andrew E. Grosz, 703-648-6314, agrosz@usgs.gov

**Mapping Sensitive Islands in the Bering Sea.** The USGS and the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration have completed a mapping project for the Pribilof Islands of Alaska. St. George and St. Paul are the only two inhabited islands in the volcanic Pribilof archipelago. The Pribilofs are located in the Bering Sea approximately 770 air miles southwest of Anchorage and 250 miles north of the Aleutian Islands. These two tiny islands are home to the world's largest community of Aleut people. The Native communities on the islands will use the maps and digital data from this project for land use, economic development analysis, and natural resource management. The products of this project will also be used in restoring the environmental integrity of the islands along with identifying and protecting sensitive habitat areas of migratory birds and marine mammals. A concerted effort was undertaken by the local residents to identify the original Aleut names for various geographic features on both islands. This effort will help to acknowledge and preserve the historical and linguistic importance of the Aleut language. The Alaska Historical Commission along with the U.S. Board of Geographic Names concurred on the significance of this innovative approach. These local-use names were provided to the USGS for incorporation into the final map products and many of the geographic features on both islands are labeled in English and Aleut. Contact: A.C. Brown, 907-786-7002, acbrown@usgs.gov

**Alaska Volcanoes and Alaska Natives.** Open communication between Alaska Natives and the USGS Alaska Volcano Observatory (AVO) is crucial in helping to safeguard Alaskan communities. Numerous Alaska Native villages and corporations communicate with the AVO during periods of volcanic activity. Native officials transmit on-site observations to AVO, and AVO scientists distribute interpretive and hazards information to the Native communities. Many of these communities are on the AVO automatic weekly update fax and/or electronic mail lists that provide the activity status of more than 40 active volcanoes in the Aleutian Islands. All Native villages in the Aleutians, including Nelson Lagoon, Naknek, Unalaska, Akutan, False Pass, Atka, King Cove, and Perryville, are near active volcanoes. AVO also conducts geological field studies and services existing seismic-monitoring equipment to provide real-time warnings of volcanic activity and related hazards to aircraft and local communities. USGS communications and research involved obtaining letters of non-objection for proposed volcano hazards work and accessing lands owned or selected by several Alaska Native corporations, including The Aleut Corporation, Akutan Corporation, Ounalashka Corporation, Ahtna Incorporated, and Cook Inlet Region Incorporated. Contact: Thomas Murray, 907-786-7443, tlmurray@usgs.gov

# Technical Assistance

# Technical Assistance

**Surface-Water Gaging Station and Temperature Probe, Keweenaw Bay Indian Community.** In September 2001, USGS employees of the Michigan Water Resources District installed a continuous-data stream-gaging station on the Silver River, which flows into Lake Superior, in a cooperative project with the Keweenaw Bay Indian Community Environmental Department. Data from the stream gage are available on a real-time basis. A real-time water temperature gage was added to the site in May 2002. A multi-parameter water-quality monitor may be added during FY 2003, if funding is available. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Water-Resources Investigation for Lac Vieux Desert Band of Lake Superior Chippewa Indians.** In FY 2002, the USGS Michigan Water Resources District and the Lac Vieux Desert Band of Lake Superior Chippewa Indians began a cooperative 4-year study of surface-water quality and basin characteristics of Lac Vieux Desert. The 6.6 mi2 lake straddles the Michigan-Wisconsin border and is the headwaters of the Wisconsin River. In May September, 2002, seven sites on the lake were sampled for a suite of physical parameters and chemical constituents to help USGS and Tribal scientists determine the water quality and health of the 34 mi2 lake basin. In June 2002, a continuous-record gaging station was installed to monitor the lake level of Lac Vieux Desert and the Wisconsin River at the lake outlet. Monitoring data will be available in real-time in late-October 2002 with the addition of a GOES satellite transceiver. Additional activities in FY 2002 included streamflow measurements of all tributaries to the lake, as well as outflow into the Wisconsin River, and investigation of ground-water discharge into the lake. Activities for FY 2003 will include operating the above-noted gaging stations, collecting and analyzing spring and fall water-quality samples from the lake, analyzing ground-water/surface-water interaction within the lake basin, and determining a water budget for the lake basin. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Streamflow Measurements of Wilson Creek Watershed, Hannahville Indian Community.** In March 2002, USGS hydrographers from the Michigan Water Resources District made several discharge measurements of Wilson Creek at baseflow conditions. Tribal staff of the Hannahville Indian Community used the information as part of a watershed study for planned industrial development of lands west of Escanaba, Michigan. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Nottawaseppi Huron Band of Potawatomi Water Issues.** Little is known about surface- and ground-water resources beneath the lands of the Nottawaseppi Huron Band of Potawatomi. Tribal members living on the Reservation depend upon domestic water from fairly shallow wells completed in unconsolidated glacial and lacustrinedeposits. Three small tributaries of the St. Joseph River system pass through agricultural land prior to crossing the Reservation. In FY 2000, a 4-year cooperative agreement was implemented between the Tribe and the USGS Michigan Water Resources District. The cooperative study will analyze and describe Tribal water resources. Results of the study will be used to establish baseline conditions. USGS and Tribal environmental staff are working cooperatively on several aspects of the data collection effort. Activities in FY 2000-2002 included surface- and ground-water measurements. Surface water was sampled and analyzed for a suite of water constituents including common agricultural pesticides and herbicides. Sampling on the three tributaries to the St. Joseph River system was conducted to better understand surface-water-quality during three distinct periods of agricultural activity: immediately after fall harvest, prior to plant emergence in the spring, and during the early summer growth season. Activities in FY 2003 are expected to include a single early- to mid-summer surface water quality sampling on the three tributaries to the St. Joseph River system. Surveys will be completed to relate all ground-water and surface-water sampling sites to a common reference datum. Additional activities will include analyzing water samples from 6 or more domestic water supply wells located on or near the Reservation for a suite of agricultural pesticides and herbicides. A summary report on the project results will be prepared. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Bad River Streamflow, Sedimentation, and Erosion Study.** The major objective of this study is to understand how streamflow, erosion, and sedimentation rates have changed in the Bad River and some of its key tributaries over time due to changes in land cover. It is not known if erosion and sedimentation are exceeding natural rates. The study began in FY 2002 in cooperation with the Bad River Band

of Lake Superior Chippewa Indians. Four tasks were completed in FY02: (1) major landscape characteristics were identified for each sub-basin; (2) a long-term gaging station record was analyzed for trends in peak and mean monthly flows; (3) erosion/sedimentation hot spots were identified through air photos, flyover video, and field reconnaissance; and (4) existing literature was reviewed. In FY03, valley transects will be constructed in key reaches with dominant processes of erosion, lateral migration, and sedimentation. Cores will be collected along the valley transects and analyzed for sedimentation rates. Contact: Faith Fitzpatrick (USGS), 608-821-3818, fafitzpa@usgs.gov; Kirsten Cahow (Bad River Band), 715-682-7123, brwater@badriver.com

**Ho-Chunk Water Quality.** The USGS Wisconsin Water Resources District is assisting the Ho-Chunk Nation by assessing the hydrology and water quality of the streams on, and in close proximity to, Ho-Chunk lands. A Water Resource Investigations report entitled, "Surface-Water-Resource Information for the Ho-Chunk Nation Lands and Vicinity, Wisconsin" will be published in FY 2003 as USGS Water Resources Investigation Report 02-4307 by Diebel, M.W. and Sullivan, D.J. The report includes an analysis of existing information on chemical, physical, and biological investigations. Water-quality information, including chemistry and biological data, were collected in FY 2002 at sites the Ho-Chunk Nation. Additional data will be collected in FY 2003. Contact: Dan Sullivan (USGS), 608-821-3869, djsulliv@usgs.gov; Randy Poelma (Ho-Chunk Nation), 800-944-1652, Rpoelma@ho-chunk.com

**Neopit Mill Pond Sedimentation And Sediment Chemistry Study.** The Menominee Indian Tribe of Wisconsin cooperated with the USGS on a study of sedimentation characteristics in Neopit Mill Pond, which was formed by damming the West Branch of the Wolf River. USGS Wisconsin Water Resources District personnel determined the texture, age, and organic and trace element chemistry of sediment stored behind the dam. The USGS staff, with the help of Menominee Tribe personnel, also mapped the pre-dam channel and topography of the West Branch of the Wolf River through the mill pond. A report is being prepared on the results of these studies. Contact: Faith Fitzpatrick (USGS), 608-821-3818, fafitzpa@usgs.gov; Doug Cox (Menominee Indian Tribe of Wisconsin), 715-799-4937, dcox@itol.com

**Historical Trends in Streamflow, Sedimentation Rates, and Sediment Trace Element Concentrations Associated with the Wolf River, Keshena Falls to Balsam Row Dam.** This project was designed to identify natural and historic concentrations of trace elements in streambed, floodplain, and backwater sediments of the Wolf River from Keshena Falls to Balsam Row Dam, mostly within the lands of the Menominee Indian Tribe of Wisconsin. This cooperative study between the Menominee Tribe and the USGS also determined the range of historic (150+ years) variability of flooding and the sedimentation characteristics along the same reach of the Wolf River. Major factors affecting stream sedimentation and flooding characteristics-geologic/natural versus land-use effects-were identified. This study was completed in FY2001 and a report has been prepared. Contact: Faith Fitzpatrick (USGS), 608-821-3818, fafitzpa@usgs.gov; Doug Cox (Menominee Indian Tribe of Wisconisn), 715-799-4937, dcox@itol.com

**Ground-Water Contribution and Community Water Systems, Menominee Lands.** The USGS Wisconsin Water Resources District continues studying the extent and composition of areas that contribute water to, and travel time of water captured by, community wells on lands of the Menominee Indian Tribe of Wisconsin. This information will be used by the Menominee government for water-resource and well-head protection planning in community areas. Contact: Charles Dunning (USGS), 608-821-3827, cdunning@usgs.gov; Gary Schuettpelz (Menominee Indian Tribe of Wisconsin), 715-799-4937, gschuett@mail.wiscnet.net

**Oneida Hydrologic Investigations.** The objectives of this cooperative project with the Oneida Tribe of Wisconsin are to collect long-term data at two sites and to perform trend analysis for pesticides, nutrients, and suspended sediment. Results of the study will assist Oneida officials with environmental and developmental planning. Contact: Kevin Richards (USGS), 608-821-3861, krichard@usgs.gov; Jim Snitgen (Oneida Tribe of Wisconsin), 920-869-5812

**Water Resources Investigation for the Prairie Island Indian Community.** The Prairie Island Indian Community asked the USGS Minnesota Water District Office to define the wellhead protection areas of their municipal wells. The USGS study uses two dimensional ground-water flow models, aquifer tests and continuous stage recorders on the Mississippi River. The Community is located adjacent to

the River. These investigations were completed in FY 2002. Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov

**Spirit Lake Nation Wetlands Ecology.** The Spirit Lake Nation will initiate a wetland-monitoring program on its lands in 2003. In preparing for that program, USGS personnel trained members of the Spirit Lake Nation in wildlife and plant inventory techniques. The training also included assistance in the development of quality assurance project plans (QAPP) to ensure that data quality is consistent with objectives of the wetland-monitoring plan. Early in 2003, USGS staff will assist Spirit Lake personnel in selecting candidate wetland sites and establishing photographic stations for monitoring general temporal changes in those wetlands. Contact: Ned H. Euliss, Jr., 701-253-5564, ned_euliss@usgs.gov

**Spirit Lake Tribe Capacity Building.** USGS North Dakota Water Resources personnel accompanied Spirit Lake Tribal staff in the field and provided quality assurance regarding the collection, processing, and shipping of water-quality samples. USGS personnel have helped Tribal staff assemble and install wetland-monitoring packages, and provided training on how to read and record water-level information, calibrate the equipment, and transfer data from the field to the office. USGS personnel also provided training on how to select the location and make and compile a discharge measurement. The USGS National Water Quality Laboratory processed the water-quality samples. Contact: Douglas G. Emerson, 701-250-7402, demerson@usgs.gov

**Geographic Information Systems Workshop for the Rosebud Sioux Tribe and Sinte Gleska University.** Sinte Gleska University (SGU) and the USGS signed a Memorandum of Understanding in 2000 to cooperatively improve science education for Native American students. During 2002, the partnership fostered successful workshops and an online course. In June 2002, SGU and the USGS conducted a 3-day, hands-on geographic information systems workshop for Tribal and SGU professionals from the Rosebud offices of water resources, lands, cultural resource management, biology, and other offices. Sinte Gleska University endorsed its first online course in geographic information systems as a part of its long-term goal of establishing the University as a center of excellence for spatial analysis. The online course is available on the Web at http://rockyweb.cr.usgs.gov/public/outreach/sgu/sgugis.html. Contact: Joseph Kerski (USGS), 303-202-4315, jjkerski@usgs.gov; James Rattling Leaf (SGU), 605-856-4262, jamesrl@sinte.edu

**Hydrologic Information and GIS Capacity Building for the Caddo Tribe.** The Caddo Tribe of Oklahoma is concerned about the vulnerability of ground water to pesticide contamination in northern Caddo County and Canadian County, Oklahoma. On behalf of the Tribe, the USGS Oklahoma Water Resources District is constructing an aquifer-sensitivity map to outline areas where the aquifer is susceptible to pesticide contamination. The Tribe, with USGS assistance, is developing a geographic information system (GIS) that will include land use, pesticide use, and other data for parcels of land. USGS scientists worked with Tribal employees on ways to use GIS to make ground-water vulnerability maps and provided the tribes with a series of risk maps. At the Caddo Tribal headquarters in October 2002, several Tribal members were trained in the use of spatial data and basic GIS software applications by USGS staff. Contact: Carol J. Becker, 405-810-4436, cjbecker@usgs.gov

**Technical Assistance to the Blackfeet Nation on Water-Resources Issues.** In FY 2002, the USGS Montana Water Resources District continued to provide technical assistance to the Blackfeet Nation on water-resources issues. The USGS provided the Tribal government with information and guidance regarding ground-water flow directions and water levels in the vicinity of a wetland area near the town of Browning. The USGS also provided streamflow data and technical assistance to Tribal authorities during flooding in June 2002 that was related to a major snowstorm. Contact: Mike Cannon, 406 457-5900, mcannon@usgs.gov

**Navajo Surface Water Project.** The Navajo Surface Water project continues to help personnel of the Navajo Nation's Water Resources Department compute streamflow records and operate their streamflow-gaging stations. The USGS Arizona Water Resources District is providing technical assistance to Navajo hydrologists and technicians by populating databases with hydrologic data to compute and store streamflow data. USGS scientists also are training Navajo personnel to compute records and develop rating curves.

Additionally, USGS personnel are providing quality assurance for the project. The USGS currently operates two streamflow gages in cooperation with the Navajo Nation to provide near-real-time hydrologic data and to provide training opportunities to Tribal personnel. Contact: Gregory G. Fisk, 520-556-7225, ggfisk@usgs.gov

**Navajo Wetlands.** USGS wetland scientists from the Mid-Continent Ecological Research Center assisted in the design of a constructed wetland on the Navajo Nation and are currently studying whether the design improves the quality of the wastewater from the community of Pi§on, Arizona, for reuse and/or discharge. Concurrently, this wetland was designed to provide wildlife habitat that is scarce in the area. This is a cooperative effort among the Navajo Nation, the Indian Health Service, the Bureau of Reclamation, and the USGS. Besides collecting water-quality data at this site annually since 1999, the group has been collecting sediments, vegetation, and invertebrates annually for bioaccumulation studies of certain chemical element. Results from this research will provide information on how and when to build additional treatment wetland cells for further development in the Piñon area and in other remote locations within the arid southwest. Two field trips were made in 2002 to collect water, sediment, plant, and invertebrate samples from the constructed wetland following the second full year of operation. Two additional field trips are planned during 2003. Contact: Joan Thullen, 303-445-2212 or, joan_thullen@usgs.gov or James Sartoris, 303-445-2230, james_j_sartoris@usgs.gov

**Stream-Gaging Cooperation.** The White Mountain Apache Tribe permitted USGS employees to access stream gages on Tribal lands, under the terms of an Intergovernmental Agreement. USGS Arizona Water Resources District staff helped train White Mountain Apache Tribal staff in water-quality and surface-water data collection techniques. Contact: Christopher Smith, 520-670-6671, ext.251, cfsmith@usgs.gov

**Availability and Quality of Surface-Water and Ground-Water Resources of the Yavapai-Prescott Indian Tribe.** During 2002, the USGS Arizona Water Resources District collected water-level measurements at 12 wells, measured stream discharge at 2 streamflow gages, and collected water-quality samples from springs, wells, and surface-water sites on lands of the Yavapai-Prescott Indian Tribe. This program was designed to assist the Tribe in managing its water resources and to provide water-quality data that the Tribe can use to assess the health of Tribal members by meeting EPA water-quality standards. The USGS has provided training in collecting hydrologic data to Tribal staff over the past several years. The Tribe plans to collect its own water-quality, peak-flow, and ground-water data in FY 2003, demonstrating the success of this collaborative project to enhance Tribal capabilities. The USGS may continue operating the continuous-record streamflow gages for the Tribe. Contact: Robert J. Hart, 928-556-7137, bhart@usgs.gov; Gregory G. Fisk, 928-556-7225, ggfisk@usgs.gov

**Hydrologic Information for the Walker River Paiute Tribe.** During irrigation season, the USGS Nevada Water Resources District collected pH and conductance measurements for the Walker River Paiute Tribe. The information will help the Tribe in managing its water quality. Contact: Kerry Garcia, 775-887-7659, ktgarcia@usgs.gov

**Support for Hydrologic Investigations and Ground-Water Modeling for the Lummi Nation.** The Bureau of Indian Affairs (BIA) is assisting the Lummi Nation in determining the ground-water resources available for Tribal use on Lummi lands. At the BIA's request, USGS Washington Water Resources District hydrologists are providing technical review of the hydrologic data collected and technical oversight and review of a ground-water model of the Lummi Peninsula that is being constructed. The review process began late in FY 2002 and will be completed in FY 2003. Contact: Brian Drost, 253-428-3600, ext. 2642, bwdrost@usgs.gov

**Surface-Water Quality Training for the Karuk Tribe of California.** USGS California Water Resources District scientists are training Karuk Tribal personnel in water-quality sampling, measurement, and quality assurance/quality control procedures. The training builds Tribal capacity to manage water resources. Contact: Jim Bowers, 760-247-1401, cbowers@usgs.gov

**Streamgaging by the Hoopa Valley Tribe.** Hoopa Valley Tribal employees are operating four gaging stations in the Trinity River watershed under the general direction of and quality assurance review by USGS California Water Resources District scientists. Tribal employees have attended USGS classes on sediment measurement, in addition to on-the-job training during USGS field work. As part of the Trinity River Restoration Program, the Hoopa Valley Tribe is planning to expand its role in taking

stream-discharge measurements and in sediment sampling. Contact: Jim Bowers, 760-247-1401, cbowers@usgs.gov

**Technical Support to Habematolel Pomo of Upper Lake.** In response to requests from the Habematolel Pomo of Upper Lake for information related to mercury in Clear Lake and adjacent areas, USGS California Water Resources District hydrologists are providing USGS reports and literature citations for non-USGS reports. This activity has evolved into requests for USGS support of an Indian-led Clear Lake watershed initiative. A USGS representative has attended the initial meeting and will continue in an active advisory role. Contact: Walter Swain, 916-278-3024, wcswain@usgs.gov

**Technical Discussions with the Owens Valley Indian Water Commission.** USGS hydrologists are continuing to provide information to the Owens Valley Indian Water Commission on ground water and its use by American Indians and the Los Angeles Department of Water and Power. These discussions may lead to USGS review of third-party reports for the Water Commission, scientific and technical explanations of USGS and third-party reports, and advice on additional ground-water models. USGS scientists are currently extending the area covered by a previously published USGS ground-water model for the Owens Valley, in cooperation with Inyo County and the Los Angeles Department of Water and Power. The extension of the ground-water model may prompt additional work with Tribes, the Owens Valley Indian Water Commission, and the Bureau of Indian Affairs (BIA). Contact: Wes Danskin, 858-637-6832, wdanskin@usgs.gov

**Aquifer Characterization with the Morongo Band of Mission Indians.** USGS hydrogeologists with the California Water Resources District completed work on a project to provide the Morongo Band with comprehensive information on the chemical and physical characteristics of their primary water-supply aquifers. Technical reports were provided earlier and a graphical poster for use by the Morongo Band of Mission Indians has been prepared and delivered. The poster will be used to educate area residents and to improve management of their water-supply resources. Contact: Allen Christensen, 858-637-6875, ahchrist@usgs.gov

**USGS Technical Assistance to Bureau of Indian Affairs.** The USGS continues to provide networking support to the Bureau of Indian Affairs (BIA). USGS employees provided technical expertise and designs to assist BIA with internal communications after BIA computers were taken off-line. Part of the design was implemented in Alaska in FY 2002. Some additional routing issues were resolved throughout BIA in early FY 2002. Contact: Pat Murphy, 650-329-4044, pmurphy@noc.usgs.net

**Surface-Water Monitoring Stations.** The USGS Water Resources District operated the following surface-water monitoring stations in FY 2002, usually with cooperative funding from the Tribe, the Bureau of Indian Affairs (BIA), or a third party:

| No. of Stations | Cooperator | Contact |
|---|---|---|
| 2 | Seminole Tribe of Florida & South Florida Water Management District (includes 2 continous recoders with Tribal nutrient autosamplers) | Contact: Mitch Murray (Florida), 305-717-5827, mmurray@usgs.gov |
| 1 | Keweenaw Bay Indian Community | Contact: Tom Weaver (Michigan), 906-786-0714, tlwaver@usgs.gov |
| 2 | Sokaogon Chippewa, Mole Lake Band | Contact: Rob Waschbusch (Wisconsin), 608-821-3868, rjwasch@usgs.gov |
| 1 | Bad River Band of Lake Superior Chippewa Indians | |
| 1 | Menominee Indian Tribe of Wisconsin | |
| 1 | Oneida Tribe of Wisconsin | |
| 1 | Mohican Nation, Stockbridge-Munsee Band | |
| 2 | Lac du Flambeau Band of Lake Superior Chippewa Indians | |
| 2 | Three Affiliated Tribes | Contact: Douglas Emerson (North Dakota), 701-250,7402, demerson@usgs.gov |
| 1 | Bureau of Indian Affairs & Crow Creek Tribe | Contact: Ralph Teller (South Dakota), 605-355-4560, ext. 222, rwteller@usgs.gov |
| 1 | Bureau of Indian Affairs & Oglala Sioux Tribe | |
| 1 | Bureau of Indian Affairs & Oglala Sioux Tribe (crest-stage only) | |
| 1 | Bureau of Indian Affairs & Rosebud Sioux Tribe | |
| 1 | Bureau of Indian Affairs & Yankton Sioux Tribe | |
| 3 | Lower Brule Sioux Tribe (crest-stage only) | |
| 3 | Oglala Sioux Tribe | |
| 1 | Rosebud Sioux Tribe | |
| 1 | Sisseton-Wahpeton Sioux Tribe | |
| 1 | Standing Rock Sioux Tribe | |
| 2 | Omaha Tribe of Nebraska and Iowa, station installed in FY 2002 | Contact: Phil Soenksen (Nebraska), 402-437-5156, pjsoenks@usgs.gov |
| 2 | Santee Sioux Tribe of Nebraska, station installed in FY 2002 | |
| 1 | Winnebago Tribe of Nebraska, station installed in FY 2002 | |
| 1 | Citizen Potawatomi Nation | Contact: Robert Blazs (Oklahoma), 405-810-4419, rblazs@usgs.gov |

**Surface-Water Monitoring Stations-Continued**

| No. of Stations | Cooperator | Contact |
|---|---|---|
| 7 | Blackfeet Nation | Contact: Wayne Berkas (Montana), 406-457-5900, wrberkas@usgs.gov |
| 3 | Chippewa Cree Tribes of the Rocky Boy's Reservation | |
| 9 | Confederated Salish and Kootenai Tribes | |
| 2 | Fort Peck Assiniboine and Sioux Tribes | |
| 4 | Northern Cheyenne Tribe | |
| 11 | Bureau of Indian Affairs | |
| 13 | Tribal Water Engineer through the Joint Business Council of the Northern Arapaho and Eastern Shoshone Tribes (Wind River Reservation) | Contact: Bob Swanson (Wyoming), 307-778-2931, rswanson@usgs.gov |
| 4 | Tribal Water Engineer through the Joint Business Council of the Northern Arapaho and Eastern Shoshone Tribes (Wind River Reservation) (rating maintenance) | |
| 2 | Southern Ute Indian Tribe | Contact: Bob Boulger (Colorado), 970-245-5257, ext. 21, rboulger@usgs.gov |
| 1 | Ute Mountain Ute Tribe | |
| 6 | Bureau of Indian Affairs | Contact: Michael Roark ( New Mexico), 505-830-7903, mroark@usgs.gov |
| 2 | Pueblo of Zuni | |
| 1 | Isleta Pueblo, flood stage gage | |
| 1 | Nez Perce Tribe | Contact: Thomas S. Brennan (Idaho), 208-387-1366, tbrennan@usgs.gov |
| 4 | Bureau of Indian Affairs | |
| 3 | Pyramid Lake Paiute Tribe | Contact: Kerry Garcia (Nevada), 775-887-7659, ktgarcia@usgs.gov |
| 1 | Summit Lake Paiute Tribe | |
| 1 | Shoshone-Paiute Tribe | |
| 10 | Walker River Paiute Tribe | |
| 1 | Bureau of Indian Affairs & Peabody Coal Co. (Navajo Reservation) | Contact: Christopher Smith (Arizona), 520-670-6671, ext. 251, cfsmith@usgs.gov |
| 3 | Bureau of Indian Affairs & Peabody Coal Co. (Hopi Reservation) | |
| 1 | Arizona Department of Water Resources (Navajo Reservation) | |
| 2 | Bureau of Indian Affairs (Navajo Reservation) | |
| 2 | Hopi Tribe | |
| 2 | Havasupai Tribe | |

**Surface-Water Monitoring Stations-Continued**

| No. of Stations | Cooperator | Contact |
|---|---|---|
| 3 | Bureau of Indian Affairs (Hualapai Tribe) | Contact: Christopher Smith (Arizona), 520-670-6671, ext. 251, cfsmith@usgs.gov |
| 6 | Yavapai-Prescott Indian Tribe (2 continous records and 4 crest-stage gages) | |
| 1 | Tohono O'odham Nation | |
| 3 | Pueblo of Zuni | |
| 3 | Bureau of Indian Affairs (White Mountain Apache Tribe) | |
| 1 | Coeur d'Alene Tribe | Contact: Robert Kimbrough (Washington), 253-428-3600, ext. 2608, rakimbro@usgs.gov |
| 7 | Confederated Tribes of the Umatilla Indian Reservation | |
| 4 | Confederated Tribes and Bands of the Yakama Nation | |
| 2 | Jamestown S'Klallam Tribe | |
| 26 | Lummi Nation | |
| 1 | Makah Nation | |
| 2 | Nisqually Indian Tribe | |
| 1 | Nooksack Indian Tribe | |
| 1 | Quileute Tribe | |
| 1 | Quinault Indian Nation | |
| 1 | Skokomish Tribe of Indians | |
| 3 | Spokane Tribe of Indians | |
| 7 | The Tulalip Tribes | |
| 2 | Bureau of Indian Affairs | |
| 11 | Confederated Tribes of the Warm Springs Reservation | Contact: Thomas A. Herrett (Oregon), 503-251-3239, herrett@usgs.gov |
| 1 | Nez Perce Tribe | |
| 7 | Hoopa Valley Tribe | Contact: Jim Bowers (California), 760-247-1401, jcbowers@usgs.gov |
| 1 | Karuk Tribe of California | |
| 2 | Tule River Tribe | |
| 3 | Alaska Native Tribal Health Consortium | Contact: Steve Freznel (Alaska), 907-786-7100, sfreznel@ usgs.gov |
| 1 | Central Council of the Tlingit and Haida Indian Tribes of Alaska | |
| 1 | Cheesh'Na Tribal Council | |
| 1 | Eklutna, Native Village | |
| 1 | Haida Corporation | |

**Water-Quality Monitoring Stations.** The USGS Water Resources District collected water-quality data at the following sites in FY 2002, usually with cooperative funding from the Tribe:

| No. of Stations | Cooperator | Contact |
|---|---|---|
| 4 | Turtle Mountain Band of Chippewa Indians (lake sites) | Contact: Douglas Emerson (North Dakota), 701-250-7402, demerson@usgs.gov |
| 2 | Southern Ute Indian Tribe | Contact: Bob Boulger (Colorado), 970-245-5257, ext. 21, rboulger@usgs.gov |
| 2 | Fort Peck Assiniboine and Sioux Tribes | Contact: John Lambing (Montana), 406-457-5900, jlambing@usgs.gov |
| 1<br>4 | Pyramid Lake Paiute Tribe<br>Walker River Paiute Tribe | Contact: Kerry Garcia (Nevada), 775-887-7659, ktgarcia@usgs.gov |
| 2 | Karuk Tribe of California | Contact: James Bowers (California), 760-247-1401, jcbowers@usgs.gov |

**Ground-Water Monitoring Stations.** The USGS Water Resources District operated the following ground-water monitoring stations in FY 2002, usually with cooperative funding from the Tribe:

| No. of Stations | Cooperator | Contact |
|---|---|---|
| 1 | Collection of Basiac Records (CBR) program (observation well located on Kaibab Band of Paiute Indians Reservation) | Contact: Christopher Smith (Arizona), 520-670-6671, ext. 251, cfsmith@usgs.gov |
| 6 | Bureau of Indian Affairs (Navajo Nation and Hopi Tribe) | |
| 15 | Pechanga Band and Morongo Band of Mission Indians (wells for monthly depth to water) | Contact: Jim Bowers (California), 760-247-1401, jcbowers@usgs.gov |
| 3 | Pechanga Band and Morongo Band of Mission Indians (continous record wells) | |
| 6 | Pechanga Band and Morongo Band of Mission Indians (wells for annual water quality) | |

**Sediment-Monitoring Stations.** The USGS Water Resources District operated the following sediment-monitoring stations in FY 2002, usually with cooperative funding from the Tribe:

| No. of Stations | Cooperator | Contact |
|---|---|---|
| 3 | Hopi Tribe | Contact: Christopher Smith (Arizona), 520-670-6671, ext. 251, cfsmith@usgs.gov |
| 1 | Pueblo of Zuni | |

# General Coordination and Policy Activities

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**General National Mapping Program Activities.** The USGS conducts the National Mapping Program of the United States. Cartographic, geographic, and remotely sensed information in digital, graphic, and image form are collected and distributed in support of Federal, Tribal, State, and local governments, private sector organizations, and the general public. Since 1994, the USGS has worked through the Interior Geographic Data Committee (IGDC) to identify topographic map revision and geospatial data requirements in support of high-priority Department of the Interior (DOI) programs and applications. This is accomplished through the DOI High-Priority Base Data Program, which is funded and administratively managed by the USGS National Mapping Discipline (NMD). Key program objectives include minimizing redundancy in the production of digital data and maximizing the number of customer requirements satisfied for each product generated. As part of this program, NMD annually solicits the DOI bureaus for their graphic revision and geospatial data requirements, and a working group of the IGDC selects the project areas where these base data are needed to support priority natural-resource and land-management issues in the upcoming fiscal year. Tribal requirements for USGS base data are typically gathered through the Bureau of Indian Affairs (BIA) area offices and submitted by the BIA as part of this process. In FY 2002, NMD funds were used to produce digital base data and revised topographic maps to support the projects identified specifically by the BIA in the following States in the Central Region:

Montana -- interferometric synthetic aperture radar (IFSAR) elevation data of the Crow Indian Reservation (Crow Tribe of Indians)

New Mexico -- high-resolution National Hydrography Dataset (NHD) for parts of the Navajo Nation and the Pueblo of Zuni

North Dakota -- high-resolution NHD data for part of the Fort Berthold Indian Reservation (Three Affiliated Tribes of the Fort Berthold Indian Reservation).

Wyoming -- IFSAR elevation data for the Wind River Indian Reservation (Northern Arapaho Tribe and Eastern Shoshone Tribe)

In addition to the above projects, an additional $1.0 million was used to produce high-resolution NHD data and to acquire color infrared imagery for the Texas portion of the U.S./Mexico Border project to meet the high-priority requirements of multiple DOI bureaus, including those of the BIA. This imagery will be used to produce digital orthophotoquads in FY 2003. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov

**National Congress of American Indians (NCAI).** The USGS exhibited at the NCAI annual meeting in Spokane, Washington in November 2001. Information resources, materials, and contacts at the exhibit provided Tribal representatives with opportunities to build Tribal capabilities through data acquisition and management. USGS employees staffing the exhibit answered questions and helped USGS understand Tribal priorities. Contact: Susan Marcus, 703-648-4437, smarcus@usgs.gov


Gladys Fast Horse LeCompte (USGS), Emanna Little Eagle (NCAI), and Sue Marcus (USGS), at USGS exhibit, National Congress of American Indians, Spokane, Washington, December 2001. Photo by Genny Hanskins.

**Intertribal GIS Council.** The Intertribal GIS Council (IGC) and the USGS, through its support of the Federal Geographic Data Committee (FGDC), continued assisting the IGC in training and workshops on metadata and the National Spatial Data Infrastructure (NSDI). The USGS, FGDC, IGC, and U.S. Environmental Protection Agency

are exploring opportunities to update Tribal boundary maps. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Rural Geospatial Innovations in America.** The Federal Geographic Data Committee (FGDC) through its Memorandum of Understanding (MOU) with Rural Geospacial Innovations in America (RGIS), will assist Federal, State, Tribal and local entities in implementing advanced geospatial information technologies to improve the quality of life, environmental health, and economics of rural communities. Implementing the MOU will include providing technical assistance in system development and management to Tribal colleges and universities, training programs including kindergarten through 12th grade education, short courses and university curricula, and advanced spatial analysis for decision-making processes. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Biological Information for Committees of the Great Lakes Fishery Commission.** The Great Lakes Fishery Commission has established inter-agency committees to coordinate fishery resource management in individual lakes. The USGS Great Lakes Science Center and American Indian groups, such as the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish & Wildlife Commission, are represented on the committees for lakes Superior, Michigan, and Huron. To assist Tribal and State fishery management agencies in assessing the success of fish restoration efforts, USGS and Tribal scientists report annually on the status of lake trout rehabilitation and important prey fishes in lakes Superior, Michigan, and Huron. In addition, for the Lake Superior Committee, the USGS provided data and technical assistance. Contact: Rebecca Hayes, 734-994-3331, rhayes@usgs.gov

**Coordination with Tribal Organizations in Michigan.** USGS staff attended quarterly Michigan Tribal Environmental Group (MTEG) meetings. The Michigan Tribes, the Inter-Tribal Council of Michigan, the U.S. Environmental Protection Agency (EPA) Region 5, the USGS, the U.S. Department of Agriculture, the State of Michigan, and other groups and agencies are represented in MTEG. MTEG meetings provide a forum for environmental issues pertinent to Michigan Tribes. The USGS also participates in quarterly Multi-Federal Agency Memorandum of Understanding (MOU) meetings sponsored by the Midwest Region of the Bureau of Indian Affairs (BIA). Federal agencies participating in the MOU workgroup include the BIA, the USGS, the Indian Health Service, the Army Corps of Engineers, and the EPA, which meet to cooperatively plan and coordinate Federal-Tribal activities in EPA's Region 5. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Water Resources and The Pokagon Band of Potawatomi Indians.** In September 2002, the USGS met with environmental staff of The Pokagon Band of Potawatomi Indians to discuss various water-resources issues. The USGS reviewed Tribal property boundaries and the parties discussed how the USGS could help address specific Tribal concerns. Afterward, five locations on the Reservation were visited, followed by further discussion about site-specific monitoring ideas (such as water-level measurements, pesticide sampling, land use changes, GIS, and ground-water flow modeling). Contact: Tom Weaver, 906 786-0714, tlweaver@usgs.gov

**Ho-Chunk Nation Department of Natural Resources.** Eight staff from the Ho-Chunk Nation Department of Natural Resources toured the USGS Upper Midwest Environmental Science Center in October 2001. Along with learning the about the USGS, the group heard a presentation on U.S. Fish and Wildlife Service involvement with Tribal resource management. Contact: Mike Dewey, 608-781-6206, Michael_Dewey@usgs.gov

**Understanding Fire in Southwestern Forests.** Western Science and Traditional Knowledge. A dialogue was held at the Western Social Science Association (WSSA) meeting in Albuquerque, New Mexico, in April 2002 to discuss the importance of traditional Native American knowledge in understanding and managing fire-adapted systems. A major focus of the discussion involved the ramifications of sharing knowledge, including the proprietary nature of some traditional knowledge and differences in perspective on this issue among different Tribes. Invited participants included members of the Santa Clara Pueblo, the Pueblo of Isleta, and the Rosebud Sioux Tribe. Contact: Sandra Haire, sandy_haire@usgs.gov

**Wildlife Disease Issues in FY 2003.** Early in FY 2003, USGS staff from the National Wildlife Health Center in Madison, Wisconsin, will participate in the 20th Annual Pacific Regional Conference of the Native American Fish and Wildlife Society in Worley, Idaho. The Coeur d'Alene

Tribe is hosting this meeting with the theme: "We shall protect what is ours, for future generations." USGS Center staff will sponsor a session and gave a presentation on emerging diseases including Chronic Wasting Disease, West Nile Virus, and Newcastle disease. The presentation will be followed by a panel discussion. The following Tribes are expected to participate: Yakama, Umatilla, Nez Perce, Warm Springs (Wascot and Paiute), Spokane, Coeur d' Alene, Kalispel and Colville. In December 2003, the Center will host a workshop on surveillance strategies to detect CWD in wild elk and deer. A representative of the Bureau of Indian of Affairs (BIA) Great Plains Regional Office was invited to participate in this workshop. The USGS has been asked to present several additional wildlife disease workshops in 2003 as well as assist Tribes in the detection of CWD in their wild herds. Contact: Scott Wright, 608-270-2460, swright@usgs.gov or Kathryn Converse, 608-270-2445, Kathy_converse@usgs.gov

**Utah-Native American GIS Meeting.** The Automated Geographic Reference Center (AGRC), a Utah State agency, sponsored a one-day meeting in August 2002 with GIS coordinators from Native American Tribes in Utah. The meeting was held to share information with Tribal members about the many GIS projects throughout Utah. AGRC managers also wanted to learn how AGRC could help Tribes with Tribal GIS operations. The Utah Framework Implementation Team Plan (I-Team Plan) was also discussed. This plan has helped AGRC develop a strategic plan for completing the 18 data theme layers that are critical to many issues in the State. The Tribes were encouraged to join this planning process. Representatives from other Federal agencies presented overviews of their GIS and geospatial programs in the State. The USGS Southwest Strategy Coordinator presented an overview of USGS projects with Tribes. USGS Geography and Water Discipline representatives gave respective overviews on The National Map, High-Resolution National Hydrography Dataset (NHD), and water delineation programs. An overview of the U.S. Census Bureau's modernization program was also presented. Contact: David M. Vincent, 801-975-3435, dmvincent@usgs.gov

**Enhancing Tribal Relations Internal Training.** Enhancing Tribal Relations" was the theme of a 2-day training session for USGS Science Center, Region, and Headquarters personnel held in Tacoma, Washington. The session featured representatives of the Jamestown S'Klallam, Lower Elwha S'Klallam, Tulalip, Nooksack, Lummi, and Puyallup Tribes, as well as representatives from the Northwest Indian Fisheries Commission and the Washington State Governor's Office of Indian Affairs. A panel discussion of Tribal history and sensitivity to cultural differences was followed by breakout groups discussing field work on Indian lands, consultation in developing proposals, and ways of enhancing partnerships with Tribes. The USGS Washington Water Science Center and the U.S. Environmental Protection Agency Region 10 Tribal Program hosted the training. Contact: Cynthia Barton, 253-428-3600, ext. 2602, cbarton@usgs.gov

Students at GIS training course on the Rosebud Sioux Reservation. Photo by Joseph Kerski.

# Future Opportunities

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**Geographic Information in the Four Corners Region.** Along with other Federal, State, and academic partners in the Colorado Plateau Data Coordination Group, USGS scientists participated in a workshop for Four Corners area Tribal users of geographic information systems (GIS), providing information about GIS training and data sharing/partnership opportunities, the Navajo Nation Data Resource Center, regional GIS involvement, Tribal and regional pilot projects, Federal and academic GIS projects and research, and presentation of a Colorado Plateau "Information Team" concept. In addition, a free one-day GIS training workshop for ArcView users provided a demonstration on how to develop a project using this software. Another training opportunity will be provided in late spring 2003. Contact: David M. Vincent, 801-975-3435, dmvincent@usgs.gov

**Bureau of Indian Affairs Requests Additional Endangered Species Training.** The Bureau of Indian Affairs (BIA) has requested USGS assistance in offering training to Tribal biologists in FY 2003. Similar training for Tribal personnel has previously been conducted, with BIA assistance, for Tribal personnel, by a research ecologist at the USGS Southwest Biological Science Center. The training includes techniques for surveying the endangered southwestern willow flycatcher. In the past, lectures were presented on the status, distribution, ecology, and habitat use of the flycatcher, and the USGS scientist led a field trip to known flycatcher breeding sites along the Rio Grande. Contact: Mark Sogge, 928-556-7466, ext. 232, mark_k_sogge@usgs.gov

**Ground-Water and Surface-Water, Colony Wash Watershed, Ft. McDowell Yavapai Nation, Maricopa County, Arizona.** The Ft. McDowell Yavapai Nation has several concerns regarding the quality of water flowing onto their lands. Samples collected from previous USGS/Fort McDowell cooperative projects indicate the presence of high levels of dissolved solids and contaminants at levels exceeding U.S. Environmental Protection Agency water-quality standards. Analyses also detected low levels of volatile organic compounds (VOCs) and pesticides. The FY 2003 USGS/Fort McDowell monitoring project will monitor the chemical composition and quality of the ground and surface water flowing through Colony Wash; it will also monitor aquifer responses to various upstream influences within the Colony Wash watershed. This work will augment a long-term hydrologic (water-quality and water-level) database that can be used to evaluate the aquifer over time. As part of this monitoring program, streamflow samples will be collected when coditions permit. Shallow ground-water samples will be collected quarterly during dry periods from existing monitor wells. Deep ground water from the Ft. McDowell back-up drinking-water well will be sampled twice. Samples will be analyzed for nutrients, major and trace ions, trace metals, VOCs, and pesticides; water-level pressure transducers will be installed in two shallow wells to monitor water-level changes with time and in response to surface flows. Modified temperature sensors (resistivity probes) will be placed at several locations within Colony Wash to detect the presence, duration, and extent of ephemeral surface flows. Contact: John Hoffmann, 520-670-6671, ext. 265; jphoffma@usgs.gov or Christie O'Day, 480-736-1093, ext. 224, cmoday@usgs.gov

**Restoration of the Elwha River Ecosystem.** Scientists from the USGS Forest and Rangeland Ecosystem Science Center are providing technical advice to the National Park Service (NPS) and the Lower Elwha Tribal Community of the Lower Elwha Reservation on restoration of the Elwha River ecosystem. As part of this project the USGS is planning to conduct a workshop in FY 2003 for NPS and Tribal employees to determine research issues associated with dam removal. Restoration of anadromous fisheries is a priority for Tribes on the Olympic Peninsula. Contact: Edward Schreiner, 360-565-3044, ed_schreiner@usgs.gov

**Umatilla Basin Ground-Water Study Planning.** During FY 2002, the Confederated Tribes of the Umatilla Indian Reservation, Oregon Water Resources Department (OWRD), and USGS planned an investigation of the ground-water resources in the Umatilla Basin with special focus on ground-water/surface-water interaction. The Columbia River Basalt Aquifer can produce large quantities of water and underlies the Umatilla Basin, however, the storage capacity of the basalts is limited. As a result, water levels in the aquifer are declining in many parts of the basin and there is concern about the impact of these changes to the hydrologic system on discharge to streams.

As part of this planning and preparation for the study, the Oregon Department of Geology and Mineral Industries was asked to conduct geologic mapping and geologic map compilation in the basin. This information will be valuable to the cooperative ground-water study that is expected to begin in late FY 2003. Recent meetings between the Tribes, OWRD, and USGS have started the process of developing a detailed scope of work for the investigation. Contact: Bill McFarland, 503-251-3204, billmcf@usgs.gov


Team planning a ground-water study in the Umatilla Basin. Meeting participants included representatives of the Confederated Tribes of the Umatilla Indian Reservation, Oregon Water Resources Department, and USGS (including Gladys LeCompte, USGS Western Region Native American Special Emphasis Program, at far right). Photo by Bill McFarland, USGS.

# USGS Contacts

The U.S. Geological Survey has an American Indian/Alaska Native Coordinating Team to establish policy and to coordinate USGS activities. Please contact any of the individuals listed below for more information or to discuss questions or concerns.

Director's Office: Susan Marcus
MS 104, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-4437; fax 703-648-5068; smarcus@usgs.gov

Eastern Region: Gayle Sisler
MS 150, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-4412; fax 703-648-4588; gsisler@usgs.gov

Central Region: Gene Napier
EROS Data Center, Mundt Federal Center, Sioux Falls, South Dakota 57198
605-594-6088; fax 605-594-6154; enapier@usgs.gov

Western Region: Elaine Padovani
ENR Building, 520 N. Park Street, Tucson, Arizona 85719-5035
520-670-5506; fax 520-670-5571; epadovani@usgs.gov

Biological Resources: Hardy Pearce
MS 300, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-4085; fax 703-648-4238; hardy_pearce@usgs.gov

Geology: Sharon Swanson
MS 910, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-6453; fax 703-648-6057; smswanson@usgs.gov

Geography: Gene Napier
EROS Data Center, Mundt Federal Center, Sioux Falls, South Dakota 57198
605-594-6088; fax 605-594-6154; enapier@usgs.gov

Geographic Information: Bonnie Gallahan
MS 590, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-6084; fax 703-648-5755; bgallahan@usgs.gov

Office of Equal Opportunity: Lynne Sendejo
MS 602, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-4868; fax 703-648-4445; lynne_sendejo@usgs.gov

Water Resources: Tom Zembrzuski
MS 405, 12201 Sunrise Valley Dr., Reston, Virginia 20192
703-648-5364; fax 703-648-5295; tjzembrz@usgs.gov

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