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U.S. Geological Survey Activities Related to American Indians and Alaska Natives

Fiscal Year 2006

Circular 1326

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U.S. Geological Survey

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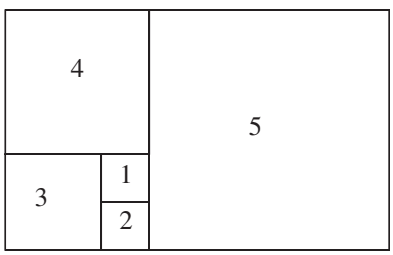
5. U.S. Geological Survey geologist Margaret Hiza. Photograph courtesy of the U.S. Geological Survey.



U.S. Geological Survey Activities Related to American Indians and Alaska Natives—Fiscal Year 2006

By Susan M. Marcus

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Suggested citation:
Marcus, S.M., 2008, U.S. Geological Survey activities related to American Indians and Alaska Natives, fiscal year 2006: U.S. Geological Survey Circular 1326, 114 p.

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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.

Organizations or Events Related to American Indians or Alaska Natives 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.

States Mentioned in the Report

This report is organized in the following manner: east to west and north to south. General information is followed by information on work in the northeastern United States; information about Alaska is at the end of each section.

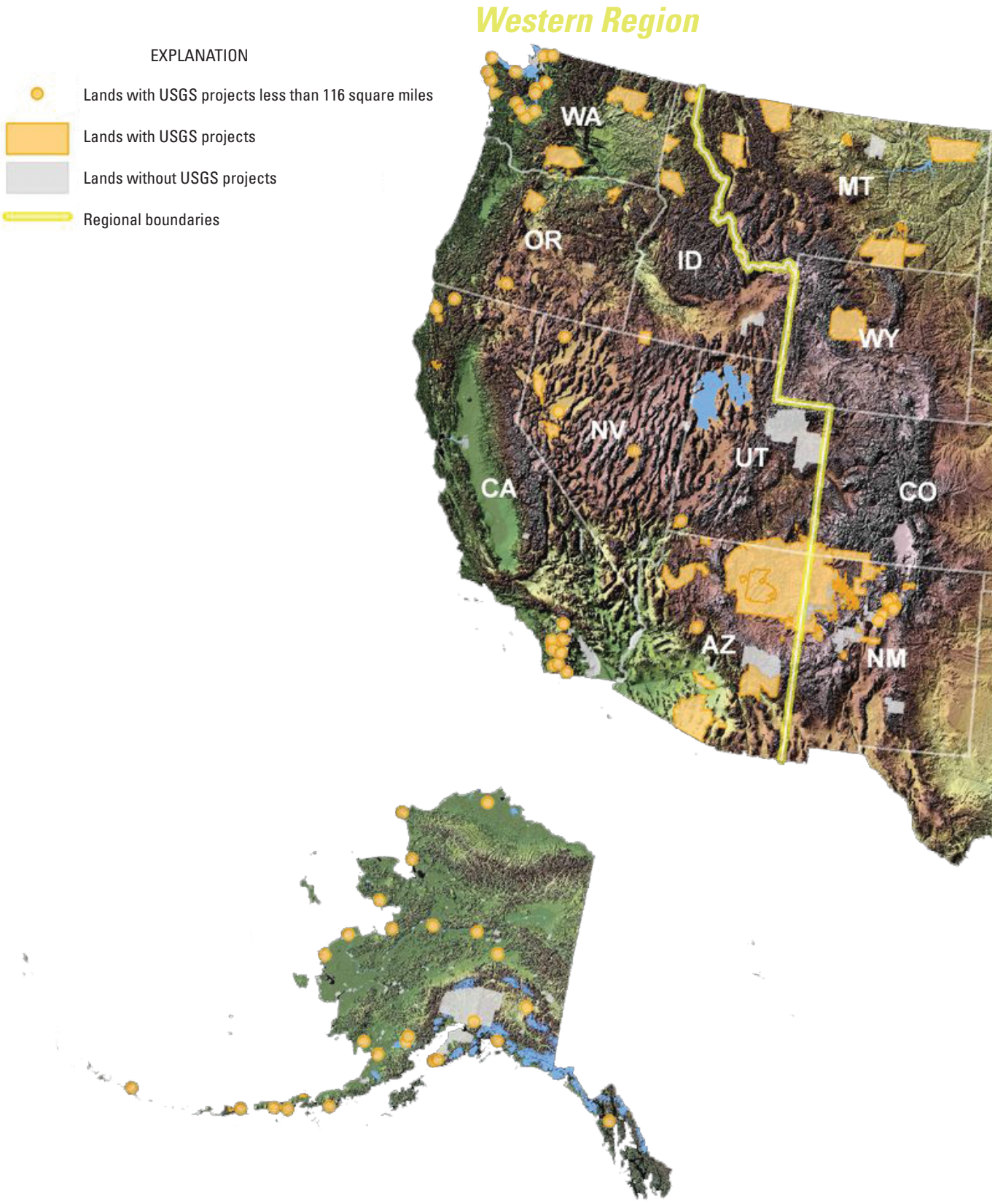

Western Region
EXPLANATION
Lands with USGS projects less than 116 square miles
Lands with USGS projects
Lands without USGS projects
Regional boundaries
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM

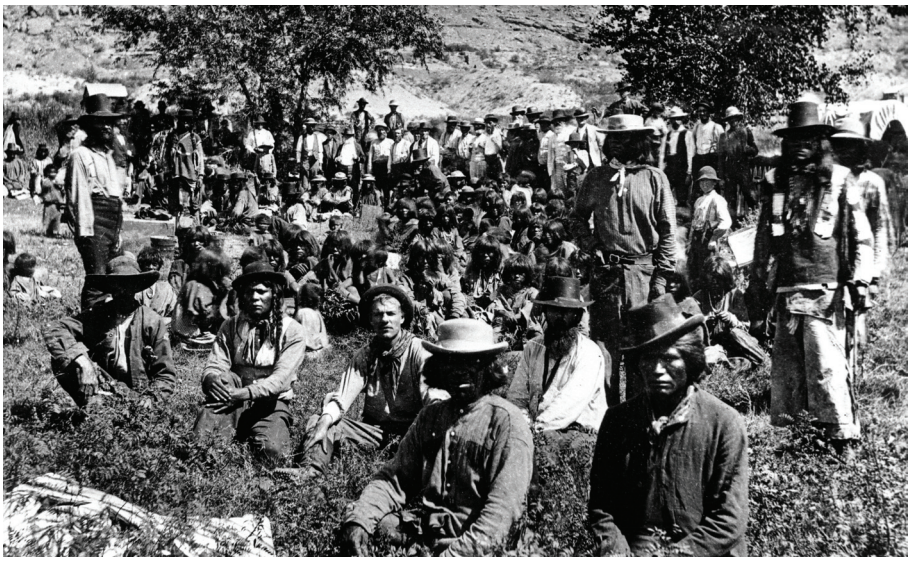
Figure 1. Map showing U.S. Geological Survey activities in fiscal year 2006 on American Indian and Alaska Native lands.

U.S. Geological Survey Activities Related to American Indians and Alaska Natives—Fiscal Year 2006

By Susan M. Marcus

Introduction

In the late 1800s, John Wesley Powell, the second director of the U.S. Geological Survey (USGS), followed his interest in the tribes of the Great Basin and Colorado Plateau and studied their cultures, languages, and surroundings. From that early time, the USGS has recognized the importance of Native knowledge and living in harmony with nature as complements to the USGS mission to better understand the Earth. Combining traditional ecological knowledge with empirical studies allows the USGS and Native American governments, organizations, and people to increase their mutual understanding and respect for this land. The USGS is the earth and natural science bureau within the U.S. Department of the Interior (DOI). The USGS does not have regulatory or land management responsibilities.



The Powell-Ingalls Special Commission meeting with Southern Paiutes near St. George. Standing figure at far left is Major John Wesley Powell—note empty shirt sleeve. Washington County, Utah. September 1873. (Photo from Smithsonian Institution: BAE neg. no. 1662 - A, Paiute)

What This Report Contains

This report briefly describes the cooperative activities between USGS scientists and Native peoples that occurred in Federal fiscal year 2006 (October 1, 2005, to September 30, 2006). Most of these activities were collaborations with Tribes, Tribal organizations, or professional societies. Others were conducted cooperatively with the Bureau of Indian Affairs or other Federal entities.

Each activity relates to Native Americans in some way. There is wide variation in the work, the goals and products, the duration of the study, and whether it was local or covered a broad area. The range of activities includes wildlife diseases, water availability, contaminants, energy and minerals, invasive and endangered species, and the interactions of humankind on our world.

Formal Activities

One type of USGS activity described in this report involves collection of specific types of data as well as investigative and research projects. These projects typically occur in the course of formal scientific studies conducted through existing USGS programs that last 2 or 3 years, although a few are parts of long-term activities. Some projects are funded through cooperative agreements with individual Tribal governments or by the Bureau of Indian Affairs. The USGS provides matching funds for some cooperative projects. Formal activities also may 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.

Participants in a meeting of the American Indian Science and Engineering Society (AISES) Government Relations Council (GRC) Meeting in Washington, D.C. September, 2006. Photograph courtesy of Jason Edwards.

Informal Activities

Informal activities are those designed by USGS employees and are usually conducted as collateral tasks that respond to an observed need. They are prompted by employee interests and frequently involve educational activities that often become reciprocal learning and teaching experiences for both USGS employees and Native participants. Through these activities, USGS employees help fulfill a mission of the USGS—to provide reliable scientific information—while helping their fellow citizens. Increasingly, some of these educational activities are becoming parts of formal USGS projects.

USGS employees also have taken the initiative in assisting American Indians and Alaska Natives through participation in several organizations that were created to promote awareness of science career opportunities among Native peoples and to help build support and communication networks. One such group is the American Indian Science and Engineering Society. USGS employees join this organization on a voluntary basis, bringing the benefits of this expanded network to the USGS.

How to Use This Report

In the following pages, diverse USGS activities related to American Indians and Alaska Natives are grouped into several categories: Most Notable Accomplishments of Fiscal Year 2006; Education and Training; and Resources and Environment. If you find an activity that might be appropriate for your area, contact the person(s) listed to learn more. The USGS has an American Indian/Alaska Native Liaison representing each USGS region, scientific discipline, and the Office of Equal Opportunity, and the bureau as a whole. Contact information for these liaisons is provided on the last page of this report.

Web Access — *www.usgs.gov/indian*

The USGS maintains a Website dedicated to making the USGS more accessible to American Indians, Alaska Natives, their governments, and institutions. This Website—*www.usgs.gov/indian*—provides information resources, training opportunities, and contact information for the USGS American Indian/Alaska Native Liaisons. This report and previous editions also are available at this site.

The Future

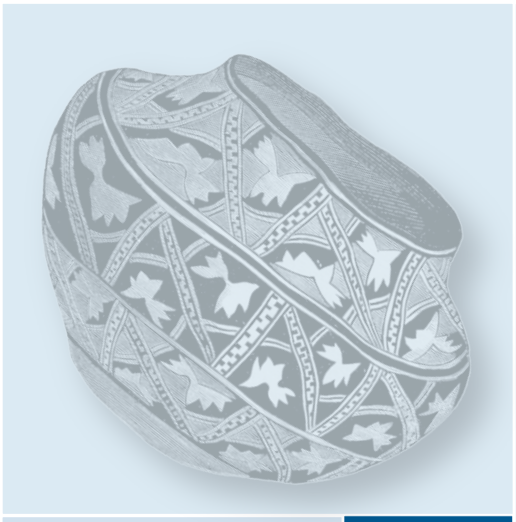
We hope this report not only captures the variety of cooperative activities that enrich both science and American Indian and Alaska Native communities, but also encourages additional cooperative, scientific, and educational studies. We have enjoyed a long, productive partnership that has brought greater understanding of the Earth and each other. By continuing to work together for mutual benefit, we can also increase the relevance of USGS science and Native traditions in honoring and respecting this great land and its people.

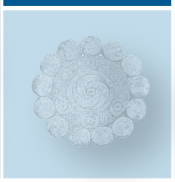
Contributors

This document was 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
- A.C. Brown and Cyndee Matus, Western Region
- Bonnie Gallahan, Geographic Information Discipline
- Janet Cushing, Biological Resources Discipline
- Ward Staubitz, Water Resources Discipline
- Sharon Swanson, Geology Discipline
- Jeffrey Dallos, Office of Equal Opportunity

Most Notable Achievements of Fiscal Year 2006





Each project description in this report exemplifies cooperation with Native American governments, organizations, or individuals. The USGS conducts science and capacity-building projects to support Tribal governments. USGS demonstrates career opportunities for Native students through activities with educators and students. Coordination between USGS and Native American organizations strengthens all participants. We want to draw your attention to a few projects that are notable because they have taken this collaboration in new directions, have increased its scope, or have profoundly affected people. Here are the notable achievements for fiscal year 2006.

Angie Reed, of Penobscot Indian Nation, teaches kids about invertebrates. Photograph courtesy of Penobscot Indian Nation.

USGS Scientists Honored by Washington Tulalip Tribe

On August 4, 2006, the Tulalip Tribe Natural Resources Department presented USGS scientists Kimberly Larsen and Reginald Reisenbichler with awards at the Tulalip Reservation in Marysville, Washington. The awards were presented in appreciation of the USGS Western Fisheries Research Center honoring the Federal Government trust responsibilities by providing continued professionalism, technical expertise, and a research partnership. A description of the assistance provided by USGS to the Tulalip Tribe is provided on page 16 of this report.

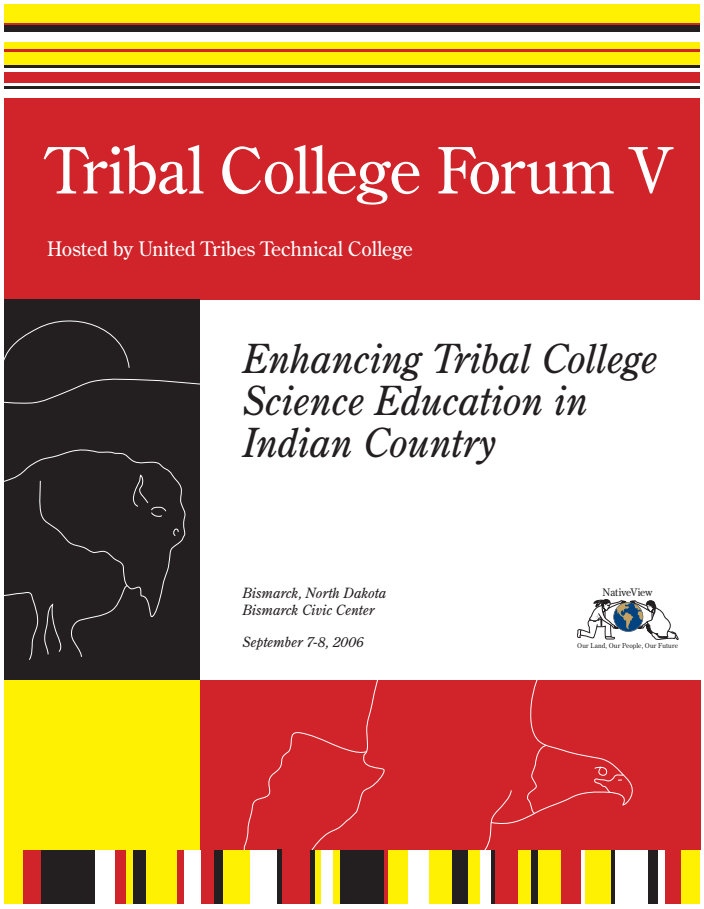
USGS Student Interns in Support of Native American Relations (National)

The USGS initiated a small Internship program in FY 2006 for students to work in the summer of FY 2007. The name of the activity, "Student Interns in Support of Native American Relations," explains its purpose—to build Tribal self-governing capacity by training future Tribal leaders. Through an internal, competitive process, the USGS American Indian/Alaska Native Liaison team selected USGS projects that benefited Tribes and Native students. Contact: Susan Marcus, 703-648-4437, *smarcus@usgs.gov*

Thomas Dowd, Bureau of Indian Education, U.S. Department of Interior, provides a keynote address at Tribal College Forum V, September 7, 2006, Bismarck, North Dakota. Photograph by Mark Barber, USGS contractor.

Bureau of Indian Education Director Dowd Addresses Fifth Tribal College Forum

Bureau of Indian Education Director Thomas Dowd provided a keynote address at Tribal College Forum V in Bismarck, North Dakota in September 2006. Tribal College Forum V was held in conjunction with the North Dakota, Intertribal Summit and United Tribes Technical College's 36th Annual International Powwow. United Tribes Technical College, in Bismarck, served as the host Tribal College. One hundred people from tribal, federal, and private entities participated in the 2006 Forum, including representatives of 25 of the 36 Tribal Colleges and Universities. The theme for the Forum was, "Natural Resource Issues in Indian Country." Presentations included topics, such as "Successful Partnerships," "Geoscience Tools," "Natural Resource Problem Solving," and NativeView, Inc. updates. The USGS, the American Indian Higher Education Consortium, and the Federal Geographic Data Committee co-sponsored the Forum. The Forum is part of the USGS implementation of Executive Order 13336 on American Indian and Alaska Native Education reaffirming the Federal Government's commitment to Tribal Colleges as they continue to provide job training and other career-building programs to Native American students. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*



Sarah Jenkins, USGS contractor, designed this cover for the proceedings from Tribal College Forum V.

Bison herd grazing on the National Bison Range, Montana. Photograph from the U.S. Fish and Wildlife Service.

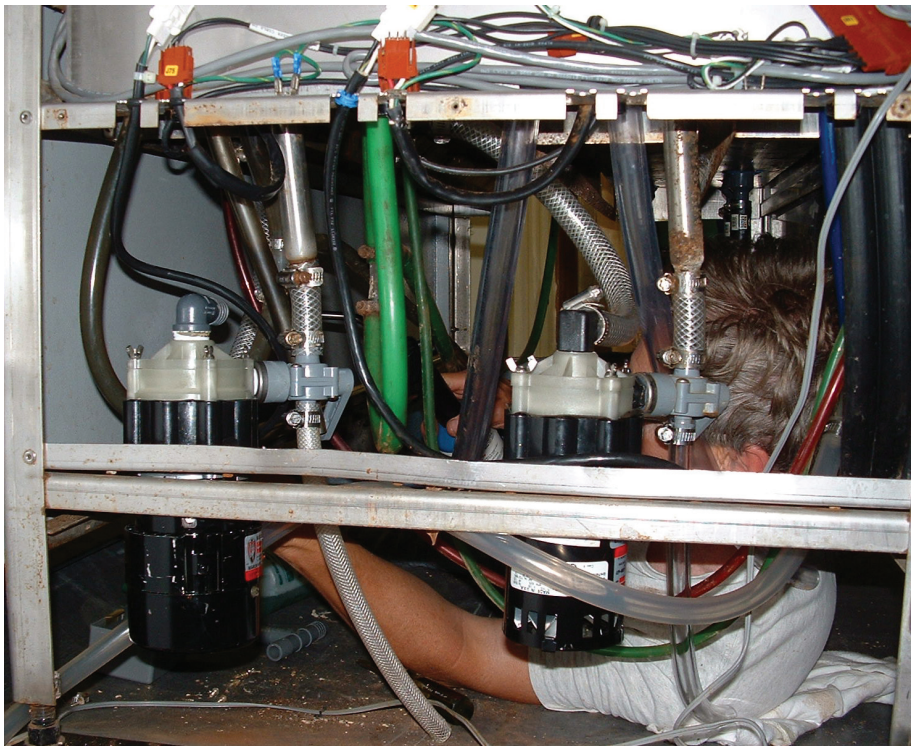
USGS Tribal Relations Training (National)

During FY 2006, the USGS began developing a new Tribal relations training course for its employees. The purpose of the training is to facilitate interactions with Tribes by informing USGS employees about the unique aspects of Tribal sovereignty; laws, regulations, and policies relating to Native Americans, as well as cultural issues that may affect collaboration. Native Americans, some of whom are USGS employees and others who are invited guests, describe their experiences and perspectives. A panel that includes USGS scientists will discuss successful approaches to cooperative Tribal relations. A team of subject matter experts from all USGS regions and headquarters designed the training. The Office of Employee Development partnered with the Office of the Special Trustee for American Indians and other bureaus (National Park Service, Bureau of Land Management, U.S. Environmental Protection Agency) to capitalize on best practices, curriculum, and instructors. Additionally, the USGS Western Regional Biology Center Directors requested and were given a brief version of the course as part of their management meeting. Contact: Susan Marcus, 703-648-4437, *smarcus@usgs.gov* or Pam Marsters, 703-648-6703, *pmarster@usgs.gov*

Equipment Provides Economic Development Option for Rosebud Sioux Tribe (South Dakota)

The Rosebud Sioux Tribe and the USGS Center for Earth Resources Observation and Science (EROS) continued to research, develop, test, and demonstrate advanced photographic laboratory equipment integration and technology on the Rosebud Sioux Reservation. During 2006, the USGS transferred excess equipment to the Rosebud Sioux Tribe. The transfer involved moving 12 pallets, weighing more than 11,000 pounds, of large-scale, black-and-white, photographic laboratory equipment and supplies by tractor-trailer from the USGS Center in Sioux Falls, South Dakota to the Rosebud Sioux facility in Mission, South Dakota. The equipment provides economic opportunities for Rosebud Sioux Tribal members. They will be able to develop and produce high-quality, large-format photographic products for their communities, for other Tribes in the United Sioux Tribe Development Corporation, and for other customers. The Rosebud Economic Development Corporation, a Rosebud Sioux tribally owned business, will manage the facility. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

Kelvin Tellinghuisen (right) prepares to install a photographic processor and chemical storage containers donated to the Rosebud Sioux Tribe by the USGS during 2006. Photograph courtesy of Dave Eitreim.



Dave Eitreim works beneath a photographic processor donated by the USGS to the Rosebud Sioux Tribe, Mission, South Dakota, in July 2006. Photograph courtesy of Kelvin Tellinghuisen.

Yupik Students Assist in Biological Research (Alaska)

Fiscal Year 2006 marked the 21st consecutive year that USGS scientists in Alaska have involved Yupik Eskimo students in a project that monitors and conducts research on waterfowl on the Yukon-Kuskokwim Delta, Alaska. The students live at a remote site with biologists while assisting the scientists in capturing geese and swans and fitting the birds with leg bands and neck collars. Movements of these waterfowl are being monitored as part of a large study to determine annual survival rates, migration pathways, and important staging and winter habitats. Twenty-two Yupik youth participated in the work in 2006; more than 200 have been involved in the program since 1986. Several species of waterfowl were captured and sampled for the avian influenza virus as part of a State-wide effort for early detection of this disease. This research provides information on the population biology of species of interest that is used regionally and throughout the Pacific Flyway by indigenous people, wildlife enthusiasts, and sport hunters. The field effort this year was followed by a celebration and potlatch in honor of more than 20 years of involvement by the town of Chevak in supporting research and management of important wildlife resources. The project also continues to enhance communication between government researchers and Alaska Natives as USGS scientists present career opportunities to Native youths. Contact: Craig Ely, 907-786-3526, *craig_ely@usgs.gov*

A Chevak student holding a northern pintail duck for sampling for avian influenza on the Yukon-Kuskokwim Delta, July 2006. Photograph by Craig Ely, U.S. Geological Survey.

Coeur d'Alene Tribe North Idaho Geospatial Data Collaboration

The Coeur d'Alene Tribe, in collaboration with USGS and the University of Idaho, is leading an effort to develop regional geographic information systems layers that will be available to the public and used for diverse applications. The Tribe is acting as a partnership development coordinator, working with multiple local, State, and Federal agencies to standardize data sets in the north Idaho region. The University of Idaho uploads the local data nightly and serves a common data set to USGS, the Tribe, and the public. Contact: Tracy Fuller, 303-202-4172, *tfuller@usgs.gov*

Assistance to the Northwest Indian Fisheries Commission (Washington)

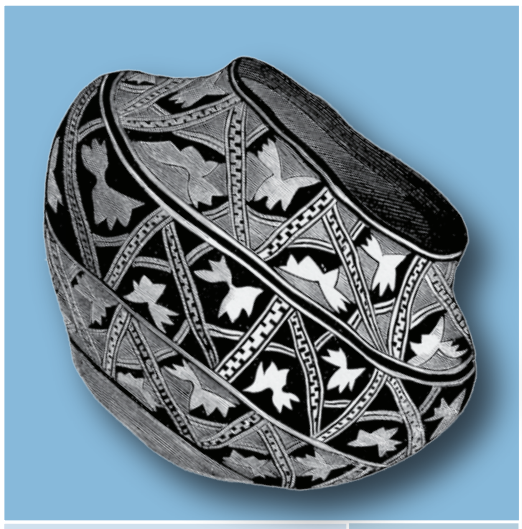
The USGS Washington Water Science Center, in cooperation with the Northwest Indian Fisheries Commission, met individually with the 20 member Tribes in western Washington to discuss Tribal water resources issues, information systems, and needs. These meetings implemented a comprehensive Tribal assessment of water resources in western Washington to address water availability, water use, and ecological requirements for water in the region. The USGS will be working with the Commission and its member Tribes to implement the assessment, facilitating Tribal protection, restoration, and management of their water resources. Contact: Chris Konrad, 253-552-1634, *cpkonrad@usgs.gov*

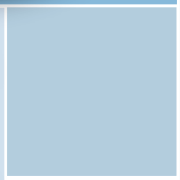
The U.S. Geological Survey Honors Two of its Employees

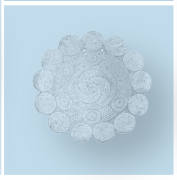
Laurie Wirt, a geologist based in Denver, Colorado, who died in 2006, studied the geochemistry of water, including the effects of uranium mining on ground water. She was particularly interested in the Verde River. She worked with the Navajo Nation and the Hopi Tribe.

With the death of Dr. James H. Petersen in March 2007, the U.S. Geological Survey lost a stellar scientist and collaborator on fisheries research with the Confederated Tribes and Bands of the Yakama Nation and the Confederated Tribes of the Warm Springs Reservation. Jim Petersen was an expert on the effects of predation on the survival of juvenile salmonids, particularly in the Columbia River system. Just as he excelled in research, Jim excelled in working with others as a colleague and mentor.

Education and Training







Cooperative Training with Department of Homeland Security/ Federal Emergency Management Agency (National)

The Federal Geographic Data Committee, through its Memorandum of Understanding with Department of Homeland Security/Federal Emergency Management Agency, offers several classes for Tribal entities on various topics, including: Tribal Framework for Emergency Preparedness; Emergency Operations for Tribal Governments; Introduction to Basic HAZUS (Hazards Use)-Multi Hazards; Intermediate Basic HAZUS-Multi Hazards; and Mitigation for Tribal Officials. All courses include overviews of the National Spatial Data Infrastructure, Cooperative Agreement Program, Geospatial One Stop, and The National Map. Contact: Bonnie Gallahan, 703-648-6084, *bgallahan@usgs.gov*

National Indian Education Association (National)

The USGS continued its support of the Native American students by participating in the National Indian Education Association's annual conference in Anchorage, Alaska. This annual conference draws the largest audience of American Indian educators who teach at all levels. The USGS booth featured photographs of Native students assisting USGS researchers. The USGS Alaska Science Center staffed the exhibit. Students and educators from across the Nation showed great interest in the unbiased science that we provide as well as educational materials, USGS careers, and job opportunities. Contact: A.C. Brown, 907-786-7002, *acbrown2@usgs.gov*

Photo of Anchorage National Indian Education Association exhibit.

Introduction to Metadata and Geographic Information System (GIS) Courses for American Indian Conservation Professionals (National)

The USGS, through its support of the Federal Geographic Data Committee, and the U.S. Fish and Wildlife Service continues offering two training sessions that introduce American Indian students to the uses of GIS. Topics of the sessions include the National Spatial Data Infrastructure, Geospatial One Stop, The National Map, 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. The courses are offered several times per year at the FWS National Conservation Training Center in West Virginia. Contact: Bonnie Gallahan, 703-648-6084, *bgallahan@usgs.gov*

Water Technician Training Course (National)

The Bureau of Indian Affairs sponsored its annual Water Resources Technician Training Course in Las Cruces, New Mexico, June 4–30, 2006. Thirteen Tribal representatives from throughout Indian Country participated. The four-week earth sciences session was coordinated by staff at New Mexico State University using instructors from several Federal agencies and academia. USGS personnel taught a three-day module entitled, "Introduction to Hydrologic Data Collection Techniques." Instruction included classroom and field activities on ground-water concepts and data collection, as well as surface-water data-collection techniques. The field-oriented training program is based on hands-on experience to develop basic data-collection skills. Contact: Edward (Nick) Nickerson, 505-646-7618, *nickerso@usgs.gov*

Houlton Band of Maliseet Indians Student Receives Master's Degree (Maine)

The USGS Maine Water Science Center joined the Houlton Band of Maliseet Indians, USGS Water Resources Research Institute, Maine State laboratories, and the George Mitchell Center at the University of Maine to support the research of Elizabeth Fretwell, whose thesis is entitled "The temporal and spatial relationship between phosphorus and nitrogen concentrations, algal growth, and nutrient sources in the Meduxnekeag River watershed." Ms. Fretwell's field work spanned the summers of 2005 and 2006. She successfully defended her thesis in Ecology and Environmental Sciences in the summer of 2006. Contact: Chuck Schalk, 207-622-8201, ext. 111, *cwschalk@usgs.gov*

American Indians Explore Potential Careers and Resources (Minnesota)

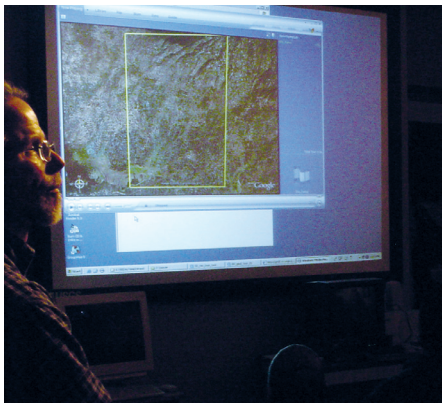
Fifty-four students and staff with the Summer Youth Employment Program from the Lower Sioux Indian Community, near Morton, Minnesota, visited the USGS Center for Earth Resources Observation and Science (EROS), August 9–10, 2006. Students toured the radome, which protects a 33-foot long Landsat satellite antenna, and learned about possible earth science careers with the USGS. In addition to learning about career and satellite paths, students toured the building and participated in a question and answer session in the auditorium. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

EROS Donates Computers to American Indians (North Dakota, South Dakota)

Throughout FY 2006, surplus computers from the USGS Center for Earth Resources Observation and Science (EROS) were donated to Tribes, Tribal schools, and organizations that benefit Tribes. Computers were distributed to Tribal offices and classrooms on Tribal lands. Tribes that participated in this program included the Rosebud, Crow Creek, and Lower Brule along with Sinte Gleska University. Contact: Mark Barber, 605-594-6176, *barber@usgs.gov* or Gene Napier, 605-594-6088, *enapier@usgs.gov*

Flandreau Indian School Students Visit EROS (South Dakota)

Twenty-two science and math students from the BIA Flandreau Indian School in Flandreau, South Dakota visited the USGS Center for EROS on April 21, 2006, for a series of demonstrations and hands-on computer activities. Following a morning of hands-on computer activities related to geographic information systems, remote sensing, and geospatial applications, the students had lunch and toured the Center. Contact: Mark Barber, 605-594-6088, *barber@usgs.gov*



Eric Wood (left) shows Flandreau Indian School students a 3-D satellite data demonstration using Geowall technology, April 21, 2006. Photograph by Mark Barber, USGS contractor.

Native American Connections Program in Sioux Falls Schools (South Dakota)

The USGS continued to support and help expand the Native American Connections Program in Sioux Falls, South Dakota during 2006. The program builds self-esteem among this disadvantaged population. The USGS, through its contractor, SAIC, provided a Native American contract employee, Michael Choate, who met weekly with students in the Native American Connections Program at Axtell Park Middle School and Washington High School in Sioux Falls. Choate was a role model and also created lesson plans that helped young American Indian students develop self-confidence, recognize their potential, graduate from high school, and pursue higher education programs. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

Sinte Gleska University and USGS Partnership (South Dakota)

The Rosebud Sioux Tribe's Sinte Gleska University (SGU) and the USGS have a multiyear Memorandum of Understanding to conduct programs and activities that enhance the capabilities of SGU by improving educational opportunities, contributing information and skills to the Rosebud Sioux Tribe, and meeting operational science objectives of SGU and USGS programs. Accomplishments during FY 2006 include support for two American Indian interns from SGU. These interns stayed on the reservation, conducting fieldwork for the USGS Central Region's Integrated Science Program. They also took training enabling them to use geographic information systems to present and analyze data. They gave formal presentations at Tribal College Forum V, September 8, 2006, and worked with USGS scientists on a separate project called the Indigenous Knowledge Center for Education and Science Impacts (IKCE SI). Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

The Multipurpose Building at Sinte Gleska University on the Rosebud Sioux Reservation. Photograph by Mark Barber, USGS contractor.

USGS EROS Supports Sinte Gleska University Tribal Rangeland Management Project (South Dakota)

Under a NASA Earth Science Research, Education, and Applications Solutions Network Cooperative Agreement Notice (REASoN CAN) grant awarded to Sinte Gleska University (SGU), the USGS Center for Earth Resources Observation and Science (EROS) is collaborating and providing support to the project titled "Using Geospatial Information to Enhance Tribal Rangeland Management Through Education and Understanding." Building on an existing USGS–SGU Memorandum of Understanding for cooperative activities, EROS staff provides geographic information systems and applied science support to this planned multiyear project. The project focuses on developing decision-support tools and educational curricula for rangeland management on Tribal lands. Observational components, including satellite, aircraft, and field measurements, were developed in year two of this five-year effort. A rangeland production model will add geographic information systems-ready meteorological data sets. This model will use information from satellite imagery, soil productivity from the U.S. Department of Agriculture's Natural Resource Conservation Service, and meteorological data to discern soil quality, climatic, and management influences on rangeland productivity. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov* or James Rattling Leaf, 605-856-8100, *James.RattlingLeaf@sintegleska.edu*

Coordination with Haskell Indian Nations University (Kansas)

The USGS, through the Kansas Water Science Center, serves on the Haskell Indian Nations University's Natural Resources Advisory Board and advises Haskell on pertinent academic programs. Contact: Walt Aucott, 785-832-3505, *waucott@usgs.gov*

Water-Quality Monitoring Class (Oklahoma)

USGS hydrologists and hydrologic technicians presented a hands-on water-quality sampling class to representatives of seven Tribes in northeast Oklahoma, September 13 and14, 2006. The tribes included the Cherokee Nation, Peoria Tribe, Eastern Shawnee Tribe, Quapaw Tribe, Wyandotte Nation, Seneca-Cayuga Tribe, and the Ottawa Tribe. A classroom session featured field videos, instructions on calculations, and a workbook. The attendees also had the opportunity to learn surface-water measuring techniques using various instruments. The class concluded by collecting samples on the Spring River that were sent to the USGS National Water Quality Laboratory for analysis. Contact: Carol Becker, 405-810-4400, *cjbecker@usgs.gov*

USGS hydrologists, hydrologic technicians, and Tribal staff pose for a picture during a Water-Quality Monitoring Class held September 13 and 14, 2006, on the Spring River near Quapaw, Oklahoma.

Outreach in the Grand County Schools, Science Fair Participation (Utah)

In FY 2006, scientists from the USGS Canyonlands Research Station (CRS) participated in the annual science fair at Helen M. Knight elementary school (Moab, Utah), which has a Native American population nearly twice that of the national average. Scientists reviewed the science fair entries and provided encouragement and information on science as a career. Contact: Sue Phillips, 435-719-2337, *sue_phillips@usgs.gov*

Training Native American Biologists to Protect Endangered Bird (New Mexico)

In May 2006, a scientist from the USGS Southwest Biological Science Center assisted Native American Tribes and Pueblos by providing training on Southwestern Willow Flycatcher biology and flycatcher survey techniques. The flycatcher is an endangered bird that lives in riparian habitats on some Tribal and Pueblo lands. Staff of the Tribes and Pueblos attend these annual training workshops (sponsored by the U.S. Fish and Wildlife Service) to be certified to conduct their own flycatcher surveys on Tribal lands. The USGS presentation at the Albuquerque-based event included several hours of classroom instruction on the flycatcher's distribution and status, breeding biology, habitat use, identification, and survey techniques. The following morning, the USGS scientist also led a field trip to a nearby Southwestern Willow Flycatcher breeding site on Native American lands, so that Native American staff could learn to identify the flycatcher under field conditions. Contact: Mark Sogge, 928-556-7194, *mark_sogge@usgs.gov*

Workshop on the Effects of Climate Change on Hopi Tribe (Arizona)

Three USGS researchers from the Southwest Biological Science Center participated in a workshop in December 2005 to discuss the effects of future climate change on the Hopi Tribe, its people, and its lands. The USGS scientist participated in a panel discussion as part of the workshop, answering questions from the audience. The workshop was attended by Hopi elders, the Hopi Tribe Vice Chairman, representatives of renewable energy corporations, environmental organizations, and Hopi schoolchildren. It was sponsored by the Sierra Club, The Grand Canyon Trust, Black Mesa Trust, Esther Honyestewa, Stacy Gildenston, and the Hopi community of Hotevilla. Contact: Kenneth Cole, 928-523-7767, *ken_cole@usgs.gov*

Sonoran Desert Ecology (Arizona)

The Sonoran Desert Research Station of the USGS Southwest Biological Science Center is cooperating with the University of Arizona and the National Park Service, Natural Resource Information Division, in creating an educational module titled, "Views of the National Parks" on the Sonoran Desert Ecosystem. This module is now available on-line (*http://www2.nature.nps.gov/views/KCs/SonoranDesert/SonDesert_Index.htm*) and on CDs for use by teachers and the public. A member of the Hia-Ced O'odham Tribe provided a valuable perspective on the Native American connections to the Sonoran Desert. This perspective is an important part of the educational experience being presented through this program. Contact: Bill Halvorson, 520-621-1174, *bill_halvorson@usgs.gov*

Streamflow Data Collection Workshop (Washington)

The USGS Washington Water Science Center held two workshops on streamflow data collection for western Washington Tribes. In the classroom, students learned about the nationally standardized USGS methods for measuring streamflow. Students also had field-based training, including wading into a local stream to make streamflow measurements. Other workshop topics included continuous water-temperature measurement, quality assurance, new acoustic technology, and equipment installation and operation. The workshops were cosponsored by the USGS and the Northwest Indian Fisheries Commission and were hosted by the Squaxin Island and Tulalip Tribes. Contact: Richard Wagner, 253-552-1685, *rjwagner@usgs.gov*

Bob Kimbrough (center), USGS Washington Water Science Center Assistant Director for Hydrologic Data, instructs technicians Joe Puhn (left), Squaxin Island Tribe, and Nydesta Gouley (right), Skokomish Tribal Nation, in stream-gaging techniques. Photograph by Rick Wagner, U.S. Geological Survey.

Assistance to the Tulalip Tribe (Washington)

USGS fisheries biologists provided expertise and training to employees of the Tulalip Tribe. The Tulalip employees were trained to process and interpret thermally marked salmonid otoliths. Thermal marks on these calcified structures provide a means of identifying varying lots of hatchery fish, sometimes several from one hatchery facility. The ability to distinguish hatchery fish from wild fish, and to identify different brood years of hatchery fish, aids in managing wild and hatchery populations. Contact: Kimberly Larsen, 206-526-6282, ext. 232, *kim_larsen@usgs.gov* or Reginald Reisenbichlter, 206-526-6559, *reg_reisenbichler@usgs.gov*

Explorer's Club—Outdoor Science Education Outreach on San Diego County Reservations (California)

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, and the San Diego Science Alliance, Eleanora Robbins has expanded a series of successful outdoor science activities originally developed under USGS auspices into a set of "Explorer's Club" programs for children ages 6 to 12. The format of each program is adapted to suit the needs of the Education Director or Recreation Director of each Tribe. Tribal elders are invited to participate as program instructors. The programs include panning for gold and magnetite, collecting rocks, coring soil, bugs and butterflies, and learning outdoor photographic techniques. Water-related activities are particularly important to help the students understand water issues in this semiarid area that has suffered 6 years of drought. Equipment is shared with children from the Campo Band of Kumeyaay Indians, Mesa Grande Band of Mission Indians, Pauma Band of Luiseño Indians, Pala Band of Mission Indians, Rincon Nation of Luiseño Indians, San Pasqual Band of Indians, Santa Ysabel Band of Diegueno Indians, Sycuan Band of the Kumeyaay Nation, and Viejas Band of Kumeyaay Indians. Contact: Eleanora (Norrie) I. Robbins (USGS Emerita), 619-303-9095, *norrierobbins@cox.net*

Eleanora (Norrie) Robbins, USGS scientist emeritus, teaches kids about having fun with science at the Santa Ysabel Culture Camp program at the lake. Photograph by Eleanora Robbins (USGS Emerita).

Scientist Serves on Advisory Council for Tribal Educational Initiative (Alaska)

A USGS Alaska Science Center biologist continues to serve on the Advisory Committee for the Tribal Natural Resource Management Program sponsored by the Chugach Alaska Corporation in collaboration with the National Oceanic and Atmospheric Administration (NOAA), the University of Alaska Fairbanks (Interior-Aleutians Campus Tribal Management Program), and the Chugach Regional Resources Commission. The goal of this project is to establish a natural resource education and degree program (associate degree) for Alaska Natives in coastal management that includes research, monitoring, management of critical coastal resources, and the traditional knowledge on which Native livelihood and culture depends. This program involves Native elders and traditional knowledge bearers from the south-central Alaska region in curriculum development and project implementation for degree qualifications. Ten students participated in the program in 2006. The academic degrees resulting from this program will focus on entrepreneurial skills and academic knowledge for entry-level management positions in Tribal institutions, local governments, and other organizations in rural Alaska. Contact: Jennifer L. Nielsen, 907-786-3670, *jennifer_nielsen@usgs.gov*

Intern holding whitefish at Lake Clark, Alaska. Photograph by Carol Ann Woody, U.S. Geological Survey.

Alaska Native Internship Program (Alaska)

A USGS scientist continued a fisheries science internship program in the Bristol Bay region of Alaska during the summer of 2006. This program provides students with hands-on experience in fisheries science by participating in projects directly related to the subsistence fishery resources of the region. During 2006, USGS hired one intern and was provided with an additional intern from the Bristol Bay Native Corporation. The interns were from the Bristol Bay region (Dillingham), Alaska. Humpback whitefish (*Coregonus pidschian*) are the second most important subsistence food fish for local residents in the Lake Clark watershed (salmon are the primary food for traditional lifeways). Recent surveys show that total whitefish subsistence harvests in the Kvichak River watershed dropped precipitously from about 13,000 fish per year in the mid-1990s to 1,000 fish per year in the early 2000s. A lack of basic biological information on humpback whitefish in Lake Clark, as well as in the greater Kvichak River watershed, hinders assessment of this species' status and their reported decline. USGS scientists are conducting research to better understand humpback whitefish biology in the affected area by determining distribution, seasonal movement and life history of this species in the Lake Clark Watershed. Interns learned how to surgically implant radio tags into mature humpback whitefish, use a diverse array of scientific fishing equipment, collect environmental data, enter data into digital data bases, and summarize and present their findings. They learned skills, such as otolith (inner ear bone) collection, genetic sample collection, environmental monitoring techniques, and data-entry techniques. The USGS coordinated the hands-on aspect of the internship program in partnership with the National Park Service at Lake Clark National Park and Preserve and with the Bristol Bay Native Association. This program encourages Alaska Natives to pursue college degrees and to consider careers in science. Contact: Christian Zimmerman, 907-786-7170, *czimmerman@usgs.gov*

Roadside Science Program Introduces Yupik Students to USGS in Alaska

Three groups of Yupik (Eskimo) junior high school students from the Lower Kuskokwim School District Roadside Science Program visited USGS facilities at the Alaska Science Center in Anchorage to learn about volcanoes, rocks and minerals, and mapping. The Alaska Volcano Observatory provided tours of the new Operations Room. Students were introduced to the monitoring tools used by Observatory staff and were shown examples of volcanic ash, rocks, and seismic equipment. Mineral Resources Team staff discussed a variety of Alaska rocks and minerals and their uses, and also explained aerial photographs and imagery of Alaska landscapes. They described how these clues are used by geologists to create geologic maps. Earth Science and Information Center staff gave each group a tour of that facility and provided a primer on how maps are made and their multiple uses. They also showed the students a variety of USGS publications, an Alaska fossil poster and discussed the geography of Alaska. The Roadside Science Program has been visiting the USGS in Anchorage for the past five summers. Contact Katherine West, 907-786-7495, *kwest@usgs.gov*

Resources and Environment

Wildlife Health Bulletins (National)

The USGS National Wildlife Health Center (NWHC) in Madison, Wisconsin, distributes Wildlife Health Bulletins to Federal, Tribal, and State natural resource and conservation agencies, including the Bureau of Indian Affairs. Wildlife Health Bulletins provide and promote an exchange of information on important threats to wildlife health. They are issued for specific wildlife diseases and related topics. During FY 2006, the NWHC produced and distributed seven Wildlife Health Bulletins. The distribution list includes members of the Native American Fish and Wildlife Society, as well as natural resource managers and conservation agency professionals. Topics in 2006 included:

- Some basic flu facts regarding the ABC Movie *Fatal Contact: Bird Flu in America*;
- Wild bird mortality reporting;
- H5N1 reported in Michigan likely low-path strain;
- Low-path avian flu H5N1 found in mallards in Maryland;
- Low-path avian flu H5N1 found in mallards in Pennsylvania,
- Low-path avian flu H5 and N1 found in northern pintails in Montana; and
- Low-path avian flu H5 and N1 found in Michigan and Ohio, and confirmation on results from Illinois and Montana.

Tribal governments are encouraged to contact the USGS to be added to the announcement list. Contact: Paul Slota, 608-270-2420, *paul_slota@usgs.gov*

Identifying the Source of Fecal Coliform Bacteria in the Meduxnekeag River, Houlton, Maine

Contamination of water from human and animal waste is a major cause of deteriorating water quality in receiving waters and can have direct social and economic effects to communities through the loss of sustenance and recreational activities. In recent years, fecal contamination of surface waters by nonpoint-source pollution (such as direct human and animal input, surface runoff, failing or inadequate septic systems and sewer overflows or straight-pipes) has surpassed industrial and municipal point-source pollution. Mitigating this problem depends on knowing the ultimate source of the fecal contamination. Since many waterborne pathogens, including viruses, are extremely difficult to detect and quantify, information on the human or animal origin of the fecal pollution may give an indication of the types of pathogens that might be expected, the inherent risk of infection, and the subsequent treatment needed to control the transmission of disease. Recent developments in molecular biology and biochemistry have made it possible to use bacterial indicator organisms, such as fecal coliforms, to indicate the probable sources of pathogens. USGS scientists have begun a new study in cooperation with the Houlton Band of Maliseet Indians to identify the sources of fecal coliform bacteria in the Meduxnekeag River. The Houlton Band of Maliseet Indians and the USGS Maine Water Science Center collaborated on a project to determine the presence, density distribution, and human or animal origin of fecal coliform bacteria in the Meduxnekeag River, which flows through Maliseet Tribal land, and is used by the Tribe for sustenance and recreational activities. Results of this study are being prepared for publication and will assist the Tribe in its efforts to mitigate contamination associated with human and animal waste. Contact: Charles Culbertson, 207-622-8201, ext. 127, *cculbert@usgs.gov*

Identification of Subsurface Aqueous Discharge Zones and Real-Time Water-Quality Monitoring in the Meduxnekeag River, Houlton, Maine

The USGS Maine Water Science Center, in cooperation with the Houlton Band of Maliseet Indians, conducted a study which combined the use of aerial infrared imagery to identify zones of subsurface aqueous inputs and the deployment of instruments to monitor real-time water quality in the Meduxnekeag River. Using aerial infrared technology permits large geographic areas of the river to be surveyed for potential influx of contaminants, which can be associated with subsurface aqueous discharge. The technique can detect small temperature anomalies associated with aqueous inputs into receiving waters. This technology, combined with the continuous, real-time monitoring of water quality, provides the Tribe and others with a means of promptly detecting water-quality changes. A publication is being prepared on this project. Contact: Charles Culbertson, 207-622-8201, ext. 127, *cculbert@usgs.gov*

Continuous, Real-Time Storm Water Discharge and Water-Quality Monitoring on the Meduxnekeag River, Houlton, Maine

The Houlton Band of Maliseet Indians and the USGS Maine Water Science Center are collaborating on a project to identify possible relations between the real-time optical measurement of river water turbidity and factors affecting water quality, including nutrients, suspended sediments, and fecal coliform bacteria. The use of turbidity as a water-quality surrogate will ultimately provide a near real-time estimate of loads of these constituents associated with river runoff events. Contact: Charles Culbertson, 207-622-8201, ext. 127, *cculbert@usgs.gov*

Photograph showing the Meduxnekeag River, Houlton Band of Maliseet Indians Tribal Land, Maine

This high resolution orthoimage shows the Maliseet Tribal Headquarters and adjacent Tribal land where much of the collaborative work is being conducted on the Meduxnekeag River. Image courtesy Dan Walters, U.S. Geological Survey.

Dave Joseph, of the Houlton Band of Maliseet Indians, makes a dissolved oxygen measurement on the Meduxnekeag River, Maine. Photograph by Cara O'Donnell.

Cara O'Donnell, Water Quality Specialist for the Houlton Band of Maliseet Indians, retrieves river-water samples from an automatic sampler on the Meduxnekeag River, Maine. Photograph by Rhonda Jewell.

Description of Hydrology of the Meduxnekeag River Watershed During Periods of Low Flow

A complete watershed budget for the Meduxnekeag River would give watershed resource managers the tools they need to manage water resources during periods of potential water-use conflicts in basins with varying degrees of land use and water use. As the initial phase of developing this watershed budget, the USGS Maine Water Science Center is collaborating with the Houlton Band of Maliseet Indians on a project to describe the hydrology of the Meduxnekeag River Watershed during periods of low flow. Contact: Pam Lombard, 207-622-8201, ext. 130, *plombard@usgs.gov*

Investigating Algae Production in Meduxnekeag River near Houlton, Maine

The USGS Maine Water Science Center, in cooperation with the Houlton Band of Maliseet Indians, conducted a study of algae production in Meduxnekeag River. Data were collected on shallow interstitial water quality (nutrients); continuous readings of pH, dissolved oxygen, temperature, and specific conductance at six stations; and temperature and light intensity at four stations. The data were prepared for analysis by use of the Whole Stream Metabolism Program, a computer program developed by the USGS in Maryland, which calculates algal production and respiration between monitoring stations. Streamflow ratings were developed for three tributary stations. Contact: Chuck Schalk, 207-622-8201, ext. 111, *cwschalk@usgs.gov*

Ecological Health and Contamination in the Penobscot River (Maine)

The Bureau of Indian Affairs, the USGS, the U.S. Environmental Protection Agency (USEPA), and the Centers for Disease Control and Prevention's Agency for Toxic Substances and Disease Registry (ATSDR) partnered to gather information regarding the presence, distribution, and ecological and human health risks associated with dioxins, furans, mercury, and PCBs in fish and sediment in the Penobscot River. The USGS continues to work with the Bureau of Indian Affairs, the lead agency, along with the USEPA and ATSDR to propose a new study to assess human or ecological risks from potential contaminants in the river. Periodic conference calls with the Penobscot Indian Nation and partner agencies led to submission of a USEPA Regional Applied Research Effort (RARE) proposal. Contact: Carl Orazio, 573-875-5399, *corazio@usgs.gov* or Susan Finger, 573-875-5399, *sfinger@usgs.gov*

Communication and Aquatic System Research in an International Wetland (New York)

In 2005, research scientists from the USGS Great Lakes Science Center completed a study of the wetland-riverine ecosystem on the Akwesasne Reservation of the St. Regis Mohawk Tribe to support tribal efforts to better manage its fisheries and aquatic resources. That work also supported an effort by the International Joint Commission to study the effects of water-level regulation in Lake Ontario and the St. Lawrence valley. Research results provide an extensive assessment of ecological health within the Akwesasne Wetland Complex and highlight some possible effects of water regulation and restoration of a Superfund site. At the request of the Tribe's Environment Division, a USGS scientist presented results of the work to the Natural Resources Damage Assessment Group in Albany, New York, in December 2005. Attendees included representatives of the Tribe, the U.S. Fish and Wildlife Service, the New York Department of Environmental Conservation, and the hydropower industry. Contact: James E. McKenna, Jr., 607-753-9391, ext. 21, *jmckenna@usgs.gov*

Lake Sturgeon Restoration in the Great Lakes Ecosystem (New York)

Researchers from the USGS Great Lakes Science Center's Tunison Laboratory of Aquatic Science and St. Regis Mohawk Tribe Environment Division have cooperatively completed the field components of a comprehensive assessment of the presence, river distribution, habitat use, and size distribution of juvenile lake sturgeon. The St. Regis River was stocked with a total of 5,000 juvenile sturgeon between 1998 and 2004; stocking occurred annually except in 2001 and 2002. Individuals representing all 5-year classes were captured throughout the 20-mile river section. Environmental quality and community characteristics were measured for the application of habitat suitability models and fish and invertebrate-based indices of biological integrity. This research focuses on the current success of sturgeon rehabilitation and associated environmental metrics in this St. Lawrence River tributary. Study results will be applicable to many historic sturgeon waters and will provide species specific habitat information needed for the further enhancement of this threatened native species throughout the Great Lakes. The USGS and Tribal scientists are preparing the technical report and manuscripts on this research. Contact: Dawn Dittman, 607-753-9391, ext. 23, *ddittman@usgs.gov*

Seneca Nation of Indians Locate Water Supply, Cattaraugus Indian Reservation (New York)

In FY 2003, the USGS New York Water Science Center signed a Cooperative Water Agreement with the Seneca Nation of Indians. During FY 2005, as part of the ongoing study resulting from that agreement, USGS hydrologists constructed a preliminary ground-water-flow model to help determine areas best suited for drilling water supply wells for the Seneca Nation. USGS findings led to refocusing designs from a single water-supply well in a confined aquifer to a location in which multiple wells could tap an unconfined sand-and-gravel aquifer. In FY 2006, additional preliminary calibration of the constructed ground-water-flow model indicated areas that might be considered, and model-simulated pumping scenarios suggested locations of recharge areas and pumping rate limits for the aquifer. The Seneca Nation has identified a suitable well location that will be re-evaluated in FY 2007 by the USGS for use as a public-water supply. Additional drilling, water-quality testing, and final model calibration are planned. The wells will be drilled and sampled by USGS for basic cations and anions, nutrients, trace metals, and pesticides to ensure that the quality of the water in the unconfined aquifer in this new location is acceptable for development by the Seneca Nation. The final ground-water-flow model will be updated with data from the new site and used to provide information on the sources of recharge to the aquifer, estimates of pumping capacity. Information on aquifer recharge sources and pumping capacity will help the Seneca Nation better manage the ground-water resources for its citizens. Contact: Ed Bugliosi, 607-266-0217, ext. 3005, *ebuglios@usgs.gov*

Reproductive Failure in Great Lakes Lake Trout and Other Salmonid Species (Michigan, New York, Pennsylvania)

Early life stage mortality syndrome (EMS) of salmonids of the Great Lakes and New York Finger Lakes is a thiamine responsive malady. Low concentrations of thiamine (vitamin B1) in salmonid eggs have been associated with EMS and treating eggs or fry with thiamine is therapeutic. Two invasive species, alewife (*Alosa pseudoharengu*) s and rainbow smelt (*Osmerus mordax*), entered the Great Lakes with the opening of the Erie Canal system. Both species contain thiaminase, an enzyme that destroys thiamine. In Pennsylvania, USGS scientists at the Northern Appalachian Research Branch of the Leetown Science Center, have been working in cooperation with Greg Wright, Chippewa/Ottawa Resource Authority (CORA), Eric Olsen, Grand Traverse Band, and Steve Lenart, Little Traverse Bands, to determine if thiamine deficiency is limiting natural reproduction of lake trout and other salmonid species within the Great Lakes. The work includes investigating mortality and the secondary effects on behavior, vision, and immune function. Contact: Dale Honeyfield, 570-724-3322, *honeyfie@usgs.gov*

South Florida Ecosystem Program, Internal Surface Water Flows

As part of the Everglades Restoration Programs, the Army Corps of Engineers and South Florida Water Management District proposed modified water deliveries to the Seminole Tribe of Florida, Big Cypress National Preserve, and other parts of Florida's interior. The proposal's intent is 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 been monitoring flow and is obtaining data from strategically located streamgages to help define future surface-water flow requirements and decompartmentalization efforts through the Comprehensive Everglades Restoration Plan. Subsequent studies based on accurate flow calibrations produced by data from these sites have been used by other agencies for computation of nutrient and other contaminant loadings in the canal system since 2002. Ongoing data collection from continuous flow gages, at selected points for interior basins, has complemented the existing eastern flow canal discharge network and allows more accurately timed surface-water releases. The study supports Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement by monitoring the canal inflow and nutrient totals exiting the Seminole Reservation from the West and North Feeder Canals, and the headwaters of the L–3, L–4, and L–28 canal intersections. The study also supports the Comprehensive Integrated Water Quality Feasibility Study by developing water-quality targets for ecosystem restoration. Contact: Rick Solis (USGS), 954-377-5948, *rsolis@usgs.gov* or Craig Tepper (Seminole Tribe of Florida), 954-966-6300, ext.1120, *ctepper@semtribe.com*

Potential Impediments to a Restoration Stocking Program for Deepwater Ciscoes (Michigan, Minnesota, Pennsylvania)

Until the mid-1950s, an incontestable hallmark of fish biodiversity within the Laurentian Great Lakes was its assemblage of salmonid fish known as coregonids, which includes ciscoes. In each lake, a variety of ciscoes occupied specific depths for foraging and spawning activities and many deepwater ciscoes were endemic to one or a few lakes. Prior to the 1950s, ciscoes were integrally important to the ecology of the Great Lakes. They constituted the most important forage fish source for native top predators, such as lake trout (*Salvelinus namaycush*). The daily vertical migration (that is, movement up or down the water column) of some ciscoes (for example, *Coregonus hoyi* and *C. kiyi*) represented an important energy link between deepwater production (for example, *Mysis relicta*, a zooplankton) and the top predator fish community. USGS scientists at the Northern Appalachian Research Branch (Pennsylvania) of the Leetown Science Center have been working in cooperation with Greg Wright, Chippewa-Ottawa Resource Authority, and Mark Ebener, Inter-Tribal Fisheries and Assessment Program, Chippewa-Ottawa Resource Authority, to define fish culture requirements of these native cisco as part of the restoration process. Contact: Dale Honeyfield, 570-724-3322, *honeyfie@usgs.gov*

Silver River Studies with the Keweenaw Bay Indian Community (Michigan)

The Keweenaw Bay Indian Community (KBIC) is concerned about the environmental effects of future development within the Silver River watershed. Much of the Silver River watershed, with the exception of the East Branch, is either within, or adjacent to, the KBIC Reservation. The watershed of the Silver River at the streamgage is 64 square miles. The Silver River drains an area in Baraga County, Michigan, dominated by highlands and flows into a bay of Lake Superior. In September 2001, USGS installed a continuous-data streamgage on the Silver River in a cooperative project with the KBIC Environmental Department. A water-temperature gage was added to the site in May 2002 and replaced by a multiprobe with water temperature and specific conductance sensors in October 2005. Temperature, specific conductance, stage, and streamflow data from the gage are available on a real-time basis. A separate multiyear cooperative water-quality project began in June 2005 when USGS and KBIC began collecting discrete water-quality samples for a number of chemical constituents and measuring streamflow at eight locations within the Silver River watershed. Keweenaw Bay provides habitat for a diverse aquatic population supporting sport and commercial fishing activities and also serves as a drinking-water supply for three communities. Contact: Tom Weaver, 517-887-8923, *tlweaver@usgs.gov*

Water-quality sampling site on the Silver River, looking upstream during the recession from spring runoff. The remote site in Baraga County, Michigan, is located within the Keweenaw Bay Indian Community Reservation. The Tribe and USGS cooperatively operate a real-time streamgage at a site downstream of this location that measures water-quality characteristics and streamflow, and routinely sample water quality at eight locations within the Silver River watershed, including this location. Photograph by T.L. Weaver, U.S. Geological Survey.

Water-quality sampling site at Dakota Creek, a tributary of the Silver River, located within the Keweenaw Bay Indian Community Reservation, Baraga County, Michigan. The trail crossing of the stream, used by vehicles ranging in size from all-terrain vehicles to logging trucks, illustrates one of the water-resource issues facing Tribes when nontribally owned land is within reservation boundaries. Photograph by T.L. Weaver, U.S. Geological Survey.

View looking upstream on the remote Yellow Dog River after heavy wet snowfall, Marquette County, Michigan. The site is on historic hunting and fishing grounds of the Keweenaw Bay Indian Community. The tribe is concerned about the effects of proposed development, including metals extraction, within the adjacent Salmon Trout watershed. USGS operates a real-time streamgage at this site that measures water-quality characteristics and streamflow. Photograph by T.L. Weaver, U.S. Geological Survey.

Studies of the Salmon Trout, East Branch Salmon Trout, and Yellow Dog Rivers with the Keweenaw Bay Indian Community (Michigan)

In October 2004, USGS employees installed continuous-data streamgages and temperature and specific conductance sensors on the Salmon Trout and Yellow Dog Rivers in a cooperative project with the Keweenaw Bay Indian Community (KBIC). In October 2005, collection of specific conductance data was discontinued at the Salmon Trout site. In November 2005, an additional site was installed on the East Branch Salmon Trout River. The Salmon Trout, East Branch Salmon Trout, and Yellow Dog River watersheds upstream of the gages are about 7, 10.6, and 32 square miles, respectively. The streams, which drain into Lake Superior, are noted for their diverse aquatic populations and species abundance. The KBIC and other interested parties are concerned about the environmental effects of future development, including metallic mineral extraction, within the watersheds, which are west of Big Bay in northern Marquette County, Michigan. Temperature, specific conductance, stage, and streamflow data from the gages are available on a real-time basis. Contact: Steve Blumer, 517-887-8922, *spblumer@usgs.gov* or Tom Weaver, 517-887-8923, *tlweaver@usgs.gov*

View looking upstream on the remote East Branch Salmon Trout River after heavy wet snowfall, Marquette County, Michigan. The site is on historic hunting and fishing grounds of the Keweenaw Bay Indian Community. The Tribe is concerned about the effects of proposed development, including metals extraction, within the Salmon Trout watershed. USGS operates a real-time streamgage at this site that measures water-quality characteristics and streamflow. Photograph by T.L. Weaver, U.S. Geological Survey.

Whitefish, Lake Trout, and Sea Lamprey Studies (Michigan)

The USGS obtained live fish during 2002–2004 from commercial trap nets set by fishers from the Sault Ste. Marie Tribe of Chippewa Indians and the Bay Mills Indian Community for an ongoing study of the seasonal depths and temperatures occupied by lake trout and lake whitefish. Those fish were implanted with miniature data-recording devices that provide nearly 33,000 observations of depth and temperature if recaptured. An external tag advertises a $100 reward for return of a tagged fish. An ongoing companion study with lake trout will allow scientists to minimize the by-catch of lake trout while exploiting lake whitefish. Tribal fishers have further contributed to the study by returning fish tags to USGS scientists. These same fishers also have contributed to important research related to the crucial sea lamprey control program in the Great Lakes by providing live parasitic-phase sea lampreys for study. Without the assistance of the commercial fishery, it would be impossible to provide enough animals for ongoing studies. A report on this work is being prepared. Contact: Roger Bergstedt, 989-734-4768, *roger_bergstedt@usgs.gov*

Hydrogeologic Analysis of Current and Future Ground-Water Availability in Chippewa Township, Michigan, Saginaw Chippewa Indian Tribe

Chippewa Township, in the central Lower Peninsula of Michigan, encompasses lands and structures belonging to the Saginaw Chippewa Tribe. The Tribe and neighboring communities need good-quality drinking water, which can be difficult to acquire in that part of Michigan and is obtained exclusively from ground-water wells. The USGS has compiled hydrogeologic data, water-quality data, surface-geophysical data, and water-level data to describe the water resources of Chippewa Township. These data were compiled to provide a better understanding of the complex hydrogeology, and ground-water availability and quality in the Township. The USGS monitored water levels at four monitoring wells in 2006. Contact: Chris Hoard, 517-887-8949, *cjhoard@usgs.gov*

Water-Resources Investigation with the Lac Vieux Desert Band of Lake Superior Chippewa Indians (Michigan, Wisconsin)

A cooperative 4-year study of surface-water quality and basin characteristics of Lac Vieux Desert was completed in FY 2005. The 6.6 square-mile lake, which has been used for generations by tribal members for hunting, fishing, and wild rice gathering, straddles the Michigan-Wisconsin border and is the headwaters of the Wisconsin River. As an outgrowth of the study, the Lac Vieux Desert Band funded operation of a real-time lake-level gage through the end of FY 2006. The National Weather Service in Wisconsin also used the site to remotely measure precipitation. A joint funding agreement with Tribe will allow the continuing operation of the lake-level gage through the end of FY 2007. Contact: Tom Weaver, 517-887-8923, *tlweaver@usgs.gov*

Bad River Streamflow, Sedimentation, and Erosion Study (Wisconsin)

The major objective of this study is to understand how historical streamflow, erosion, and sedimentation rates have changed in the Bad River and some of its key tributaries caused by changes in land cover. The study began in FY 2002 in cooperation with the Bad River Band of Lake Superior Chippewa Indians. Historical aerial photographs and government land office survey maps were used to identify reaches with bluff or bank erosion, lateral migration, and bar formation. Partial valley cross sections were surveyed and cores were collected and described from flood-plain, channel, and abandoned channel environments. The core data, combined with elevation data from the valley surveys, were used to determine pre- and post-European settlement erosion and sedimentation rates. During FY 2005 and 2006, total sediment-load data were collected at the streamgage. In FY 2006, a baseline study of trace elements in streambed sediment was conducted. Results from the erosion/sedimentation study were presented at the 2006 Federal Interagency Sedimentation Conference (abstract). A USGS Scientific Investigations Report is being prepared. Contacts: Faith Fitzpatrick (USGS), 608-821-3818, *fafitzpa@usgs.gov* or Kirsten Cahow-Scholtes (Bad River Band of Lake Superior Chippewa Indians), 715-682-7123, *water@badriver.com*

Ground Water and the Lac Courte Oreilles Band of Ojibwe (Wisconsin)

The Lac Courte Oreilles Band of Ojibwe is concerned about the quantity and quality of ground water on their lands, particularly near the Grindstone Springs area and in their village of New Post. The existing water-supply wells in New Post may not be sufficient for projected future needs and the water has elevated nitrate concentrations. The USGS worked cooperatively with the Tribe to describe the glacial sediments and estimate the depth to crystalline bedrock in the vicinity of New Post. As a result of studying the geologic setting, the scientists located a suitable well-site with a thickness of more than 100 feet of saturated, fine-to-medium sand. This information was used in an existing two-dimensional ground-water-flow model to evaluate likely zones of contribution to the existing and possible future supply wells. The model also was used to evaluate possible base-flow reductions in Grindstone Creek caused by pumping from up-gradient irrigation wells. Simulated results indicated that base flows out of a headwater spring complex could be reduced from 0 to 12 percent during dry periods. Although the simulated reduction in base flow is less than natural seasonal variability, the simulated pumping stress represents a systematic reduction in available water for the stream. These studies can be used by the Tribe for decisions involving the sources and qualities of drinking water for their communities. Contacts: Paul Juckem (USGS), 608-821-3845, *pfjuckem@usgs.gov* or Daniel Tyrolt (Lac Courte Oreilles Band of Ojibwe) 715-634-0102, ext. 124, *ddtyrolt@cheqnet.net*

Neopit Mill Pond Sedimentation and Sediment Chemistry Study (Wisconsin)

The Menominee Indian Tribe of Wisconsin cooperated with the USGS on a multiyear study of sedimentation characteristics in Neopit Mill Pond, which was formed by damming the West Branch of the Wolf River. USGS Wisconsin Water Science Center 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 and published USGS Open File Report 03–23 on this work. In June 2005, streambed sediment from the West Branch of the Wolf River was sampled downstream of Neopit Mill Pond to determine concentrations of trace elements and semivolatile organic compounds in the river from the millpond to its confluence with the Wolf River. In FY 2006, a USGS Scientific Investigations Report was being prepared. Contacts: Faith Fitzpatrick (USGS), 608-821-3818, *fafitzpa@usgs.gov* or Jeremy Pyatskowit (Menominee Indian Tribe of Wisconsin), 715-799-6150, *jpyatskowit@mitw.org*

Modeling Shallow Ground-Water Flow for the Menominee Indian Tribe of Wisconsin

The Menominee Indian Tribe of Wisconsin is interested in furthering its understanding of the regional hydrogeology on tribal lands, including hydrogeologic controls on regional and local ground-water flow. The Tribe also has a specific interest in determining the recharge areas that contribute water to community wells on the Reservation. To assist the Menominee Indian Tribe, the USGS constructed a single-layer analytic element (AE) ground-water flow model, the near field of which covers all of the Menominee Reservation. The calibrated ground-water model has been used to describe regional ground-water flow across the Reservation, to delineate the area of recharge to community wells, and to identify potential sites for new municipal wells for the town of Keshena, Wisconsin. In 2006, the model for the Menominee Indian Tribe was updated and refined in local areas. The model is being used to evaluate locations for new municipal wells for the Village of Neopit. A USGS Water-Resources Investigations Report will be finalized at the conclusion of the modeling activities. Contact: Charles Dunning (USGS), 608-821-3827, *cdunning@usgs.gov* or Gary Schuettpelz (Menominee Indian Tribe of Wisconsin), 715-799-4937, *gschuett@mail.wiscnet.net*

Ground-Water Flow Studies with the Stockbridge-Munsee Community (Wisconsin)

The Stockbridge-Munsee Community (Mohican Nation) is interested in improving its understanding of the regional hydrogeology and shallow ground-water flow on its lands. The Tribe is specifically interested in shallow ground-water flow in the Red Springs area, where past farming practices have some potential to adversely affect water quality in private wells. To assist the Stockbridge-Munsee Community, the USGS constructed a single-layer analytic element (AE) ground-water flow model, the near-field of which covers all of the Stockbridge-Munsee Reservation. The calibrated AE ground-water model was used to describe regional ground-water flow across the Reservation, and also simulates ground-water flow paths at specific locations of interest in the Red Springs area. The flow model was used to simulate the effect of infiltrating filtered municipal wastewater on local ground-water flow. The model is being used to simulate ground-water flow in areas of new residential development where the shallow ground water is reported to have elevated concentrations of nitrate. A USGS Water-Resources Investigations Report will be prepared when the modeling is completed. Contacts: Charles Dunning (USGS), 608-821-3827, *cdunning@usgs.gov* or Greg Bunker (Stockbridge-Munsee Tribal Community), 715-793-4363, *greg.bunker@mohican-nsn.gov*

Oneida Hydrologic Investigations (Wisconsin)

The Oneida Tribe of Indians of Wisconsin has developed a seven-generation plan for its Reservation that includes instituting land-use practices that will allow the surface-water system draining the reservation to revert to its pre-colonial condition. The Oneida Tribe needs continuing information regarding quality and conditions of water entering and within its Nation's boundaries to determine trends in water quality and to provide data to assess the Tribe's water resources. 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* or Jim Snitgen (Oneida Tribe of Wisconsin), 920-869-5812.

Hydrogeology and Ground-Water Flow Near the Indian Mission and Sand Pillow Communities, Ho-Chunk Nation (Wisconsin)

The Ho-Chunk Nation expects considerable growth in the Indian Mission and Sand Pillow communities, Jackson County, Wisconsin. The Ho-Chunk Nation wants to plan to meet anticipated water demands by providing an efficient and sustainable water supply, so understanding the geology and hydrology of the aquifer is necessary. In 2004, a geologic field investigation and evaluation of existing well and geological data were used to provide information to a regional, single-layer, analytic-element model. Model simulations and the geologic information were used to identify locations that had favorable characteristics for providing the quantity of water needed by the Tribe. Test wells have been installed and additional model simulations have been run to assist the Tribe in assessing the contributing areas of those test wells and their interference at different pumping rates. A report is being prepared, titled: Ground-Water Flow in the Vicinity of the Ho-Chunk Nation Communities of Indian Mission and Sand Pillow, Jackson County, Wisconsin. Contacts: Charles Dunning (USGS), 608-821-3827, *cdunning@usgs.gov* or James Dunning (Ho-Chunk Nation), 715-284-7548, *jdunning@ho-chunk.com*

Ho-Chunk Water Quality (Wisconsin)

Scientists from the USGS Wisconsin Water Science Center are assisting the Ho-Chunk Nation by assessing the hydrology and water quality of the streams on, and in close proximity to, Ho-Chunk lands. The scientists conducted a habitat assessment in anticipation of tribal stream habitat improvements in the Kickapoo River area. In the summer and fall of 2006, they sampled surface water from streams in the Kickapoo River area to determine baseline water-quality conditions. Contacts: Krista Stensvold (USGS), 608-821- 3856, *kastensv@usgs.gov* or Randy Poelma (Ho-Chunk Nation), 800-944-1652, *Rpoelma@ho-chunk.com*

Monitoring moose in Minnesota. Photographs courtesy of Michael Nelson, U.S. Geological Survey.

Moose Population Dynamics in Northeastern Minnesota

The USGS Minnesota Field Station of the Northern Prairie Wildlife Research Center completed its final year of moose research with the Minnesota Department of Natural Resources, Fond du Lac Band of Lake Superior Chippewa, and the 1854 Authority (The 1854 Authority is composed of the Grand Portage Band of Lake Superior Chippewa and the Bois Forte Band of Chippewa). The objective of the study was to determine survival rates of adult moose, causes of mortality, and to improve aerial surveying of the moose population. A total of 114 moose (60 female, 54 male) were captured and radio-collared in northeastern Minnesota each February, from 2002 through 2005. Fifty-five moose (26 female, 29 male) died, 17 to 28 percent annually. Nonhunting mortality was 9 to 24 percent. Cause of death was identified for 23 moose (12 hunter kills, 2 poached, 5 train/car/truck collision, 3 wolf predation, and 1 natural accident). Twenty-five moose died from unknown nontraumatic causes throughout the year. Fifteen of those were intact but emaciated and the remaining 10 were scavenged. Fifty-two percent (20 of 38) of radio-collared moose were observed during the annual aerial survey, indicating there were twice as many moose present as seen. This information will enable sound management decisions critical to the long-term welfare of moose in Minnesota. Contact: Michael Nelson, 218-365-4505, *michael_nelson@usgs.gov*

Ground Water and Water Quality of Lakes and Springs on Lands of the Grand Portage Band of Lake Superior Chippewa (Minnesota)

The USGS Minnesota Water Science Center is delineating the direction of ground-water flow and sources of recharge water to lakes and wetlands on lands of the Grand Portage Band of Lake Superior Chippewa. This effort is part of a continuing study in which the information will be used by the Grand Portage Band to help evaluate potential land use in environmentally sensitive ground-water recharge areas. The study also will provide information regarding tribal water resources. The geological history of the area was established using reconstruction methods and techniques. Diatoms were analyzed and their ages were determined from two lake-sediment cores to document historical nutrient conditions. Contact: Don Hansen, 763-783-3250, *dshansen@usgs.gov*

Streamflow Measurement with Grand Portage Band Lake Superior Chippewa (Minnesota)

The USGS Minnesota Water Science is continuing to measure seasonal streamflow for two sites on the Grand Portage Band of Lake Superior Chippewa lands. This study is being conducted as part of a feasibility analysis to determine if in-water generators can be installed to support fish farming and hatcheries. Contact: Kevin Guttormson, 218-326-1297, *kgguttor@usgs.gov*

Streamflow Measurement for the Bois Forte Band of Chippewa (Minnesota)

USGS scientists from the Minnesota Water Science Center are measuring streamflow on Nett Lake and Wood Duck Creek, Minnesota, for the Bois Forte Band of Chippewa. The USGS also is monitoring stage, evaporation, and outflow discharging from Nett Lake Dam to improve accuracy of water-budget estimates and provide scientifically sound information to regulate water levels for wild rice production. Contact: Kevin Guttormson, 218-326-1297, *kgguttor@usgs.gov*

Water Issues and the Leech Lake Band of Ojibwe (Minnesota)

The Leech Lake Band of Ojibwe and the USGS Minnesota Water Science Center cooperatively maintain one real-time lake stage monitor. The Band is concerned about stage fluctuations and effects and interactions with the shallow-glacial aquifer. There is a proposal for a comprehensive investigation of the ground-water and surface-water interaction and the fate and transport of crude oil on the Reservation in 2007. Contact: Don Hansen, 763-783-3250, *dshansen@usgs.gov*

Ground-Water Resource Assessment for the Fond du Lac Band of Lake Superior Chippewa, near Cloquet, Minnesota

The USGS Minnesota Water Science Center and the Fond du Lac Band of Lake Superior Chippewa are assessing the hydraulic gradients, flow directions, and recharge rates to shallow aquifers, and will assess the effect of court-ordered ditch system on surrounding ground-water resources on the Reservation. These assessments will provide vital hydrologic information regarding the hydrologic conditions that will be most beneficial for wild rice production on the Reservation. Contact: Perry Jones, 763-783-3253, *pmjones@usgs.gov*

Water Issues and the Prairie Island Indian Community (Minnesota)

The Prairie Island Indian Community and the USGS Minnesota Water Science Center cooperatively maintain two real-time lake stage monitors. The Community is concerned about stage fluctuations and flooding in Sturgeon Lake that may affect tribal residences and pleasure boat traffic adjacent to the Community. Contact: Don Hansen, 763-783-3250, *dshansen@usgs.gov*

Ground-Water Resource Assessment for the Upper Sioux Community and the Lower Sioux Indian Community (Minnesota)

The USGS Minnesota Water Science Center is cooperating with the respective environmental offices of the Upper Sioux Community, near Granite Falls, Minnesota, and the Lower Sioux Indian Community, near Redwood Falls, Minnesota. The goals of the projects are to determine the availability of ground water to meet increased water-supply needs for planned residential, commercial, retail, and tourism development for each Community. In 2006, three observation wells were installed adjacent to the Upper Sioux Community, and two observation wells were installed adjacent to the Lower Sioux Indian Community to determine water quality within the capture zone of each Community's wells. Real-time ground-water monitoring of municipal and observation wells is planned for both Communities. Contact: Don Hansen, 763-783-3250, *dshansen@usgs.gov*

Water Quality and Habitat Assessment of the Iowa River and Tributaries within the Meskwaki Settlement, Sac and Fox Tribe of the Mississippi in Iowa (Meskwaki Nation)

In 2006, the Meskwaki Nation began a 2-year collaboration with the USGS to conduct periodic sampling and analyses of water from the Iowa River and its tributaries within, and contiguous to, the Meskwaki Settlement. The Tribe wishes to determine if any stream is so contaminated that it is a threat to tribal health and safety and to set and maintain water-quality standards for the betterment of the Meskwaki people and the environment of the Settlement. Water-property, sediment-concentration, bacteria, and water-chemistry data were compiled from 39 surface-water samples at eight sites from April through September 2006, including a storm-event sampling. These data will provide information about the effects of tribal and non-tribal land-use practices on the quality of water from those streams. The Tribe is more formally known as the Sac and Fox Tribe of the Mississippi in Iowa. Contact: Greg Littin, 319-358-3609, *grlittin@usgs.gov*

Clint Van Schepen (left) and Jason McVay collect water-quality samples from the Iowa River near Montour, Iowa, during the July 2006 sampling cycle. The sample location is at the western boundary of the Meskwaki Settlement, about 10 miles east of Marshalltown, in central Iowa. Photograph courtesy of Greg Littin, U.S. Geological Survey.

Presence of Pesticides in Wetlands and Lakes on the Lake Traverse Reservation (South Dakota)

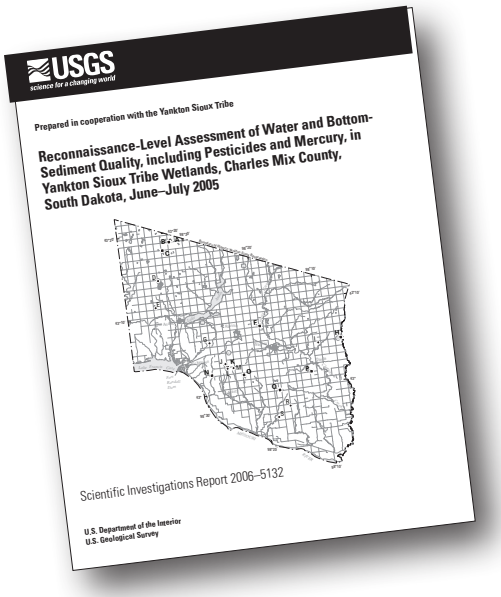
Eighteen wetland sites were sampled by personnel from the Sisseton Wahpeton Oyate of the Lake Traverse Reservation and USGS after the primary pesticide was applied on the Tribe's lands during the late spring of 2006. Samples were analyzed for a large suite of pesticide compounds that are widely used and may be present in surface water. Pesticide concentrations detected in surface-water samples will be compared with available water-quality criteria relative to aquatic organisms and the current (2006) state of knowledge for effects on aquatic biota. Results will be disseminated in a USGS report. Completion of reconnaissance sampling on the Reservation will provide valuable information that will help the Sisseton Wahpeton Oyate assess the aquatic resources of its lands. Contact: Kathy Neitzert, 605-352-4241, ext. 226, *kmneitze@usgs.gov*

Jerry Eastman (left) and Frank Gangone, Jr., Sisseton Wahpeton Oyate, take water-quality samples from the shore of Lake Traverse, South Dakota. Photograph provided by Dave Hernandez (USGS) and Sisseton Wahpeton Oyate personnel.

Reconnaissance of Water Quality for the Standing Rock Sioux Tribe (North Dakota)

USGS North Dakota Water Science Center personnel and tribal staff collected surface- and ground-water, and river-sediment samples in response to the immediate water-quality concerns on the Standing Rock Sioux Tribe. Information from the sampling program will provide data to verify the water quality at selected sources and preliminary data to be used for long-term planning and development of future water appropriations. Contact: William C. Damschen, 701-250-7430, *wcdamsch@usgs.gov*

Jerry Eastman, Sisseton Wahpeton Oyate, assists with water-quality sampling on Lake Traverse, South Dakota. Photograph provided by Dave Hernandez (USGS) and Sisseton Wahpeton Oyate personnel.



Pesticides and Mercury in Wetlands on the Yankton Sioux Reservation (South Dakota)

Nineteen wetland sites were sampled by Yankton Sioux Tribe and USGS personnel after the primary pesticide was applied on the Tribe's lands during late spring of 2006. Samples were analyzed by the USGS staff for many widely used agricultural pesticide compounds that may be present in surface water. In addition, 10 sites were sampled for mercury and methyl mercury concentrations in water and bed-sediment samples, and major-ion concentrations. Pesticide and mercury concentrations detected in surface water were compared with available water-quality criteria relative to aquatic organisms and the current (2006) state of knowledge for effects on aquatic biota. Results were disseminated in USGS Scientific Investigations Report 2006–5132 during FY 2006. The report is available online at *http://pubs.usgs.gov/sir/2006/5132/*. This study will provide valuable information that will help the Yankton Sioux Tribe assess the aquatic resources of its lands. Contact: Roy C. Bartholomay, 605-352-4241, ext. 204, *rcbarth@usgs.gov*

Well Inventory and Water Use for the Yankton Sioux Tribe (South Dakota)

Water-use information will help the Yankton Sioux Tribe manage its water resources. Identifying locations of abandoned wells is useful so that preventive measures, such as well plugging, can be implemented to prevent contamination of ground water. The Yankton Sioux Tribe is interested in plugging abandoned wells within its Reservation. The USGS Water Use database has information for Charles Mix County that is being accessed, tabulated, and summarized for the tribal government. USGS scientists continue to work with the Tribe on a study that involves evaluating existing data, inventorying wells in areas that had not been previously visited, and updating information stored in the USGS Ground-Water Site Inventory database relative to abandoned wells. The Yankton Sioux Tribe will use the results of this study to assist it in providing safe water to tribal members and residents. Contact: Kathy Neitzert, 605-352-4241, ext. 226, *kmneitze@usgs.gov*

Rosebud Total Maximum Daily Load (South Dakota)

The USGS South Dakota Water Science Center and the Rosebud Sioux Tribe concluded a water-quality assessment in support of Total Maximum Daily Load (TMDL) development for the Little White River in Todd County, South Dakota. The objectives of the project were to

1. Compile historical data collected on the Little White River within Todd County for tribal, federal, and state agencies;

2. Collect new reconnaissance data to examine a wide variety of water-quality conditions, including nutrients, trace elements, pesticides, and macroinvertebrates (for example, water insects);

3. Collect more detailed data for suspended sediment and fecal coliform along the Little White River and its tributaries within Todd County; and

4. Analyze and model selected data.

The Rosebud Sioux Tribe is using the data and analysis to develop water-quality standards for the Little White River. An important part of this project has been technology transfer and capacity building, which enable the USGS to help the Tribe with TMDL development for other streams within its lands. Contact: Joyce Williamson, 605-394-3219, *jewillia@usgs.gov*

Screening Ground Water for Hydrocarbons and Pesticides on the Rosebud Reservation (South Dakota)

A previous cooperative effort between the Rosebud Sioux Tribe and the USGS identified a number of open and abandoned wells throughout the Reservation. In 2005, a new project was initiated to begin implementing a comprehensive program to reduce the potential for ground-water contamination by plugging wells that were found to be free of contamination. Field work began in late FY 2005 with screening open and abandoned wells for gross contamination of hydrocarbons and pesticides. Thirty-nine wells were sampled, and although no gross contamination was identified, detectable levels of hydrocarbons were measured in 9 wells and detectable levels of pesticides were measured in 16 wells. Work was completed on this phase of the project by mid-FY 2006, when a project completion report was delivered to the Rosebud Sioux Tribe. In 2006, a proposal was prepared for more sampling to be conducted in FY 2007, and follow-up sampling was scheduled for the summer of 2007. Contact: Kathy Neitzert, 605-352-4241, ext. 226, *kmneitze@usgs.gov*

Potentiometric Map for the Arikaree Aquifer, Pine Ridge Reservation (South Dakota)

The USGS, in cooperation with the Oglala Sioux Tribe, the Bureau of Reclamation, the Indian Health Service, and the Bureau of Indian Affairs, is conducting a study to map the potentiometric surface of the Arikaree aquifer. The potentiometric surface is the upper surface of the unconfined aquifer and is also known as the "water table." The Arikaree aquifer is present near the surface in about 80 percent of the Reservation and is the single largest source of ground water for the Tribe. The objectives of the study are to provide the Oglala Sioux Tribe with a map depicting the potentiometric surface of the aquifer along with well location, water level, and well construction information used to produce the map. The map will be useful to several tribal departments and could be used to identify the best locations for new wells, predict ground-water movement, and assess aquifer vulnerability to contamination. Data collected during FY 2006 have been reviewed and entered into the USGS Ground Water Site Inventory database, and the draft map is being revised according to the newly acquired information. Base map layers that include cities, streams, lakes, and roads have been completed. A 1:500,000-scale geologic map of the study area is nearly complete. The map is scheduled for completion in December 2007. Contact: Janet Carter, 605-394-3215, *jmcarter@usgs.gov*

Water Quality on the Lands of the Prairie Band of Potawatomi Nation (Kansas)

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 for water supply as the Tribe develops its economic base. Surface water on tribal lands has been sampled by USGS and tribal personnel quarterly since June 1996. Ground-water samples have been collected annually since 2002. Tribal personnel assist USGS scientists with the Kansas Water Science Center in collecting and preparing samples for analysis in conjunction with the water-quality aspects of this study. Three reports summarizing the surface-and ground-water quality on the Reservation have been published as a part of this study. The study is scheduled to continue through 2007 with a fourth interpretive report to be released when the study concludes. Contact: Mike Pope, 785-832-3548, *mpope@usgs.gov*

Osage-Skiatook Petroleum Environmental Research Project (Oklahoma)

USGS scientists are leading the Osage-Skiatook Petroleum Environmental Research Project to investigate the transport, fate, and biologic effects of produced water and hydrocarbon releases from oil production at two sites on Skiatook Lake, northwest of Tulsa, Oklahoma. This work focuses on the effects of produced water and hydrocarbon releases from oil production on soils, ground and surface water and the oak forest and lake 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 Natural Resources Department have 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, U.S. Environmental Protection Agency, Bureau of Indian Affairs, U.S. Army Corps of Engineers, University of Tulsa, Oklahoma State University, University of Oklahoma, and USGS research scientists from Oklahoma, Virginia, Colorado, and California. The project Web page can be found at: *http://ok.water.usgs.gov/skiatook/*. The following Website provides brief summary of the project, with digital links: *http://toxics.usgs.gov/sites/ph20_page.html*. Contact: Yousif Kharaka, 650-329-4535, *ykharaka@usgs.gov*

Surface-Water Quality and Total Petroleum Hydrocarbon Loading into Skiatook Lake, Northeastern Oklahoma

This project continues to investigate the effects of petroleum production on surface-water quality near Skiatook Lake on the Osage Nation. Hominy Creek was impounded to form Skiatook Lake in 1984 for flood control and recreation. The lake also supplies water to the cities of Sand Springs and Sapulpa. Past water-quality data collected on Hominy Creek indicated the presence of variable but commonly high concentrations of major ions associated with surface- and ground-water discharges of produced waters. Produced waters are usually salty water that is a by-product of oil or gas production. Objectives of this study are as follows: (1) to determine the general quality of water entering Skiatook Lake, and (2) to monitor the loads of constituents discharged by Hominy Creek and Wildhorse Creek into Skiatook Lake. The project began in September 2003 and will continue through 2007. The Hominy Creek streamgage has been operational since 2003. Water quality has been continuously monitored only during 2004 and 2005. Periodic water-quality samples were collected at the Hominy and Wildhorse Creek sites. Contact: Kelli DeHay, 918-254-6651, *kdehay@usgs.gov*

Reconnaissance of Contamination of Soil, Ground Water, and Vegetation at an Abandoned Oilfield-Service Site near Shawnee, Oklahoma

During fiscal year 2005 and 2006, scientists from the USGS Oklahoma Water Science Center and the Absentee Shawnee Tribe of Oklahoma conducted a reconnaissance study of contamination at an abandoned oilfield-service site by testing soil, ground water, and vegetative tissues for the presence of trace metals and semi-volatile organic compounds. The oilfield-service site was used as a pipe and supply yard for local oilfields from the early 1960s to the mid-1990s. Activities on the site included storage for oilfield pipes and above-ground storage tanks, cleaning oilfield equipment, and cutting and threading pipes. The Absentee Shawnee Tribe of Oklahoma is working to reclaim the site for future development and needed to know the extent of contamination to aid cleanup efforts. A USGS Scientific Investigations Report summarizing the data and results of the study will be completed in fiscal year 2007. Contact: Shana Mashburn, 303-236-4882 ext. 253, *shanam@usgs.gov*

Delineation of Brine Contamination In and Near the East Poplar Oilfield, Fort Peck Indian Reservation (Montana)

Brine is a byproduct of crude oil production. Handling and disposing brine during the last 50 years in the East Poplar oilfield has resulted in the contamination of the shallow Quaternary aquifers and the Poplar River. Previous investigations have documented and delineated a portion of the extent of brine contamination in the East Poplar oilfield during the early 1990s. Ground water in the contaminated Quaternary aquifers flows toward the nearby City of Poplar, Montana, which relies on these shallow aquifers as its sole source of water. The objective of this project is to delineate brine contamination in the Quaternary aquifers in and near the East Poplar oilfield. This project will provide the Fort Peck Assiniboine and Sioux Tribes with an updated delineation of brine contamination in these shallow aquifers in and near the East Poplar oilfield. The project also will enable the Tribes to determine more effective remediation of brine contamination within the oilfield, and provide information the Tribes need to evaluate the threat to the well field for the City of Poplar's water supply. In FY 2006, USGS staff completed initial interpretations of helicopter-borne electromagnetic survey data and drafted a report. Eleven wells were installed and sampled to verify water-quality conditions indicated by the electromagnetic survey. Contact: Joanna Thamke, 406-457-5900, *jothamke@usgs.gov*

Surface-Water-Quality Monitoring in the Vicinity of the Fort Peck Indian Reservation (Montana)

During FY 2006, the USGS conducted periodic surface-water-quality monitoring at one site on the lower Missouri River near the southeastern boundary of the Reservation of the Fort Peck Assiniboine and Sioux Tribes, at two sites on the Poplar River (one within and one north of the Fort Peck Reservation), and one site on the East Poplar River north of the Fort Peck Reservation. The sites on the Poplar and East Poplar Rivers were sampled to document potential effects from a coal-fired power plant in Canada. Boron and total dissolved solids are constituents of concern for potential effects to the quality of irrigation water in the East Poplar River downstream from the power plant. Contact: John Lambing, 406-457-5900, *jlambing@usgs.gov*

Habitat Mapping with the Confederated Salish and Kootenai Tribes (Louisiana, Montana)

Scientists from the USGS National Wetlands Research Center in Lafayette, Louisiana, assisted the Salish and Kootenai Tribes Environmental Quality Agency's wetlands section in creating a community-level habitat classification system that will become an integral part of the Tribes' sophisticated geographic information system (GIS). The GIS facilitates tribal land-use planning. The U.S. Environmental Protection Agency awarded a grant to the Salish and Kootenai Tribes to begin remapping the entire Flathead Reservation. The project included photointerpretation of very detailed color infrared aerial photography that formed the basis for community/association habitat types. The resulting maps were produced as a series of paper and digital (CD) base maps for 26 miles of the Flathead River downstream from the Flathead Lake dam and for about 5,000 acres of wetlands on the southeastern shore of Flathead Lake. USGS staff visited the Flathead reservation and conducted training, fieldwork, and a review of mapping for a pilot area of the Reservation. USGS staff hosted a training class August 7–10, 2006, on the National Wetlands Inventory mapping and classification process, started the development of a photointerpretation signature key, and reviewed in-the-field mapping progress. The USGS staff also loaned Salish and Kootenai College in Pablo, Montana, equipment necessary for image interpretation. The equipment was placed at the college for use in the forestry classes, but would be available to the tribal Environmental Quality agency and the Natural Resources agency for their use on various projects. Also, in August 2006, National Wetlands Research Center personnel were invited to describe the WETMAAP (Wetland Education through Maps and Aerial Photography) program to 12 educators and tribal agency personnel in Polson, Montana. Meeting participants agreed to try to develop a local site, teaching materials, and provide training sessions in summer 2007 in Polson. This process would include USGS staff training for one or two master teachers in the Polson area as part of the project to provide additional training sessions in the future. Contact: Larry Handley, 337-266-8691, *larry_handley@usgs.gov*

Methods for Estimating Mean- and Low-Flow Characteristics at Ungaged Sites in Montana

Information about the magnitude and variability of stream flow throughout Montana is required by water and land-use managers, planners, and administrators and by builders, engineers, recreationists, and the general public. The primary objective of this project is to develop methods for estimating mean- and low-flow characteristics in Montana based on updated streamflow and frequency data at streamgages. A secondary objective of this project is to use a Geographic Information System (GIS) to determine basin and climatic characteristics at gaged sites. Use of a GIS will enable users to determine more quickly and efficiently the required basin and climatic characteristics for application at ungaged sites. Methods for determining mean- and low-flow characteristics at ungaged sites throughout Montana for GIS-based methods will provide water managers, planners, and designers with much better tools for evaluating the adequacy of water plans and structures for mean and low-flow conditions. The primary activities for this project in FY 2006 were assembling GIS coverages and beginning the process of determining basin characteristics for gaged sites using GIS-based methods. The Confederated Salish and Kootenai Tribes have helped support this project. Contact: Steve Sando, 406-457-5900, *sksando@usgs.gov*

Evaluating Springs, Northern Cheyenne Reservation (Montana, Wyoming)

The Powder River structural basin of Montana and Wyoming is the target of extensive exploration for and development of coal-bed methane. Development of coal-bed methane on lands adjacent to the southern and southeastern boundaries of the Northern Cheyenne Indian Reservation could have unwanted effects on valuable ground-water resources within the Reservation, such as depletion of the water resource and lowering of water levels over large areas. The coal-bearing formation targeted for methane development discharges water to wells and springs throughout the Reservation and supplies most of the domestic and livestock water used on the Reservation. The objective of this study is to inventory and monitor springs throughout the Reservation, with special emphasis on lands that may have a high potential for development of coal-bed methane. Springs will be inventoried for quantity of discharge (on a seasonal basis), water quality, geologic source, probable source area for recharge, and present water uses. This study of springs will provide data to help define the Northern Cheyenne Tribe‘s water resources and help determine if future coal-bed methane development could have an effect on springs, and thus potentially affect drinking water, stock water, wildlife habitat, and cultural resources on the Reservation. In FY 2006, 30 springs were inventoried and 22 of them were sampled. Contact: Mike Cannon, 406-457-5900, *mcannon@usgs.gov*

Hydraulic Characteristics and Flood-Limit Delineation of the Jocko River on Part of the Flathead Reservation (Montana)

The objective of this cooperative project was used 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 Kootenai Tribes. USGS hydrologists from the Montana Water Science Center surveyed channel-geometry (cross-section) data for the Jocko River and used the data in a hydraulic model to calculate water-surface profiles and other hydraulic characteristics, such as flow area, conveyance, flow widths, mean flow depths, and velocities. The hydraulic data were 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 effects and would also enable citizens to purchase subsidized flood insurance. Contact: Katherine Chase, 406-457-5900, *kchase@usgs.gov*

Coal-bed Methane Assessment of the Northern Cheyenne Reservation (Montana)

The Northern Cheyenne Tribal Council and the USGS Central Region Energy Resources Team are cooperating to drill deep Fort Union coal and sandstone beds to evaluate the potential of coal-bed methane resources in the Birney Day Village on the Northern Cheyenne Indian Reservation. The project is funded by the Bureau of Indian Affairs Division of Energy and Mineral Resources and is expected to continue through FY 2007. The objective of this study is to inventory and monitor water from wells throughout the Reservation, with special emphasis on lands that may have a high potential coal-bed methane development. The wells are being inventoried to determine the quantity of discharge (on a seasonal basis), water quality, geologic source, probable source area for recharge, and present water uses. This study is providing water resources data to the Northern Cheyenne Tribe to determine whether future coal-bed methane development could affect springs, and thus potentially affect drinking water, stock water, wildlife habitat, or cultural resources on the Reservation. The USGS staff drilled one well to determine the rock types. Water-flow testing of the coal and sandstone beds in the second well drilled by USGS estimated transmissivity and hydraulic conductivity. The coal cores were desorbed and measured for gas on the well site. The USGS performed additional desorption and coal analyses at the laboratory facilities at the Denver Federal Center and at USGS headquarters in Reston, Virginia. The data are used by the Northern Cheyenne Tribal Council to make policy decisions, such as whether to develop the coal-bed methane on the Reservation. An administrative report was prepared for the Northern Cheyenne Tribe and the Bureau of Indian Affairs. Contact: Romeo M. Flores, 303-236-7774, *rflores@usgs.gov*

Jason Whiteman (left) and Allen Clubfoot, Sr., Director, Natural Resources Department, Northern Cheyenne Tribe, inspect the drilling site and operations in June 2005. Photograph by Romeo Flores, U.S. Geological Survey.

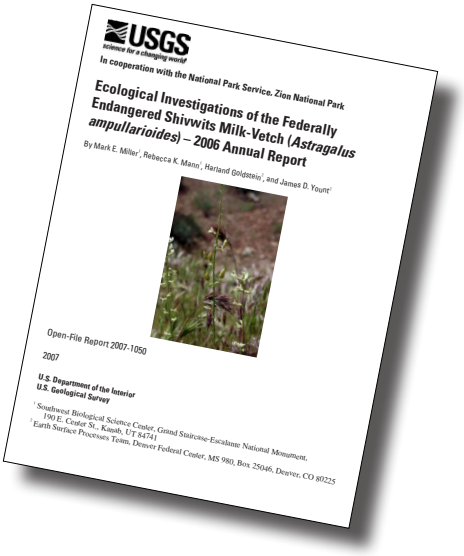
Evaluation of the Quantity of Ground Water in Coal-Bed Aquifers in Part of the Northern Cheyenne Reservation (Montana)

Development of coal-bed methane on lands adjacent to the southern and southeastern boundaries of the Northern Cheyenne Reservation could have unwanted effects on valuable ground-water resources within the Reservation, such as depletion of the water resource and lowering of water levels over large areas. The coal-bearing formation targeted for methane development supplies most of the domestic and livestock water used on the Reservation. USGS scientists are working with the Northern Cheyenne Tribe to evaluate the quantity of ground water in coal-bed aquifers in areas of the Reservation that are adjacent to non-Reservation lands having a high potential for development of coal-bed methane. Knowledge of the present ground-water resources in coal beds of the Reservation is needed by land and resource managers to help them determine if future off-Reservation coal-bed methane development would have an effect on the availability and quality of drinking water and stock water on the Reservation. In FY 2006, USGS staff assembled and interpreted the hydrologic and geologic data and began preparing a final report. Contact: Mike Cannon, 406-457-5900, *mcannon@usgs.gov*

Coeur d'Alene Tribe National Map Implementation and Wildfire Mitigation Application (Idaho)

Coeur d'Alene Tribe employees completed a 3-year project to develop geographic information systems (GIS) data and analytical capabilities required to improve the Tribe's wildfire management capabilities and to enhance the data available to all people involved in wildfire mitigation. The Coeur d'Alene Tribe completed its project to enhance wildfire management and mitigation capabilities and to display tribal data on The National Map. Staffs at the USGS Center for Earth Resources Observation and Science (EROS) and the U.S. Forest Service Fire Lab in Missoula, Montana, created models of fire fuels and related biophysical characteristics. The Tribe is using high-resolution elevation and imagery data, acquired and processed in collaboration with USGS, with those models to predict wildfire hazards. Areas with high probability for wildfire were cross-referenced with highly detailed structure data over tribal lands, and a wildfire mitigation plan was proposed to tribal managers. As part of this cooperative project, the Coeur d'Alene Tribe has shared its expertise with other Tribes in the region. Contact: Tracy Fuller (USGS), 303-202-4172, *tfuller@usgs.gov*, Gene Napier (USGS), 605-594-6088, *enapier@usgs.gov*, or Frank Roberts (Coeur d'Alene Tribe), 208-686-5307, *fmroberts@cdatribe.org*

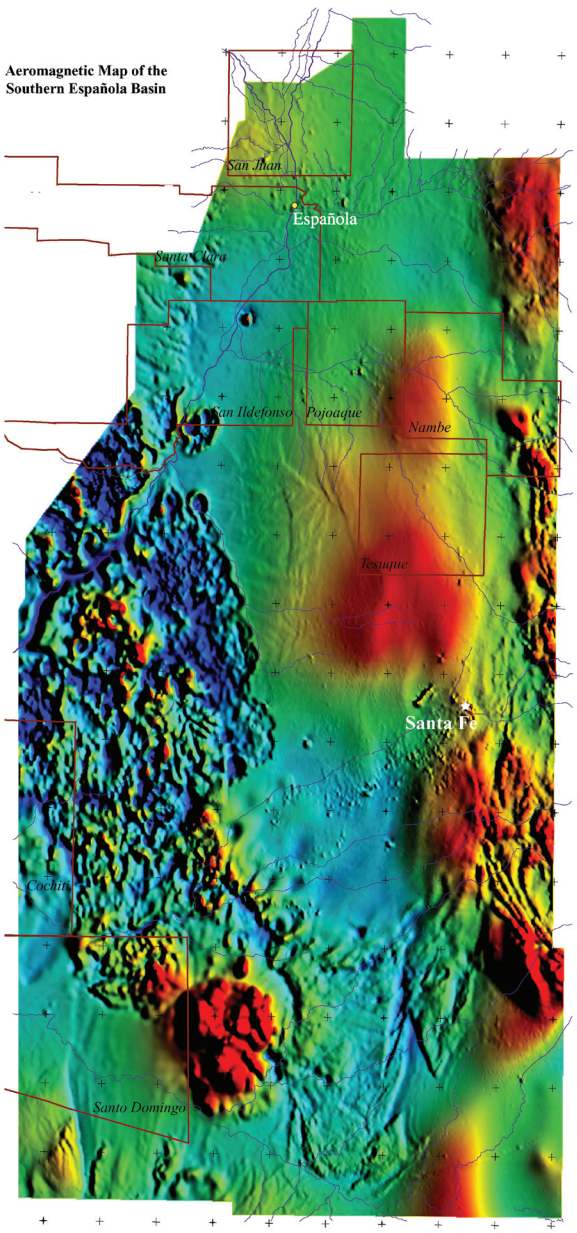
USGS Research on Endangered Plant Supports Shivwits Band of the Paiute Indian Tribe (Utah)


USGS
science for a changing world
In cooperation with the National Park Service, Zion National Park
Ecological Investigations of the Federally Endangered Shivwits Milk-Vetch (*Astragalus ampullarioides*) – 2006 Annual Report
By Mark E. Miller[1], Rebecca K. Mann[1], Harland Goldstein[2], and James D. Yount[2]
Open-File Report 2007-1050
2007
U.S. Department of the Interior
U.S. Geological Survey
[1] Southwest Biological Science Center, Grand Staircase-Escalante National Monument, 190 E. Center St., Kanab, UT 84741
[2] Earth Surface Processes Team, Denver Federal Center, MS 980, Box 25046, Denver, CO 80225

In April 2006, USGS ecologists from the Southwest Biological Science Center and USGS geologists from the Earth Surface Dynamics Program initiated collaborative research on the federally endangered Shivwits milk-vetch (*Astragalus ampullarioides*), a narrowly distributed endemic plant with only five known populations in Washington County, Utah. This research focuses on plant-soil relations and threats from invasive exotic plants, and is being conducted in support of the Shivwits Band of the Paiute Indian Tribe, the National Park Service (Zion National Park), the Bureau of Land Management, and the U.S. Fish and Wildlife Service. Previous work suggested that this species was restricted to outcrops of a specific geologic unit of the Triassic Chinle Formation, but during the first week of this new study, the interdisciplinary USGS team documented this species on the outcrops of another formation. This important finding expands the concept of potential habitat for this rare and endangered plant and thus may lead to the discovery of additional populations. A progress report on this project has been produced by M.E. Miller, R.K. Mann, H. Goldstein, and J.D. Yount, 2007, Ecological investigations of the federally-endangered Shivwits milk-vetch (*Astragalus ampullarioides*); 2006 annual report: U.S. Geological Survey Open-File Report 2007–1050 [available online at *http://pubs.usgs.gov/of/2007/1050/*]. Contact: Mark Miller, 435-644-4325, *mark_miller@usgs.gov*

Mapping Exotic Plants in the Southwest

In conjunction with land managers, biologists at the USGS Southwest Biological Science Center have overseen the development of the Southwest Exotic Plant Mapping Project (SWEMP) regional database of invasive plants. The SWEMP database is an important regional tool for inventorying, tracking, and sharing data on invasive nonnative plants infesting the Southwest. Land management collaborators have contributed mapping data and USGS scientists compiled the data into the regional database according to Federal standards. The database also can be used to produce maps of locations of the plants. The goals of this effort included maintaining a web-based distribution system that integrates educational, management, and scientific information to aid in control of invasive plants, and facilitating the on-going collaborations among tribal, federal, state, and private land managers that are concerned about invasive plants. The database is available on the Southwest Exotic Plant Information Clearinghouse (SWEPIC) website (*http://sbsc.wr.usgs.gov/research/projects/swepic/swepic.asp*) and the data and the SWEPIC information are freely available to tribal members. The active part of this project has concluded with final compilation and inclusion of 62,000 location records for 192 species. Contact: Kathryn Thomas, 520-670-5534, *kathryn_a_thomas@usgs.gov*



Color aeromagnetic data map with the Pueblo boundaries located and labeled for the Española Basin part of the study.

Study of Geologic Framework in Española and San Luis Basins (New Mexico)

The USGS is conducting geologic and geophysical studies to provide a framework for understanding aquifers in the Española and San Luis basins, two areas along the Rio Grande where increasing urban demands on water resources concern several Native American Nations. The Española basin includes the Pueblos of Cochiti, Nambe, Ohkay Owingeh, Pojoaque, Tesuque, San Ildefonso, and Santa Clara and the cities of Santa Fe and Española. The southern San Luis basin includes the Taos Pueblo and the Town of Taos. Geologic and geophysical studies of these basins provide the Pueblos with information that aids in ground-water protection and assessment of water and other natural resources. In FY 2006, the USGS expanded the project's airborne geophysical coverage on the east side of the Española basin, which included flights over Nambe and Tesuque lands. USGS project scientists also hosted an annual public workshop in Santa Fe, which was attended by members of several Pueblo Nations. Tribal government officials from Ohkay Owingeh and Tesuque Pueblos were featured in a panel discussion on regional planning issues. The workshop agenda and abstracts can be found at *http://esp.cr.usgs.gov/ebtag/*. Contact: Mark Hudson, 303-236-7446, *mhudson@usgs.gov* or Tien Grauch, 303-236-1393, *tien@usgs.gov*

Tamarisk Removal and Erosion along the Rio Puerco, New Mexico, Pueblo of Isleta

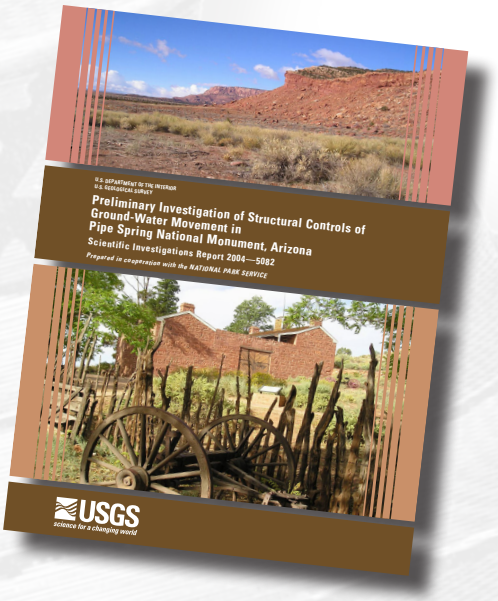
The USGS Fort Collins Science Center and the Pueblo of Isleta are conducting research on the removal of tamarisk, an exotic shrub. The Rio Puerco and the Rio Grande pass through the Isleta Pueblo. Tamarisk now is the dominant woody plant along many rivers in New Mexico, including portions of the Rio Grande. Several Pueblos and Tribes share the desire to remove this invasive plant to increase water availability and to allow native species to reestablish themselves. Tamarisk removal may cause hydrologic and ecological problems for these governments to manage, including streambank erosion. Tamarisk is being cleared along part of the Rio Puerco to determine how the removal influences erosion. Results of these studies will be applied to other areas along the Rio Puerco and the Rio Grande. The USGS Central Region Integrated Science Program is supporting these studies. Contact: Jonathan Friedman, 303-541-3017, *jonathan_friedman@usgs.gov*

Albuquerque Seismological Laboratory Serves a Global Community from the Pueblo of Isleta (New Mexico)

The USGS has a multiyear lease with the Pueblo of Isleta for the use of all buildings and facilities of the original Albuquerque Seismological Laboratory (ASL). This locale includes seismometer test tunnels, surface vaults, and boreholes on Isleta lands south of Albuquerque, New Mexico. The ASL has used these facilities since 1961 for seismic network maintenance, data collection and quality control, and for testing seismic instrumentation. The ASL's mission includes operation and maintenance of about 150 stations of the Global Seismographic Network (GSN). The ASL maintains the information technology backbone of the Advanced National Seismic System (ANSS) and supports the ANSS regional networks through the operation of an equipment depot. In addition, the low seismic noise of the Isleta site combined with the ASL test equipment and facilities provides a high-quality environment for testing seismic instrumentation. The ASL collaborates with seismic equipment manufacturers, researchers, and other government agencies to conduct instrument testing at this site. The ASL also operates a standard GSN station at this location, one of 140 such stations operating worldwide. Data received in real time and on media mailed from the GSN and ANSS stations support earthquake monitoring and research at the USGS National Earthquake Information Center and the Incorporated Research Institutions for Seismology, tsunami warning efforts by the National Oceanic and Atmospheric Administration, and nuclear test 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. The USGS appreciates the Pueblo of Isleta for permitting this globally important scientific endeavor on their lands. Contact: Lind Gee, 505-853-8887, *lgee@usgs.gov* Additional information: *http://earthquake.usgs.gov/regional/asl/* Live Seismograms: *http://www.liss.org/*

Hydrogeologic Studies Near Pipe Spring National Monument and Lands of the Kaibab Paiute Tribe (Arizona)

Pipe Spring National Monument, near the border of Arizona and Utah, includes several small springs that are the primary natural features of the monument. The National Park Service is concerned about the declines in spring discharge. Residents in the vicinity of the monument, tribal members, and the local Arizona communities share the limited water supply. The USGS has mapped and preformed seismic imaging of the subsurface near Pipe Spring National Monument and the surrounding area. An initial report on the ground-water hydrology was published in 2004 (USGS Scientific Investigations Report 2004–5082) and is available online at: *http://pubs.usgs.gov/sir/2004/5082/*. In 2006, the program monitored ground water from a real-time monitoring well (*http://waterdata.usgs.gov/az/nwis/uv/?site_no=365236112442501&PARAmeter_cd=72019*) about 1 mile north of the monument boundary. The results of USGS geologic and hydrogeologic interpretations of the geologic mapping and seismic profiles have been used to pursue ongoing geophysical approaches to identify ground-water movement in fractured rocks in FY 2007. A proposal to improve the understanding of ground-water flow systems in the area has been prepared by the USGS and the National Park Service in cooperation with the Tribe. The USGS Arizona Water Science Center staff also regularly provides natural resources information to the Tribe. Contact: Robert Hart, 928-556-7137, *bhart@usgs.gov* or Margot Truini, 928-556-7352, *mtruni@usgs.gov*



Mapping and Landscape Vulnerability on the Navajo Nation (Arizona, New Mexico, Utah)

USGS geologists, ecologists, and geochemists are working with archaeologists and educators of the Navajo Nation to establish relations of land use and climate change to changes in the land surface. Data are compiled as digital maps in a Geographic Information System (GIS), with bedrock and surficial mapping as a foundation to document land surface conditions. The Navajo Nation (roughly the size of West Virginia) has the largest land base and reservation population of all tribes in the United States. Sand dunes cover about one-third of the arid to semiarid 27,000 square miles of the Navajo Nation on the southern Colorado Plateau. The geologic information provided by USGS studies is crucial for planning urban development and infrastructure, such as highways, buildings, bridges, and domestic septic and landfill systems. USGS maps also provide information on geologic hazards, such as sand and dust storms and flood vulnerability that will lead to a better understanding of ecosystem responses to land use and global warming. Reactivation of sand dues to drought, climate change, or land use practices has serious consequences on human and animal populations, agriculture, grazing, and infrastructure. Stabilized sand is reactivating in many areas of the Navajo Nation. Dune mobility is inundating housing and causing transportation problems. It also may be contributing to a loss of rare and endangered native plants and grazing land, and to lower air quality from periodic dust storms. Dust from sandstorms on the Navajo Nation is affecting snowmelt in the Colorado Rockies, because it lowers albedo (reflectance) and absorbs heat. Continuing severe drought conditions have diminished soil moisture during the past several years, leaving several areas without enough moisture to support stabilizing vegetation. Additional information is available on-line at *http://geomaps.wr.usgs.gov/navajo/* Contact: Margaret Hiza, 928-556-7366, *mhiza@usgs.gov*

Navajo Nation: Flood-Flow Frequency Investigation (Arizona, New Mexico, Utah)

The United States Congress provided authorization for flood-plain mapping throughout the Navajo Nation by the U.S. Army Corps of Engineers. The Navajo Nation, the BIA, and the Corps of Engineers needed updated techniques to estimate flood-flow frequency for ungaged sites pertaining to the Navajo Nation. New regression models are being developed to improve understanding of the flood-prone regions. The objectives of this investigation are to analyze and compile hydrologic data and then to use the compilations and analyses to create predictive models of flow frequency for selected streams on the Navajo Nation. The new regression models use variables determined from a Geographic Information System using the National Elevation Dataset. Other variables considered in the investigation included updated drainage area, average basin elevation, average basin slope and aspect, and 24-hour, 100-year maximum precipitation. A Scientific Investigations Report is approved for release in FY 2006 and 2007. Contact: Scott Waltemeyer, 505-830-7953, *sdw@usgs.gov*

Navajo Coal and Air Quality Research (Arizona, New Mexico, Utah)

In February and July 2006, the air was monitored in the Shiprock, New Mexico, area of the Navajo Nation. The concentration of inhalable particulate matter was measured inside 16 homes to compare indoor air quality in summer in relation to winter. Many Navajo residents burn coal indoors for heat during the winter, and coal combustion is known to mobilize and produce compounds that are linked to acute and chronic respiratory disease. Additionally, indoor and ambient (outdoor) air samples were collected for organic and trace metal chemical characterization at two residential locations that may be affected by coal combustion products created from electricity generation at two nearby power plants. A fact sheet was published in English and Navajo languages describing the project and presenting some initial findings (*http://pubs.usgs.gov/fs/2006/3094/*). Organizations that have cooperated with USGS on planning, funding, and executing this project include the Navajo Nation Environmental Protection Agency, Navajo Nation Division of Health, Diné College, Indian Health Service, Shiprock Chapter of the Navajo Nation, Navajo Nation Historic Preservation Department, Navajo Tribal Utility Authority, U.S. Department of Energy, and the Agency for Toxic Substances and Disease Registry (U.S. Department of Health and Human Services). Results of the study will provide information to assist the Navajo Nation develop policies and practices to improve healthful use of coal for the benefit of the Navajo people. Contact: Joe Bunnell, 703-648-6497, *jbunnell@usgs.gov*

Canyon de Chelly Vegetation Mapping (Arizona)

A team of USGS scientists from the Sonoran Desert Research Station of the Southwest Biological Science Center is conducting a vegetation mapping project at Canyon de Chelly National Monument. Canyon de Chelly National Monument is on land owned by the Navajo Nation. The staff of the Navajo Nation Natural Heritage Program is doing accuracy assessment of the provisional vegetation map. The USGS team has been assisting them by providing field materials and training. Contact: Kathryn A. Thomas, 520-670-5534, *kathryn_a_thomas@usgs.gov*

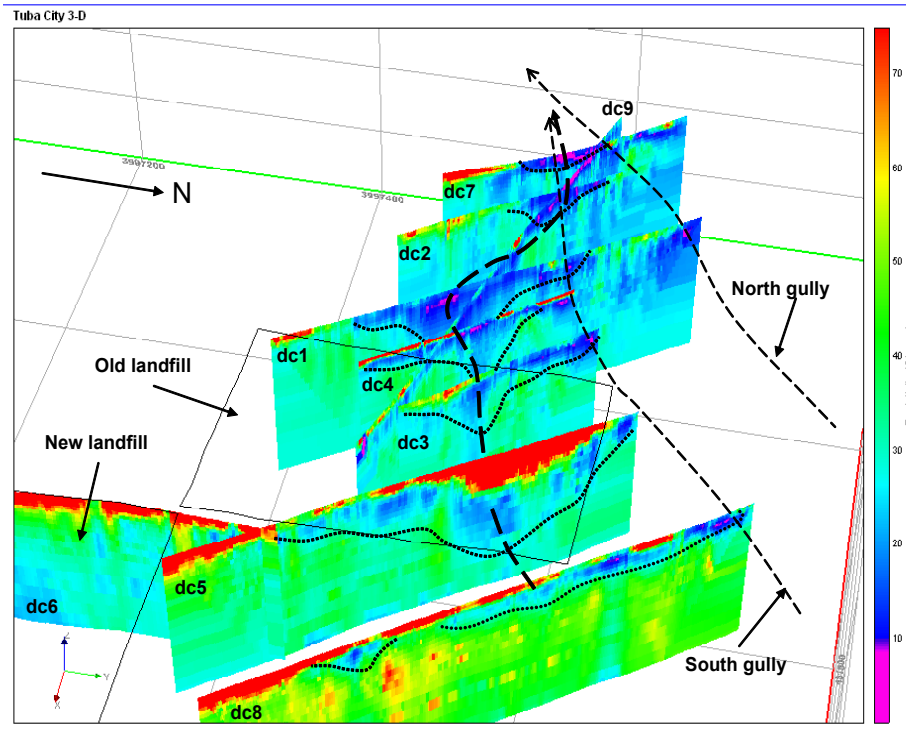
Geologic Mapping of the Eastern Grand Canyon Region (Arizona, New Mexico, Utah)

A new USGS mapping project titled, "Geologic Mapping of Parks and Federal Lands of the Southwestern United States" has included on-going mapping of the eastern Grand Canyon region. The project includes a task, cooperatively funded by the USGS and the National Park Service, which is designed to improve understanding of the surficial and ground-water resources of the eastern part of Grand Canyon National Park and adjacent Navajo lands. The initial geologic mapping of the eastern Grand Canyon began in FY 2003 and encompasses an area of about 2,000 square miles, including the western Navajo Nation and lands of the Hopi Tribe. The mapping was conducted with cooperation of the Cameron, Coalmine Canyon, Leupp, and Tolani Lake Chapters of the Navajo Nation. The map of this initial study is in press. New mapping includes the Tuba City and Glen Canyon Dam 30' x 60' quadrangles, Arizona. This activity started in 2006 and is expected to last at least four years. Contact: George Billingsley, 928-556-7198, *gbillingsley@usgs.gov* or Sue Priest, 928-556-7148, *spriest@usgs.gov*

Laurie Wirt (deceased) and Avery Pavinyama (top), water-quality specialist with the Hopi Tribe, acquire spring samples near the Tuba City, Arizona, landfill. Photograph by David Fey, U.S. Geological Survey.

Uranium in Arizona Landfill

Monitoring wells at the Tuba City Landfill, which is on Hopi and Navajo lands near Tuba City, Arizona, have detected high levels of uranium and other contaminants. This contamination is thought to be related to the landfill waste. The USGS conducted geochemical and geophysical surveys to provide information for possible remediation of the site. Regional data from rocks and ground water in the vicinity of the Tuba City, Arizona Landfill were collected by USGS scientists to provide the Bureau of Indian Affairs with baseline data on the presence of uranium and other trace metals in the area. The geochemistry of ground water emanating from the Tuba City Landfill is consistent with a source of uranium and other trace metals related to mining and milling activities that used to occur in the area. The resistivity surveys were conducted by USGS geophysicists to delineate fluids leaching from the landfill, and to help define the ground-water system surrounding the landfill. The resistivity survey identified a subsurface conductive zone interpreted as a leachate plume moving downgradient from the landfill. This information is being used by the BIA and the Tuba City Landfill Committee, which includes the Navajo Nation and the Hopi Tribe, to understand the possible sources of uranium in the Tuba City Landfill and to pursue appropriate remedial action. Contact: Ray Johnson (geochemistry), 303-236-1885, *rhjohnso@usgs.gov* or Robert Horton (geophysics), 303-236-1338, *rhorton@usgs.gov*



Resistivity data shown in three dimensions for the landfill in Tuba City, Arizona. Red and yellow zones are resistive areas, whereas blue and purple zones are conductive areas. The leachate plume is defined by a conductive zone immediately west of the landfill. The path of the plume is indicated by the bold dashed line. Image by Robert Horton, U.S. Geological Survey.

Monitoring N Aquifer Withdrawals, Navajo Nation and Hopi Tribal Lands, Black Mesa, Arizona

The Peabody Western Coal Company (Peabody) had been the principal industrial water user, and the Navajo Nation and Hopi Tribe were the principal domestic and municipal water users until December 31, 2005. On January 1, 2006, Peabody reduced the industrial pumping from greater than 4,000 acre-ft/year to about 1,000 acre-ft/year. Both Tribes have been concerned about the long-term effects of withdrawals from the N aquifer from industrial and municipal pumping. In 1971, these concerns led to the establishment of a monitoring program in the Black Mesa area by the USGS in cooperation with the Arizona Department of Water Resources. In 1983, the Bureau of Indian Affairs (BIA) joined the cooperative effort. Since 1983, the Navajo Tribal Utility Authority, Peabody, the Hopi Tribe, the Western Navajo, Chinle, and Hopi BIA Agencies have assisted in the collection of hydrologic data. The project, along with USGS data reports, are on the web at *http://az.water.usgs.gov/projects/9671-9E9/*. Contact: Margot Truini, 928-556-7352, *mtruini@usgs.gov* or Jamie Macy, 928-556-7276, *jpmacy@usgs.gov*

Hydrogeology of the Coconino Plateau and Adjacent Areas, Coconino and Yavapai Counties, Arizona

Two regional ground-water flow systems are present in the Coconino Plateau and adjacent areas of northern Arizona: the C aquifer and the Redwall-Muav aquifer. Residents, local and tribal governments, water-facilities managers, Federal entities, and environmental groups recognize the potential consequences of increased ground-water development related to population growth. The public has identified the sustainability, protection, and maintenance of springs, seeps, and riparian habitat on the Coconino Plateau as major issues that have broad support. The USGS evaluated the hydrogeology of the Coconino Plateau to develop a hydrogeologic framework and conceptual model of ground-water flow and estimated water budgets for the ground-water flow system. This study has the support of the Navajo Nation and the Hopi, Havasupai, and Hualapai Tribes because of the improved understanding it provides on the availability, presence, and movement of ground water that supports seeps and springs on tribal lands. These water sources are critical cultural, religious, and natural resources to Native American cultures. A Scientific Investigations Report has been approved for publication, and a website is available for access to data and project information at *http://az.water.usgs.gov/projects/RWI/*. Continued monitoring and data collection are in progress to improve the numerical ground-water flow model in development. Contact: Donald J. Bills, 928-556-7142, *djbills@usgs.gov or* Robert J. Hart, 928-556-7137, *bhart@usgs.gov*

Monitoring the C Aquifer and Adjacent Water-bearing Zones, Near Leupp, Arizona

The C aquifer, in the Little Colorado River Basin near Leupp, Arizona, is a potential water supply source for industrial and municipal users. Consideration and evaluation of the C aquifer is necessary to determine the long-term sustainability of this ground-water resource. The Bureau of Indian Affairs (BIA) recognized the potential effects of increasing ground-water withdrawals on the availability of ground water to meet tribal demands and sustain critical cultural, religious, and riparian sites. The BIA asked the USGS to develop a monitoring program for the C aquifer in areas of potential ground-water withdrawals to determine the baseline conditions. Monitoring focuses on water levels and water chemistry of the C aquifer in the Leupp area and other water-bearing zones and base-flow evaluations in streams. Monitoring may be expanded to include other water-bearing zones above and below the C aquifer and base-flow evaluations in natural discharge areas. A website is being developed to facilitate access to near real-time and other data. Contact: Robert J. Hart, 928-556-7137, *bhart@usgs.gov* or Donald J. Bills, 928-556-7142, *djbills@usgs.gov*

Beneficial Use Agreement with the Hualapai Tribe Continues (Arizona)

The USGS Grand Canyon Monitoring and Research Center (GCMRC), within the USGS Southwest Biological Science Center, continued working in partnership with the Hualapai Tribe to provide a beneficial use for nonnative trout that are being removed from the Colorado River. Since 2003, the GCMRC staff has overseen an experimental trout removal project near the confluence of the Little Colorado River as part of an ongoing effort to reduce competition with and predation on the endangered native humpback chub. When the trout removal project was first proposed in 2002, several of the Tribes involved with the Glen Canyon Dam Adaptive Management Program expressed concern that this project would have an adverse effect on Native American traditional cultural properties near the Little Colorado River confluence. Through consultations with the Hopi and Hualapai Tribes and the Navajo Nation, the GCMRC reached an agreement with the Tribes that has allowed the trout removal project to proceed with the provision that the fish carcasses would be removed from the river and a beneficial use would be found for the remains. At the Tribe's request, the GCMRC has been recycling the trout by providing the remains as fertilizer for Hualapai community gardens. This arrangement was subsequently formalized through a cooperative agreement with the Hualapai Tribe in FY 2005. The resulting produce from the Hualapai community gardens has won several blue ribbons at the Mohave County Fair. FY 2006 was the fourth and final year of the experimental trout removal project. Contact: Helen Fairley, 928-556-7285, *hfairley@usgs.gov*

Rangeland Health and Bark Beetle Infestation on the San Carlos Reservation (Arizona)

The USGS Southwest Geographic Science Team is working closely with officials of the San Carlos Apache Tribe to map and monitor the health of grassland and forest areas on the San Carlos Reservation. This cooperative study is intended to use the resources of the USGS, the San Carlos Apache Tribe, and the BIA. Easily accessible from the Phoenix, Arizona, metropolitan area, the San Carlos Apache Reservation is described by a variety of historical, cultural and recreational activities. The 1.8 million acres encompass a variety of landscapes, including mountainous terrain covered by diverse forests, woodlands, and grasslands along with desert habitats in the lower elevations. Forestry, cattle ranching, and tourism help sustain the tribal economy. The Tribe wants to use the best tools and data available to manage its diverse lands. Tribal managers want to evaluate grassland health and invasive species for better rangeland management and to monitor tree mortality caused by bark beetle infestation for better forestry management. Rangeland health is being learned by analyzing calibrated multitemporal satellite data sets to assess phenological clues into desertification processes acting on the Reservation's grassland communities. Coarse and higher resolution maps and processed image data displaying estimates of grassland health and invasive activity are being field-checked. This methodology seems to be effective. Historical and more current data will be analyzed to determine historical trends and susceptibility of grassland to future degradation. High-resolution imagery and field data are being coupled to map the distribution of forest trees afflicted by the bark beetle infestation. This study will develop techniques for using remote-sensing data to detect signs of tree decline and mortality resulting from beetle attacks. In addition, the Tribe wants to develop and enhance its own capability to produce remotely sensed data products that are customized to specific tribal needs. Therefore, this project includes a strong technology transfer component. This part of the project has assisted the Tribe in acquiring needed software and training in remote-sensing principles, applications, and techniques. USGS remote-sensing and image-processing experts trained San Carlos Employees and BIA personnel in remote sensing as well as presented ongoing research and results to larger tribal audiences. Contacts: Barry Middleton (USGS), 928-556-7465, *bmiddleton@usgs.gov;* Dee Randall (San Carlos Tribe), 928-475-2326 or Bob Hetzler (BIA), 928-475-2326

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 farther downstream, including the Yavapai-Prescott Indian Tribe and the Fort McDowell Yavapai Nation. Beginning in 2001, this study was funded by the Yavapai County Water Advisory Committee to improve hydrologic and geologic information upon which water resource decisions will be based. This study is augmenting a larger investigation supported by the State of Arizona. USGS Scientific Investigations Report 2005–5198 is available online at *http://pubs.usgs.gov/sir/2005/5198/*, titled "Hydrogeology of the Upper and Middle Verde River Watersheds, Central Arizona." Contact: Kyle Blasch, 520-670-6671, ext. 283, *kbalsch@usgs.gov* or Don Bills, 928-556-7142, *djbills@usgs.gov*

Dos Pobres/San Juan Ground-Water Monitoring (Arizona)

Ground-water withdrawals associated with the first major copper mine proposed for Arizona since 1973 could affect existing water rights and water supplies near Safford in southeast Arizona. At the request of the Secretary of the Interior, USGS hydrologists in Arizona worked with the Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), and other parties to develop a plan to monitor effects to the ground-water system caused by mine-related pumping in the foothills of the Gila Mountains. The results could affect the claims to water by the Gila River Indian Community and the San Carlos Apache Tribe. The USGS is providing oversight of the hydrologic data collected as part of the ground-water monitoring plan. In FY 2006, USGS scientists collected ground-water samples at 15 Phelps Dodge monitoring wells and 4 springs (3 additional springs were dry). Isotopic analyses were conducted on all well and spring samples, and a suite of water chemistry analyses was conducted on 5 of the 15 well samples. In conjunction with the Phelps Dodge contractor, USGS scientists also conducted two rounds of side-by-side water-level measurements at 47 wells. Further information on this project is available online at *http://az.water.usgs.gov/projects/9671-BGJ/*. Contact: Nick Paretti, 520-670-6671, *nparetti@usgs.gov*

Mining operations. Photograph courtesy U.S. Geological Survey.

Support for Endangered Kootenai River White Sturgeon Recovery (Idaho, Massachusetts, Washington)

USGS biological research has had a multiyear partnership with the Kootenai Tribe of Idaho, Idaho Department of Fish and Game, and the U.S. Fish and Wildlife Service to recover endangered Kootenai River white sturgeon (*Acipenser transmontanus*). The Kootenai River Subbasin is an international watershed and the river is the second largest tributary to the Columbia River. About 500 wild Kootenai River white sturgeon remain and they spawn at specific locations within the spawning reach. USGS studies have focused on the spawning success as it relates to incubation success, fish movement, bottom sediment, and flow modeling. In 2006, staff from the USGS Western Fisheries Research Center's Columbia River Research Laboratory in Washington conducted experiments at the Kootenai Tribe of Idaho's white sturgeon hatchery to investigate survival of white sturgeon eggs incubated on several types of river sediments. The USGS and the Kootenai Tribe continue working together to sample and describe the spawning habitat of white sturgeon near Bonners Ferry, Idaho. The scientists are using hydraulic and sediment-transport models to assess the feasibility of restoring natural recruitment. In addition, the USGS collaborated with Idaho Department of Fish and Game by providing telemetry equipment and expertise to monitor movements of spawning white sturgeon over an area scheduled for habitat improvements. The USGS continues developing a multidimensional computer model of the spawning reach that simulates river depth, downstream and cross-stream flow velocities, flow direction, and sediment motion over a large range of streamflows. The model can simulate historic river flows as well as river management scenarios and will be used to design spawning habitat enhancement options. The USGS S.O. Conte Anadromous Fish Research Center in Turners Falls, Massachusetts, is conducting research on behavior, dispersal, and wintering behavior of the Endangered Kootenai River white sturgeon early life stages. The Kootenai Tribe supplied fertilized eggs for the USGS study. Together, the egg incubation experiments, field telemetry studies, and hydraulic models provide the Kootenai Tribe and the Kootenai River White Sturgeon Recovery Team with information for habitat restoration. Results of the study also are being used by tribal, federal, and state agencies to designate critical habitat for the species. Several reports on these activities can be found at *http://id.water.usgs.gov/projects/kootxsections/.* Contact: Gary Barton (USGS), 253-428-3600, ext. 2613, *gbarton@usgs.gov*; Boyd Kynard, 413-863-8307, *bkynard@usgs.gov*; Mike Parsley, 509-538-2299, ext. 247, *michael_parsley@usgs.gov*; or Sue Ireland (Kootenai Tribe of Idaho), 208-267-3620, *Ireland@Kootenai.org*

Limnological Monitoring of Coeur d'Alene Lake, Idaho, by USGS and the Coeur d'Alene Tribe

The USGS, in cooperation with the Coeur d'Alene Tribe, completed the second year of a three-year cooperative program to monitor and evaluate water-quality conditions in north Idaho's Coeur d'Alene Lake, a 50-square mile lake with a long history of nutrient enrichment and metal contamination problems. Tribal scientists monitored water quality at 20 near-shore sites around the lake; USGS scientists monitored five deep-water sites on the lake. All water-quality samples were analyzed by the USGS National Water Quality Laboratory. In the final year of the program, monitoring of the deep-water sites continued as well as cooperative preparation of an interpretive report, and the design of a long-term water-quality monitoring program beyond FY 2006. Contact: Molly Wood, 208-387-1320, *mswood@usgs.gov*

Shoshone-Paiute Tribes National Map Collaboration with USGS (Idaho, Nevada)

The Shoshone-Paiute Tribes of the Duck Valley Reservation entered a cooperative agreement with the USGS to enhance tribal GIS data holdings and display selected data holdings on The National Map. The Shoshone-Paiute Tribes purchased and installed a large format plotter in FY 2006 to enhance tribal mapping capabilities. Plotted maps are being used to improve accuracy of tribal data sets and to increase the effectiveness of the Tribes' Geographic Information System (GIS) Department to support Tribal Council decisions. USGS and tribal personnel are developing a plan for long-term data maintenance and data serving. This project was completed in FY 2006. Contact: Tracy Fuller, 303-202-4172, *tfuller@usgs.gov* or Mary Howard, Shoshone-Paiute Tribes, 775-757-2440, *howard.mary@duckvalley.org*

Cui-ui and Lahontan Cutthroat Trout in Pyramid Lake, Nevada

The cui-ui is an endangered fish species of the sucker family that is found only in Pyramid Lake, Nevada, and within the bounds of the Pyramid Lake Paiute Indian Reservation. Historically, the cui-ui was a favored food fish of Native Americans but since the early 1980s the Pyramid Lake Paiute Tribe has curtailed cui-ui fishing so as not to jeopardize the species. The USGS Western Fisheries Research Center has been studying cui-ui population dynamics to determine probability of their persistence under different water management scenarios. The USGS study also has generated demographic information on Pyramid Lake fish populations that has been useful to the Tribe in managing its Lahontan cutthroat trout sports fisheries. In addition, cui-ui sacrificed for age and growth analyses have, through legal mechanisms, been given to the Pyramid Lake Paiute Tribe so that tribal members (especially tribal elders) can continue their long tradition of consuming their sacred food. Contact: G. Gary Scoppettone, 775-861-6396, *Gary_Scoppettone@usgs.gov*

Hydrologic Information for the Walker River Paiute Tribe (Nevada)

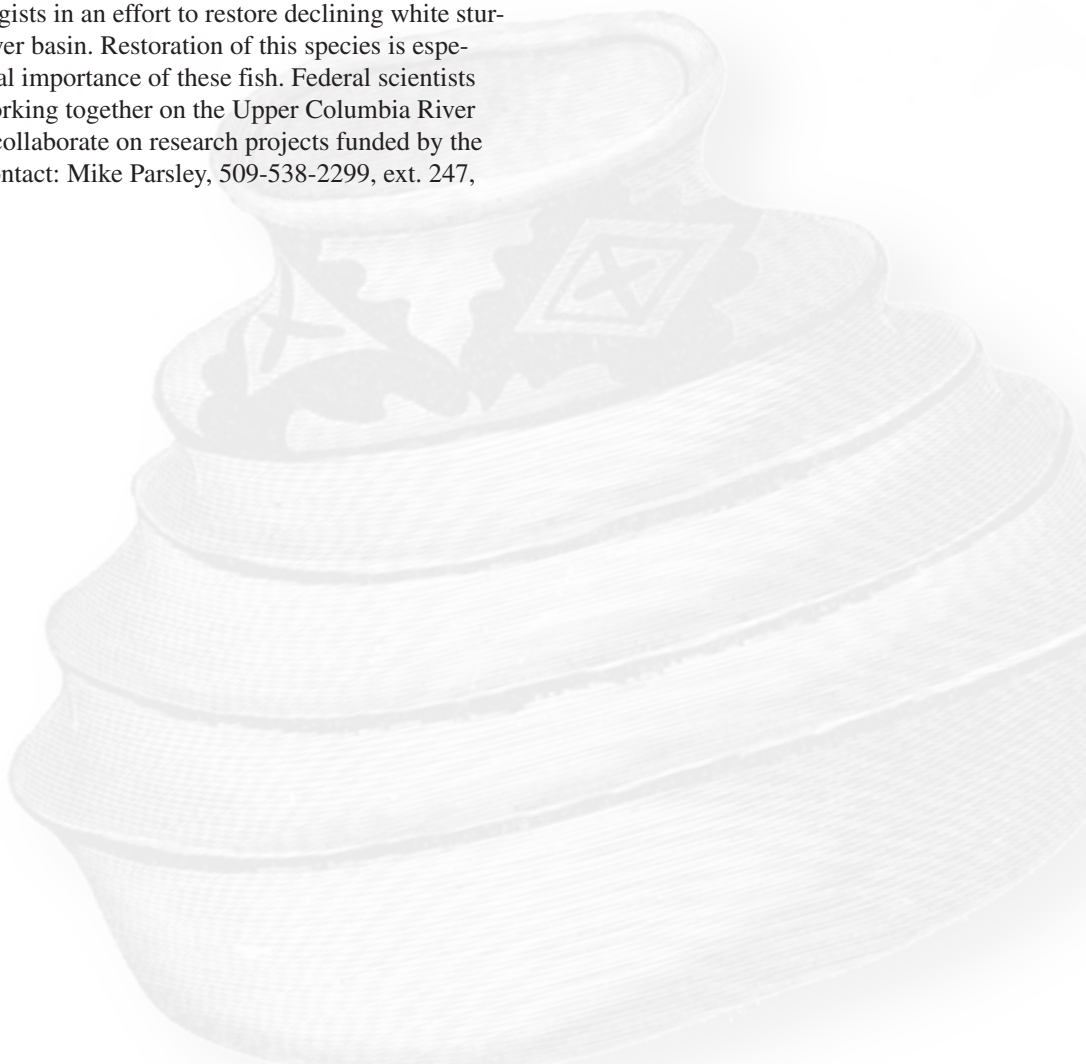
During irrigation season, the USGS Nevada Water Science Center continues to collect pH and conductance measurements for the Walker River Paiute Tribe. The information helps the Tribe manage its water quality. Contact: Kerry Garcia, 775-887-7659, *ktgarcia@usgs.gov*

Hydrologic Study of the Walker Basin, Walker River Paiute Tribe (Nevada)

USGS scientists began a study in FY 2004 to quantify streamflow in the Walker Basin, to determine evapotranspiration losses from natural and agricultural vegetation and the surface of Walker Lake, and to develop an improved water budget for Walker Lake. The study includes many tasks. Ground-water and evapotranspiration data are being collected. Geophysical data, including seismic, LiDAR (laser-imaging technology for high resolution elevation data), and bathymetric data, were collected. Single-beam sonar data were combined with LiDAR data to refine the lake elevation/surface area/volume relation up to an elevation of 4,083 feet, the lake elevation in 1882. Sidescan sonar also was used to obtain images of the mounds identified using single-beam sonar, however, no mounds were found. A computer model is planned that will use these and other data collected throughout the basin to predict how changes in irrigation practices in the Walker Basin will affect flows in the lower Walker River. Results of the study will be used by agencies involved in ongoing mediation. Although this work is funded by the Bureau of Reclamation, access to the Walker River Paiute tribal lands is critical to the success of the study. A Memorandum of Understanding between the Tribe and USGS allows continued access by USGS staff to data-collection sites. Contact: Tom Lopes, 775-887-7688, *tjlopes@usgs.gov*

White Sturgeon Restoration in the Columbia River (Washington)

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 importance of these fish. Federal scientists and tribal representatives continue working together on the Upper Columbia River White Sturgeon Recovery Team and collaborate on research projects funded by the Bonneville Power Administration. Contact: Mike Parsley, 509-538-2299, ext. 247, *michael_parsley@usgs.gov*



Shallow and Airborne Trace Metal Concentrations from Lake Roosevelt (Washington)

Lake Roosevelt is a 125-mile-long reservoir in eastern Washington State that extends from Grand Coulee Dam almost to the Canadian border. Mining waste has contaminated the lake sediment, leading to concerns about the contamination effects on human health. When the water level of the reservoir is lowered, large areas of contaminated sediment are exposed. Upon drying, the fine-grained portion of the sediment can become airborne due to high winds. The Confederated Tribes of the Colville Reservation want to know more about the potential threat to human health of trace metals in exposed sediment from the lake. USGS scientists sampled trace metals in the exposed fine-grained sediment during the 2001 drawdown of the reservoir. Results were published in USGS Water-Resources Investigations Report 03–4170; *http://pubs.usgs.gov/wri/wri034170/*. Following this initial sampling of exposed sediment, a network of air-quality monitors was established to determine the presence, concentrations, distribution, and seasonal variability of selected trace elements on airborne dust particles and, to the extent possible, the fraction of airborne trace elements originating from exposed lakebed sediments. The network was established in FY 2002 and continued operating through FY 2006, the final year of monitoring. Contact: Mike Majewski, 916-278-3086, *majewski@usgs.gov* or Sue Kahle, 253-552-1616, *sckahle@usgs.gov*

Mike Majewski (USGS Sacramento) at meteorological station and Mike McKay (Spokane Air Pollution Control Authority) at the air sampler. Photograph by Susan Kahle, U.S. Geological Survey.

Effect of Trace-Elements on Water Quality and Biological Health, Lake Roosevelt National Recreational Area (Washington)

Mining wastes and other upstream activities have introduced large quantities of metals into Lake Roosevelt, causing concerns about the effects of these contaminants on fisheries resources. This USGS project, conducted in cooperation with the National Park Service, included sampling and analyzing sediments from eight sites on Lake Roosevelt for concentrations of metals, as well as biological toxicity, bioaccumulation potential, and geochemistry. The results will help describe the environmental processes resulting in the uptake of metals to the water and biota in the lake. Because Lake Roosevelt is a cultural and economic resource for the Confederated Tribes of the Colville Reservation and Spokane Tribe of Indians, the USGS coordinated the selection of sites with the Tribal Historical Preservation Officers of both Tribes and National Park Service archeologists. Upon request of the Confederated Colville Tribes' Historic Preservation Officer, collection of sediment at three sites was monitored by a National Park Service archeologist in FY 2004. Consultation with the Historic Preservation Officer of the Spokane Tribe of Indians resulted in no additional action during sampling. The chemical analyses and biological tests for the study were completed in FY 2005, and the interpretation of the data was completed in FY 2006. At the end of FY 2006, a data report and two peer-reviewed journal manuscripts were undergoing internal USGS reviews. Contact: Tony Paulson, 253-552-1681, *apaulson@usgs.gov*

USGS personnel recovering a sediment core on Lake Roosevelt. Photograph by Robert E. Drzymkowski, U.S. Geological Survey.

Midnite Uranium Mine, Spokane Indian Reservation (Washington)

The Midnite Mine, an open-pit uranium mine, operated from 1956 to 1981. An estimated 2.3 million tons of mine wastes were stored on the 300-acre site. Some of these wastes and byproducts were released into Blue Creek, a down-cutting stream. Downstream of the Midnite Mine site, Blue Creek has been contaminated by releases of radioactive materials, toxic metals, and elevated concentrations of sulfate (SO_4) in water and sediment. Resources of Blue Creek have long been used by the members of the Spokane Indian Tribe as part of their traditional lifeways. The Blue Creek drainage provides terrestrial, riparian, wetland, and aquatic habitat that supports a fishery and provides important cultural resources for tribal members. The area of the mine site also is used by animals that are routinely hunted by the Tribe for subsistence. The mine site was listed by the U.S. Environmental Protection Agency on the Superfund program's National Priorities List in 2000. The USGS was asked to determine the pre-mining geochemical baseline in Blue Creek and the extent of contamination from historical mining in the sediment in the Blue Creek delta in Lake Roosevelt. Samples were collected in April 2006. Most analyses were completed by fall 2006. A draft manuscript of the study was submitted for review in December 2006. Contact: Stan Church, 303-236-1900, *schurch@usgs.gov*

Joint USGS and Skagit System Tribal Cooperative Research Identifies Critical Habitat for Chinook Salmon (Washington)

The USGS Western Fisheries Research Center and the Skagit River System Cooperative (SRSC) collaborated to investigate whether rearing Chinook salmon in the Skagit River delta increases the survival of juveniles and whether limitations in the amount of that habitat is limiting the Skagit population of Chinook salmon. The SRSC has been monitoring densities and size of juvenile salmon for more than a decade and collecting samples for USGS to analyze otoliths (ear "stones") to reveal specific rearing strategies used by the juvenile salmon. Fish otoliths accumulate daily growth rings that are spaced proportionally to the growth rate of the fish. These rings also record movement among freshwater, delta, and bay habitats. This research has shown that the longer juvenile salmon stay and grow in the delta, the faster they grow when they move on to the bay. Faster growth in the bay should increase survivability because faster growth reduces vulnerability to predation in the bay and at sea. These and other data from this research show that the remaining delta habitat is insufficient to support the number of juvenile salmon produced in many years. Therefore, restoring delta habitat that was formerly lost to diking is a promising means to increase the numbers of adult Chinook salmon in the Skagit River. The results have provided a clear, scientific basis for advocating delta restoration in the Skagit River and other rivers of Puget Sound, and already have led to initiation of several habitat restoration projects in the Skagit River delta. The results also contribute to a larger applied research framework by providing specific life history data to a habitat-based salmon production model. In turn, the data supports priorities listed in the Skagit River System Tribal Cooperative Chinook Recovery Plan. Contact: Reginald Reisenbichlter, 206-526-6559, *reg_reisenbichler@usgs.gov* or Kim Larsen, 206-526-6282, ext. 232, *kim_larsen@usgs.gov*

Dosewallips River—Geomorphic Mapping Using Remote Sensing (Washington)

The USGS Washington Water Science Center is cooperating with scientists of the Port Gamble S'Klallam Tribe to map areas where habitat restoration activities will provide the greatest improvements for fisheries listed under the Endangered Species Act. The Dosewallips River, on the west coast of Hood Canal in Washington, is one of the streams least affected by human activities, although historical logging activities and some development have significantly changed the river's ability to support fisheries. Remote sensing data—LiDAR (laser-imaging technology for high-resolution elevation data) and digital color orthophotography—have been used to identify overflow channels, abandoned stream channels, and floodplain shelves near the river elevation where restoration activities may turn them into high-quality salmon habitat. Elevation maps, slope maps, and digital color imagery were interpreted and mapped using geographic information software with multiple lines of supporting evidence, and supported by field reconnaissance. As large woody debris naturally returns to the stream, or is placed as part of a restoration plan, these near-stream channels and shelves will provide salmon spawning and rearing habitat. This project was completed and the results were published in Photogrammetric Engineering & Remote Sensing (*http://www.asprs.org/publications/pers/2006journal/november/highlight.pdf*). Contact: Joseph L. Jones, 253-428-3600, ext. 2684, *jljones@usgs.gov*

Habitat Use of Nearshore by Juvenile Salmon and Shellfish, Elwha River, Washington

Juvenile Chinook salmon were collected from various habitats within the Elwha River system and their otoliths were processed by USGS scientists. The otoliths are calcium carbonate structures which can be used to determine residence and growth in particular habitat types and ultimately identify successful life history strategies. This cooperative research with the Lower Elwha Klallam Tribe will provide a baseline of data needed to assess the importance of the Elwha River estuary to the current Chinook salmon population to data gathered in the future. The baseline will be compared to data gathered during and after a period of rapid geomorphic change in the estuary caused by dam removal. The results also help address tasks that are parts of the USGS Coastal Habitats in Puget Sound Program. The Tribe will integrate the research results into their "Comprehensive Assessment of the Wetland Complex at the Mouth of the Elwha River," which is funded by a U.S. Environmental Protection Agency grant. Contact: Kim Larsen, 206-526-6282, ext. 232, *kim_larsen@usgs.gov*

Elwha Sediment Model—Transport of Suspended Sediment and Effect on Aquatic Habitat in Elwha River (Washington)

The USGS Washington Water Science Center is modeling fluvial sediment transport in the Elwha River to help management agencies understand the potential changes in hydrology and sediment transport in response to the scheduled removal of two dams on the river. A sediment-transport model has been constructed to examine the response of suspended-sediment concentrations and the size of streambed material to different streamflow scenarios. The results will provide information about the potential effects of dam removal on resources of interest to the Lower Elwha Klallam Tribe, including salmon habitat and the recovery of the river after dam removal. The model was completed in 2006 and a final report is being prepared. Contact: Chris Konrad, 253-428-3600, ext. 2634, *cpkonrad@usgs.gov*

Elwha River Channel Studies (Washington)

The Elwha River is slated for the removal of two large dams, and data were collected to document baseline conditions prior to dam removal. The USGS Washington Water Science Center conducted a channel survey of the Lower Elwha River in May 2006. The survey used an Acoustic Doppler Current Profiler, a real-time kinematic global positioning system, and an echosounder to collect data on channel current velocities and bathymetry. The work is part of the Coastal Habitats in Puget Sound project that is described in USGS Fact Sheet 2006–3081 (available online at *http://pubs.usgs.gov/fs/2006/3081/*). Studies on the Elwha River are focused on the recovery of near shore ecosystems. This project will continue for several years in close cooperation with the Lower Elwha Klallam Tribe. Contact: Jeff Duda, 206-526-6282, ext. 233, *jduda@usgs.gov* or Chris Curran, 253-552-1600, ext. 1614, *ccurran@usgs.gov*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USGS SCIENCE FOR PUGET SOUND RESTORATION AND PRESERVATION:

Coastal Habitats in Puget Sound (CHIPS)

Partners Focus on the Nearshore

The Critical Need for Science

Support for the Nisqually Chinook Recovery Plan (Washington)

Juvenile Chinook salmon were collected from various habitats within the system and their otoliths were processed by USGS scientists. The otoliths are calcium carbonate structures that can be used to determine residence and growth in particular habitat types and ultimately identify successful life history strategies. This particular research, in partnership with the Nisqually Indian Tribe and U.S. Fish and Wildlife Service, will provide data needed to evaluate the estuary restoration planned by the Service at the Nisqually National Wildlife Refuge and will also help to meet monitoring priorities listed by the Nisqually Tribe in the 2001 Nisqually Chinook Recovery Plan. Contact: Kim Larsen, 206-526-6282, ext. 232, *kim_larsen@usgs.gov*

Ground-Water Resources of the Yakima River Basin (Washington)

Surface water in the Yakima River Basin is being adjudicated. The amount of surface water available for appropriation in the Yakima River Basin is not known, but there are increasing demands for water, including municipal, fisheries, agricultural, industrial, and recreational uses. These demands must be met either by ground-water or by changes in the way water resources are allocated and used, or by both. The USGS, in cooperation with the Bureau of Reclamation and the Washington State Department of Ecology, is studying the availability of ground water, and working with the Confederated Tribes and Bands of the Yakama Nation. An improved understanding of the ground-water system will help estimate the effects of selected management strategies and the effects of current and potential future groundwater pumping on streamflow. Streamflow is important to the life-history stages of salmonids, which are of cultural and religious importance to the Yakama Nation. A ground-water model will be constructed to improve understanding of the system and to help estimate the effects of selected management strategies. The model will address the effects of potential future ground-water pumping on streamflow because of the importance of streamflow to the life-history stages of salmonids. 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. Four reports were released in 2006 and two more were completed in 2007. These reports, and earlier ones, are available along with additional information on the project website at *http://wa.water.usgs.gov/projects/yakimagw/status.htm*. Contact: John Vaccaro, 253-428-3600, ext. 2620, *jvaccaro@usgs.gov*

Watershed Restoration and Reintroduction of Salmon and Steelhead (Washington)

USGS fishery biologists are continuing a partnership 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, which is on the White Salmon River at river kilometer 5 (about mile 3) and is scheduled for removal in 2008. Federal scientists and tribal representatives worked together on a Technical Advisory Committee to the White Salmon Watershed Management Council. A USGS website for the project follows: *http://wfrc.usgs.gov/research/fish%20populations/STPetersen2.htm*. Contact: Pat Connolly, 509-538-2299, ext. 269, *patrick_connolly@usgs.gov*

Water Management and Steelhead on National Wildlife Refuges (Washington)

USGS fishery biologists from the Western Fisheries Research Center are continuing to study the effects of water and land management at Toppenish National Wildlife 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. A USGS website for the project follows: *http://wfrc.usgs.gov/research/aquatic%20ecology/STPetersen13.htm*. Contact: Pat Connolly, 509-538-2299, ext. 269, *patrick_connolly@usgs.gov*

Portland Harbor and Potential Fisheries Issues (Oregon, Washington)

At the request of the Confederated Tribes of the Colville Reservation, a USGS scientist participated in discussions concerning the Natural Resources Damage Assessment site at Portland Harbor, Oregon. The USGS could provide expertise and could conduct studies on the potential effects of contamination on lamprey and sturgeon. The USGS provided information on the support needed to conduct physiological, genetic, and chemical studies. The information was useful for continuing talks among the State of Oregon, the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Agency, Tribes, and parties involved with mitigation of the site. Contact: Aïda Farag, 307-733-2314, ext. 11, *aida_farag@usgs.gov*

Ground-water Supply on the Umatilla Indian Reservation (Oregon)

The USGS is preparing a report on the results of a 3-year study to understand ground-water flow in the water-bearing zones of the Columbia River Basalt Group. This work was done in cooperation with the Confederated Tribes of the Umatilla Indian Reservation. Wells tapping the basalt provide drinking water for the Umatilla Tribes in this part of arid north-central Oregon. Permeable zones in the basalt were identified using borehole geophysics and help to explain differences in water levels in tribal water supply wells. Comparing ground-water levels, water use, and precipitation will provide information to understand how these stresses affect aquifer water levels and the tribal water supply. Contact: Terrence Conlon, 503-251-3232, *tdconlon@usgs.gov*

Cooperative Agreements Program Grant Proposal Submitted by the Confederated Tribes of the Warm Springs Reservation (Oregon)

The Confederated Tribes of the Warm Springs Reservation submitted a proposal to the Federal Geographic Data Committee's Cooperative Agreement Program for funding. In January 2006, the USGS Oregon Geospatial Liaison reviewed proposal and provided a Letter of Support for the project. As part of the proposal, the Tribes would share geospatial base data for their ceded lands in Oregon with the USGS The National Map and Geospatial One-Stop activities. Although the project proposal was not selected for funding by the Federal Geographic Data Committee, the Warm Springs Tribes plan to submit another proposal for the FY 2007 grant process. Contact: Sheri Schneider, 503-231-3210, *sschneid@usgs.gov* (2006 work done by Nancy Tubbs, now retired)

Spring Chinook Salmon on the Deschutes River, Oregon

USGS fishery biologists continue cooperating with the Confederated Tribes of the Warm Springs Reservation in the fourth 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. In this portion of the study, USGS scientists are helping staff at the Warm Springs National Fish Hatchery evaluate whether or not changes in how they raise juvenile salmon improves the likelihood of the fish migrating to the sea. The USGS role is to develop nonlethal measurement techniques that will predict the behavior of the fish. Working together, scientists from the Confederated Tribes of the Warm Springs Reservation, U.S. Fish and Wildlife Service, and the USGS are sharing the responsibilities for in-stream sampling during this study. Contact: Patrick Connolly, 509-538-2299, ext 269, *patrick_connolly@usgs.gov*

Grand Ronde Tribes and USGS Collaborate on Pacific Lamprey Research (Oregon)

The USGS is collaborating with the Confederated Tribes of Grand Ronde on a study assessing the passage characteristics of Pacific lamprey at Willamette Falls Dam near Portland, Oregon. The USGS is monitoring passage of fish at the dam and the Tribe is monitoring fish movements and distribution upstream of the dam. The USGS has provided telemetry equipment and training to assist tribal biologists and technicians in conducting this project. This cooperative effort will identify impediments to passage for lampreys at the dam and document their current distribution in the basin. Such information is needed to help restore and conserve these ancient fish, which are an important cultural and food resource for many Pacific Northwest Tribes. Contact: Matthew Mesa, 509-538-2299, ext. 246, *matt_mesa@usgs.gov*

Quantifying the Ground-Water Resources of the Upper Klamath Basin (Oregon, California)

Ground water has long been considered a possible source to meet the increasing demand 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. USGS is conducting a 9-year investigation that continues through FY 2007 to quantify the ground-water resources of the upper Klamath Basin. Information obtained through these studies will help determine how ground water can be used to help solve water-supply problems while maintaining ground-water discharge to streams that is critical for aquatic wildlife. The Klamath Tribes reside 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 information that this study can provide them. Although the USGS is not cooperating in a formal 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. Tribal representatives have attended many project-related meetings. Contact: Marshall Gannett, 503-251-3233, *mgannett@usgs.gov*

Modeling Klamath and Trinity River Salmon Production, Yurok, Karuk and Hoopa Valley Tribes (California)

The USGS Fort Collins Science Center in Colorado has been working with the Yurok, Karuk, and Hoopa Valley tribal fishery programs to gather high-quality data on adult and juvenile Chinook and coho salmon. The Tribes are located in coastal and inland northern California along the Klamath and Trinity Rivers. The USGS scientists are using data and analyses to identify and estimate aquatic habitat limitations. That information then is used to refine a computer model known as SALMOD that simulates the young-of-year (all fish that are less than 1 year old) fish production model for the main stem of the Trinity and Klamath Rivers. By including proposed flow regimes and habitat modifications, the calibrated model and data collected can be used by fishery biologists from the three Tribes, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service to enhance spawning and rearing habitat, and thus young-of-year and adult salmon production. Information on the model, its developments, and applications may be found at *http://www.fort.usgs.gov/Products/Software/SALMOD/*. Contact: Sam Williamson, 970-226-9362, *sam_williamson@usgs.gov*

Klamath River Adult Spawner Estimates, Yurok and Karuk Tribes (California)

To estimate the number of successfully spawning Chinook salmon in the Klamath River, scientists from the USGS Fort Collins Science Center in Colorado are providing technical guidance to a crew of Yurok Tribe and U.S. Fish and Wildlife Service personnel collecting and marking salmon carcasses. In a similar effort, a crew of Karuk Tribe and U.S. Fish and Wildlife Service personnel count redds (gravel nests dug by females) in the reach of the Klamath River from the Iron Gate Dam to Happy Camp. Both Tribes have lands along the Klamath River in coastal and inland northern California. Carcass surveys (first proposed and funded by USGS in 2001) have shown that redd counts underestimate successful female spawners by a factor of 3 to 4. Using carefully evaluated mark-recapture calculations, the U.S. Fish and Wildlife Service provides the official mainstem Klamath estimate for inclusion in the California Department of Fish and Game's annual estimate of returning fall Chinook adults and juveniles for the entire basin. Contact: Sam Williamson, 970-226-9362, *sam_williamson@usgs.gov*

Estimating Juvenile Coho Salmon Survival in the Klamath River Downstream from Iron Gate Dam (California)

A recent Biological Opinion mandates water releases from Iron Gate Dam to improve survival of juvenile coho salmon downstream. This mandate was based on general theory, but as noted by the National Research Council, no data exist to ensure it is applicable in this case. The USGS is working with the U.S. Fish and Wildlife Service (Arcata, California), the Yurok Tribe, and the Karuk Tribe to estimate the survival of radio-tagged juvenile coho salmon to address this information gap. The Yurok and Karuk Tribes live in the lower Klamath River Basin. The non-USGS cooperators conducted a pilot study in 2005, and the USGS joined the collaboration in 2006 to provide expertise in estimating survival of tagged fish in other locations. The USGS worked with the tribal partners to identify study sites and create study protocols, and tribal employees searched for tagged fish, retrieved telemetry data and transmitted it to the USGS for analysis. Analysis by the USGS and U.S. Fish and Wildlife service is underway. The Bureau of Reclamation in Klamath Falls, Oregon, is supporting this study. Contact: John Beeman, 509-538-2299, ext. 257, *jbeeman@usgs.gov*

Klamath River Salmon Fry Production and Habitat Selection, Karuk Tribe (California)

To calculate estimates of chinook and coho salmon fry numbers moving downstream from their rearing grounds, the USGS Fort Collins Science Center in Colorado provides technical guidance to a crew of Karuk Tribe and U.S. Fish and Wildlife Service personnel sampling these fish annually from early March to mid-May. The Tribe is inland in northern California along the Klamath River. Frame nets (for shallower water), rotary screw traps (for deeper water), and temporary dye marking are used for estimating, as follows:

- Fish abundance through catch-per-unit efforts, in which nets are set at the same time over consecutive days for maximum and consistent sampling;
- Sampling gear efficiency (efficiency estimates); and
- Expanded estimates of total production.

These techniques are used to estimate total fish fry production, as well as uncertainties associated with sampling. Since 1997, the USGS scientists also have conducted electrofishing, snorkeling, and seine sampling for habitat-use density estimates to develop habitat suitability criteria specific to the Klamath River. These criteria were recalculated in 2006 and used for physical habitat modeling and flow recommendations in the Hardy Phase II Final Report, which is currently (FY 2006) being reviewed by a National Academy of Science panel. Contact: Sam Williamson, 970-226-9362, *sam_williamson@usgs.gov*

Klamath River, California. Photgraph by Tupper Ansel Blake, U.S. Fish and Wildlife Service.

Investigations of Agua Caliente Spring, Agua Caliente Band of the Cahuilla Indians (California)

Agua Caliente Spring is the only known hot spring in the Palm Springs area and one of only a handful in southern California. Little is known about the scientific characteristics of the spring, including the source, age, and sustainability of flow of the hot spring water. The natural seasonal, and longer term, variability of the discharge, temperature, and chemical characteristics of the spring are unknown. The hydraulic connection with cool-water aquifers and the susceptibility to effects of ground-water development also are not known. This study will define the geology, sources, age, variability, and losses of the spring. During FY 2006, USGS personnel collected gravity measurements and seismic reflection and refraction data to help identify the stratigraphic units and geologic structure in the area around the Agua Caliente Spring. Chemical and isotopic data were collected to determine the source (local in relation to regional ground-water flow systems) and age (time since recharge) of water discharged by the Agua Caliente Spring. Samples were collected for chemical and isotopic analyses from the Agua Caliente Spring and other springs and wells in the area. Tritium was not present in samples from any of the thermal springs sampled for this study, indicating that the water sampled from these springs was recharged prior to about 1950. Tritium was detected in a local cold spring and nearby ground water, indicating that at least some water sampled from these sites was recharged since 1950. Water-quality data for the Agua Caliente Spring is described by comparatively high pH and low calcium-to-sodium ratios, unlike the local ground water that has lower pH and significantly higher calcium-to-sodium ratios than the geothermal spring. The results of the chemical and isotopic data indicate that there is little interaction between the Agua Caliente Spring and the local ground water. The USGS scientists are analyzing discharge and temperature data collected at the Agua Caliente Spring during FY 2005 to 2007 to determine if the spring discharge and temperature are being influenced by changes in climate or regional pumping, or both. During FY 2007, the final interpretive report describing the source, discharge, and chemical characteristics of water from the Agua Caliente Spring will be prepared for publication. The results will provide a greater hydrologic understanding of the warm spring, and allow the Agua Caliente Band of Cahuilla Indians to better manage and use the cultural natural resource. All work was performed in close cooperation with the Agua Caliente tribal government. Contact: Peter Martin, 619-225-6127, *pmmartin@usgs.gov*

Anza-Terwilliger Hydrologic Study (California)

The USGS California Water Science Center continued its working relationship with the Cahuilla Band of Mission Indians. USGS scientists are conducting water-level measurements in more than 100 existing private wells in the vicinity of Anza and Terwilliger, California. The results will be shown on a map of water-level changes. As a reconnaissance evaluation, Center staff also analyzed nutrients, stable isotopes, and some metal concentrations in a limited number of surface- and ground-water quality samples. Contact: Dennis Clark, 619-225-6126, *daclark@usgs.gov*

Alaska Marine Mammal Tissue Archival Project (Alaska)

The Alaska Marine Mammal Tissue Archival Project routinely collaborates with Alaska Natives to obtain high-quality tissue samples from marine mammals harvested by subsistence hunters throughout Alaska. During 2006, USGS Alaska Science Center staff worked with subsistence hunters from the North Slope Borough Department of Wildlife Management (Barrow), Natural Resources Department of Kawerak, Inc. (Nome), and the Native Village of Kotzebue to collect tissues for this project. Contact: Kristin Simac, 907-786-3942, *kristin_simac@usgs.gov*

Seabird Tissue Archival and Monitoring Project (Alaska, South Carolina)

In 1998, the Alaska Maritime National Wildlife Refuge, the USGS Alaska Science Center, and the National Institute of Standards and Technology (NIST) initiated a joint effort to develop and test protocols for collecting, transporting, processing, and storing seabird eggs collected at the colonies on the wildlife refuge. Based on this work, a Seabird Tissue Archival and Monitoring Project (STAMP) was designed to gather information for 100 years. The STAMP was implemented in 1999. Through FY 2006, this long-term, cooperative effort has collected common and thick-billed murre and black-legged kittiwake eggs from more than nine seabird colonies on the wildlife refuge and three seabird colonies on privately-owned lands. The processed contents are cryogenically stored at the NIST National Biomonitoring Specimen Bank in Charleston, South Carolina, for current and future studies of contaminants. The project also is analyzing subsamples of the banked tissues to document baseline levels of persistent bioaccumulative contaminants (for example, chlorinated pesticides, PCBs, mercury) at these Alaskan nesting locations. The STAMP routinely collaborates with Alaska Native groups to obtain seabird eggs from subsistence harvests throughout the State, including: Point Hope IRA Council, Point Hope, Alaska; Maniilaq Association Subsistence Program, Kotzebue, Alaska; Chugach Regional Resources Commission; Seldovia Village Tribe's Environmental Office; Nanwalek Tribal IRA Council; and residents and officials of Nanwalek, Alaska, the Alaska Sea Otter and Steller Sea Lion Commission, and Tatitlek Village IRA Council, Tatitlek, Alaska. Contact: Kristin Simac, 907-786-3942, *kristin_simac@usgs.gov*

Alaska Walrus Research

Pacific Walrus utilize beaches around Cape Peirce as haulout areas on which to rest between feeding forays. These beaches are surrounded by sheer cliffs affording the walrus protection from predators. Photograph courtesy the U.S. Fish and Wildlife Service

Walrus are important culturally and are a source of subsistence food and traditional materials for Alaska Natives and Russians, who harvest the animals annually. However, the size and trend of the walrus population are unknown, largely due to problems with survey methods. The USGS Alaska Science Center and U.S. Fish and Wildlife Service created a Pacific Walrus Survey Team to develop new survey techniques. In March and April 2006, a survey was conducted to determine the abundance of walrus throughout their range. The team developed an aerial thermal imaging technique for counting walruses on ice, a remotely deployed satellite-linked transmitter to allow estimation of the proportion of the population not on the ice, and an overall survey design with associated estimation methods. Project scientists received advice and assistance in the field from Alaska and Russian Native hunters. Future USGS research, starting in 2007, will focus on the seasonal distribution and habitat use of walruses in the Chukchi Sea to address information needs related to climate warming and potential effects of oil exploration. Research planning and collaborations with Alaska Native communities will be facilitated in meetings with the Eskimo Walrus Commission and local village organizations. The results of these ongoing studies, publications, and other data sets will be available through the following website: *http://alaska.usgs.gov/science/biology/walrus/index.html* Contact: Chad Jay, 907-786-7414, *chad_jay@usgs.gov*

Polar Bear Research (Alaska)

The USGS Alaska Science Center's polar bear program continues to actively collaborate and communicate with the Alaska Nanuq Commission and the North Slope Borough Department of Wildlife Management. Efforts to determine polar bear population size, boundaries, and health have direct bearing on the subsistence harvest quota set for Alaska Native hunters. Contact: Steve Amstrup, 907-786-3424, *steven_amstrup@usgs.gov*

Polar bear walking along the Beaufort Sea Coastline of Alaska. Photograph by Susanne Miller, U.S. Fish and Wildlife Service

Tanacross, Alaska Uses Geology for Waste Management Plan

Surficial geologic mapping along the Alaska Highway in east-central Alaska was originally undertaken to provide baseline environmental data along the route of a proposed high-pressure natural gas pipeline that would parallel the highway from Fairbanks to the Yukon. The project has produced surficial geologic maps of the Tanacross B6, B5, B4 quadrangles (Scientific Investigations Maps 2850, 2856, and 2935, respectively). These maps are accompanied by text, including introduction (physiography, glaciation, permafrost, climate, vegetation, and history), unit descriptions, and information on geologic hazards and economic resources. The Tanacross Corporation owns about 25 percent of the land mapped during this project. Results of the mapping have been shared with the Environmental Director of the Native Village of Tanacross and have been included in the village's Solid Waste Management Plan and into the remediation of the Tanacross Airfield site. Contact: Paul Carrara, 303-236-1287, *pcarrara@usgs.gov*

Mineral Resources Studies in Southwestern Alaska

The USGS is conducting field-based mineral resource investigations in a poorly known part of southwestern Alaska that is thought to contain undiscovered metallic resources. The USGS study includes geologic field mapping, regional geochemical sampling, and collection of airborne magnetic data for an 8,500-square-mile area, much of which lies within the Bristol Bay Native Corporation regional boundary. By the end of FY 2006, the geologic and geochemical coverage was 75 percent complete; the aeromagnetic coverage was 100 percent complete. Publication of these new data is expected to facilitate mineral exploration, assist in land-use planning, and encourage economic development. The Bristol Bay Native Corporation is interested in bringing resource development to its region and is participating in the study under a Cooperative Research and Development Agreement (CRADA). Using USGS sampling protocols, Corporation geologists and shareholders carried out part of the stream sediment sampling program, thereby augmenting the regional coverage. Contact: Marti L. Miller, 907-786-7437, *mlmiller@usgs.gov*

Streamgaging of Eklutna River (Alaska)

In continuing cooperation with the Native Village of Eklutna, the USGS Alaska Science Center operates a streamgage on the Eklutna River near Eklutna, Alaska. USGS employees take periodic discharge measurements on the Eklutna River upstream from the confluence with Thunderbird Creek. The Eklutna River, a subsistence fishery for the village, has been adversely affected 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 describe streambed sediment. Contact: Steven Frenzel, 907-786-7000, *sfrenzel@usgs.gov*

Streamgaging and Water Quality near Newtok (Alaska)

In cooperation with the U.S. Army Corps of Engineers, Alaska District, the USGS Alaska Science Center is monitoring the quantity and quality of streamflow near a site being considered for relocation of the Native Village of Newtok, Alaska, on lands within the Yukon Delta National Wildlife Refuge on Nelson Island. The present village site is experiencing severe erosion along the banks of the Ninglick River. The average annual erosion rate is 90 feet per year and it is expected that the land under the homes, schools, and businesses of Newtok will erode within 8 years. Contact: Steven Frenzel, 907-786-7000, *sfrenzel@usgs.gov*

Streamgaging of Gunnuk Creek (Alaska)

In cooperation with the U.S. Army Corps of Engineers, Alaska District, the USGS Alaska Science Center is monitoring the quantity of streamflow near the construction site of a water-supply dam for the Native Village of Kake, Alaska. Frequent high flows destroyed the previous water-supply reservoir, and continue to hamper new construction. Flood magnitude and frequency are poorly defined throughout Alaska, necessitating onsite measurements. Contact: Steven Frenzel, 907-786-7000, *sfrenzel@usgs.gov*

Arctic Soils, Metal Uptake, and Moose—Cooperative Studies on the Seward Peninsula (Alaska)

The Bering Straits Native Corporation is working with USGS, the Alaska Department of Fish and Game, and the University of Alaska on the south-central Seward Peninsula to study the movement of metals from tundra soils, through browse vegetation, and finally into moose. A large part of these Native lands is underlain by metasedimentary rocks (known generally as the "Nome Formation") that have been shown to possess variable amounts of bioavailable metals. For example, research has found that the numerous species of willow throughout the area tend to accumulate the metal cadmium from soils derived from certain rock units within the Nome Formation. Subsistence hunting by the Native population results in the annual harvest of moose that feed primarily on willow. This study seeks to examine the relations between a metal-bioaccumulating plant species and moose, and whether there are human health implications of the consumption of moose. Contact: Larry Gough, 703-648-4404, *lgough@usgs.gov*

Bull moose. Photograph by Mike Lockhart, U.S. Fish and Wildlife Service

Salmon Research, Norton Sound Region, Alaska

Declines in salmon returning to the Norton Sound region of western Alaska have resulted in restrictions to commercial and subsistence fisheries. In response to these declines, research is needed to describe the status and population structure of salmon throughout the region. In collaboration with Kawerak, Inc. (a nonprofit Alaska Native corporation that provides services to the Native communities of the Bering Straits Native Association), the USGS Alaska Science Center is conducting a study to describe homing and straying of salmon among rivers draining into Norton Sound. Describing the connections among populations is an important step in understanding the relations between salmon populations and determining the potential for colonization of rivers where salmon populations are in severe decline. Using otoliths, or ear stones, the research is evaluating chemical signatures of natal rivers to determine if adult salmon stray into other rivers to spawn. USGS and Kawerak, Inc. personnel collaborated to identify sampling locations and collect samples for analysis. Contact: Chris Zimmerman, 907-786-3954, *czimmerman@usgs.gov*

Local subsistence fishers capture fish in a gillnet. Photograph courtesy U.S. Geological Survey.

USGS Provides Updates on Status of the Southeast Alaska Sea Otter Population to Federal and Tribal Managers (Alaska)

USGS Alaska Science Center biologists are determining important status and trends information on the sea otter population in Southeast Alaska. Their findings are of interest to Alaska Natives, who harvest sea otters, and to the U.S. Fish and Wildlife Service, which has management authority for sea otters for the U.S. Department of the Interior. In FY 2006, the USGS scientists provided briefings to the Alaska Scientific Review Group (established under the Marine Mammal Protection Act) and the U.S. Fish and Wildlife Service, which is preparing a sea otter stock assessment. On February 4, 2006, one of the biologists presented his research results in Anchorage, Alaska, to the Alaska Sea Otter and Steller Sea Lion Commission. On February 9, 2006, the other biologist presented the findings in Sitka, Alaska, at the Southeast Alaska Marine Mammal Workshop, hosted by the Sitka Tribe of Alaska and the Sitka Marine Mammal Commission. The sea otter population of Southeast Alaska was extirpated and then reintroduced to the outer coast in the late 1960s. The briefings compare results of a population survey in 2002 and 2003 to results from previous surveys on the distribution and abundance of this recolonizing population. The high growth rate of the population (typical for recolonizing populations) appears to have slowed in the last 10 years, and otters are now occupying inner waters, such as Glacier Bay. Contact: Jim Bodkin, 907-786-3550, *jbodkin@usgs.gov*

Sea otter. Photograph by Mike Boylan, U.S. Fish and Wildlife Service.

Sulfide Oxidation, Metal Fluxes, and Biological Effects in Coastal Environments of Prince William Sound, Alaska

Field investigations by scientists with the USGS and University of Alaska Anchorage in 2003 and 2005 focused on oxidation of sulfide-rich debris in near-shore environments of Prince William Sound, Alaska. This debris is related to mining about 6 million tons of copper ore from several deposits near shorelines between 1897 and 1930. Specifically, the extent of metal-sulfide oxidation, acid generation, and metal fluxes within the transitional zone between land and sea needed to be delineated to identify potential human and environmental effects. The studies were directed at near-shore areas below the mine sites, intertidal zones, and shallow subtidal areas offshore. Samples of sulfide-bearing ore and waste, surface water, sediment, microbe-rich precipitates, and shellfish were collected from mine workings, drainages below mines and mine dumps, the mixing zone between ground water and seawater underlain by beach gravels, and offshore. The field observations and subsequent analytical studies provide evidence that plumes of acidic, metal-rich water resulting from sulfide oxidation are entering the intertidal zone at the Ellamar and Threeman sites in eastern Prince William Sound. At the Beatson mine site (the largest copper deposit in the region) on Latouche Island in western Prince William Sound, metal-rich precipitates are found along drainages and seeps downslope from the waste dumps and near the intertidal zone. Preliminary results indicate that mussels collected from intertidal areas near the Ellamar, Threeman, and Beatson mine sites have elevated concentrations of copper and zinc. Reports that include compositional data for samples and descriptions of sulfide oxidation processes, acid generation, and metal transport at these sites are currently (FY 2006) being prepared. The USGS contacted Alaska Native corporations to obtain permission for access to mine areas. Chugach Alaska Corporation and The Tatitlek Corporation own much of the surface land and some of the underground mine sites in the area. The results of the USGS study have implications for people who use local aquatic resources, including shellfish, boating and other forms of recreation along the shorelines, ecotourism, and the development of new home sites, especially at Ellamar. Contact: Randolph A. Koski, 650-329-5499, *rkoski@usgs.gov*

Technical Assistance

USGS Information Helps Fire Management on Tribal Lands (National)

The USGS National Center for Earth Resources Observation and Science (EROS), provided imagery and analyses in response to the needs of Federal Burned Area Emergency Response (BAER) teams, local resource managers, and other non-federal land managers responsible for managing and assessing effects of wildfires. In FY 2006, 61 fires representing over 2.5 million acres were mapped across the United States. EROS responded to requests for wildfire mapping services on several 2005 and 2006 fires affecting Native lands, predominantly in Alaska. EROS staff obtained satellite images of the burned areas before and after the fire. The staff then estimated burn severity by comparing the pre- and post-fire images. The resulting EROS preliminary burn severity maps and associated pre- and post-fire satellite images were provided to the BAER team for immediate use in creating official and final soils burn severity map. The BAER team and other managers may have refined USGS preliminary data/maps based upon field assessments and local expert knowledge. The final soils burn severity map was used to develop many of the BAER team's subsequent assessments, actions and recommendations. The local managers were provided with a copy of all maps and images for future diverse resource management applications. Contact: Randy A. McKinley, USGS contractor, 605-594-2745, *rmckinley@usgs.gov*

Area of burned trees from a 2002 wildfire, caused by a lightning strike, at Mesa Verde National Park. Photgraph courtesy U.S. Geological Survey.

Technical Assistance in Fish Health (National, Alaska, Oregon, Washington)

Scientists at the USGS Western Fisheries Research Center in Washington have a strong commitment to respond to requests for research and technical assistance from tribal fisheries agencies as well as from U.S. Department of the Interior bureaus. The assistance is typically in the form of technical support, laboratory services, education and training, technology transfer, and rapid response concerning aquatic animal health issues. The Northwest Indian Fisheries Commission and other northwest tribal entities are important clients for technical assistance related to management of tribal hatcheries and for focused research on diseases affecting salmonids and other fishes important to tribal cultures. In 2006, the fish health research group at the Western Fisheries Research Center contributions included:

- Providing reference laboratory service to identify viral pathogens submitted by staff from the Northwest Indian Fisheries Commission fish health laboratory.
- Participating in the Bacterial Cold Water Disease Research Group, composed of fish health professionals from tribal, federal, state, and academic entities in the Pacific Northwest. The group, led by the Northwest Indian Fisheries Commission, will facilitate development of novel approaches for the prevention and control of this important disease affecting both wild and hatchery fish stocks.
- Developing a research proposal in collaboration with fisheries biologists at Kawerak, Inc., the consortium of the 20 federally recognized Tribes in the Bering Straits Region of Alaska, and with representatives of the Native Village of Unalakleet to conduct a fish-health survey and to develop technical capacity among Native villages in the region.
- Providing expert review requested by the Northwest Indian Fisheries Commission for the Washington Co-Managers Disease Control Policy by which the various entities rearing salmonids in the State of Washington, including tribal hatcheries and fisheries programs, agree to a set of standard practices to minimize the spread and severity of diseases affecting salmonids in the State.

Contact: James Winton, 206-526-6587, *jim_winton@usgs.gov*

Wildlife Diseases (National, Arizona, Wisconsin)

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 anywhere in the country are submitted to the Center for diagnostic evaluation. When a wildlife mortality is reported, potential responses include diagnostic services to determine the cause, onsite assistance to contain the outbreak, and research to improve understanding of the ecology of the disease. Services are available to bureaus within the U.S. Department of the Interior and to tribal governments. In December 2005, the Center was contacted about crow morbidity and mortality on the Reservation of the Kaibab Paiute Tribe. The USGS Center offered assistance; however, no animals were available for examination. In May 2006, one Mexican Wolf was submitted for diagnostic testing from the White Mountain Apache Reservation, Apache County, Arizona. Contact: Scott Wright, 608-270-2460, *swright@usgs.gov* or Kathryn Converse, 608-270-2445, *kathy_converse@usgs.gov*

Spirit Lake Tribe Capacity Building (North Dakota)

USGS North Dakota Water Science Center personnel provided Spirit Lake tribal staff technical assistance and quality assurance with collecting, processing, and shipping water-quality samples. The Tribe has its water-quality samples processed by the USGS National Water Quality Laboratory in Denver, Colorado. The report, Vining, K.C. and Cates, S.W., 2006, Summary of surface-water quality, ground-water quality, and water withdrawals for the Spirit Lake Reservation, North Dakota, U.S. Geological Survey Open-File Report 2006–1144 was published and distributed to the Tribe and is available online at *http://pubs.usgs.gov/of/2006/1144/*. Contact: Douglas G. Emerson, 701-250-7402, *demerson@usgs.gov*

Technical Assistance with Installation and Operation of Dam Safety Sites, Rosebud Reservation (South Dakota)

The USGS assisted the Rosebud Sioux Tribe with the installation of rain gages as part of its Dam Safety Program. Additional rain gages were added near existing dam safety sites at He Dog Lake, Ghost Hawk Lake, and Rosebud Lake. Rain gages also were installed at Rain Thunder Lake and between Paulson Lake and South Oak Creek Lake. The wider distribution of rain gages will allow the Tribe to improve its assessment of potential flooding. The Tribe maintains and operates the sites. Installation was completed in 2006. Contact: Joyce Williamson, 605-394-3219, *jewillia@usgs.gov*

Navajo Surface Water Project (Arizona)

The USGS and the Navajo Nation continue cooperating on the Navajo Surface Water Project, which helps personnel of the Navajo Nation's Water Resources Department compute streamflow records and operate their streamgages. The USGS Arizona Water Science Center 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 (FY 2006) operates two streamgages 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, 928-556-7225, *ggfisk@usgs.gov*

Kaibab Paiute Tribe Ground Water (Arizona)

The staff of the USGS Arizona Water Science Center frequently provides natural resources information to Kaibab Paiute Tribe personnel and also maintains a ground-water monitoring well in the area. A proposal to improve the understanding of ground-water flow systems in the area has been prepared by the USGS and the National Park Service, in cooperation with the Tribe. Contact: Robert J. Hart, 928-556-7137, *bhart@usgs.gov* or Margot Truini, 928-556-7352, *mtruni@usgs.gov*

Hopi Water Surface-Water Monitoring (Arizona)

The USGS Arizona Water Science Center continues cooperating with the Hopi Tribe by providing technical assistance and training to Hopi personnel concerning their surface-water resources monitoring program. USGS personnel trained the tribal hydrologic technician to measure streamflow discharge at Hopi surface-water gages. Contact: Robert J. Hart, 928-556-7137, *bhart@usgs.gov* or Gregory G. Fisk, 928-556-7225, *ggfisk@usgs.gov*

Hualapai Water Surface-Water Monitoring (Arizona)

The USGS Arizona Water Science Center is cooperating with the Hualapai Tribe and its water resources monitoring program by providing technical assistance and onsite training to Hualapai personnel. USGS personnel trained the tribal hydrologic technician to collect sediment data and measure streamflow. Contact: Robert J. Hart, 928-556-7137, *bhart@usgs.gov* or Gregory G. Fisk, 928-556-7225, *ggfisk@usgs.gov*

Flood Warning for White Mountain Apache Tribe (Arizona)

USGS Arizona Water Science Center staff operated three flood-warning gages to benefit White Mountain tribal communities. The gages were established out of concern that wildfires may have increased the potential for floods that could affect these communities due to lack of vegetation cover. Contact: Christopher Smith, 520-670-6671, ext. 251, *cfsmith@usgs.gov*

Yavapai-Prescott Water Monitoring Program (Arizona)

The USGS Arizona Water Science Center continues to cooperate with the Yavapai-Prescott Indian Tribe by providing technical assistance and training to Yavapai-Prescott personnel with its water-resources monitoring program. The Tribe began operating and maintaining a crest-stage gage network in FY 2004 and began their own well-monitoring program in FY 2004 following training with the USGS staff. This activity demonstrates successful collaboration that enhances tribal capabilities. 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 U.S. Environmental Protection Agency's water-quality standards. Contact: Robert J. Hart, 928-556-7137, *bhart@usgs.gov;* Gregory G. Fisk, 928-556-7225, *ggfisk@usgs.gov*

Scientific Advisor for Sitka Tribe Salmon and Herring Research (Alaska)

A USGS Alaska Science Center biologist is serving as scientific advisor for the Sitka Tribe of Alaska on their Tribal Wildlife Grant from the U.S. Fish and Wildlife Service. The grant supports research on spawning stock structure in salmon and herring, which are important subsistence fisheries for the Tribe. Researchers are investigating ecosystem information on these fisheries because they are important to future generations of tribal subsistence harvesters. Innovative technologies using microchemical analyses of fish otoliths (ear bones) and scales are being used to define critical population structure and breeding ecology. The project is under the leadership of the lead Sitka tribal biologist and supports graduate school studies for one Masters of Science student sponsored by the Tribe. Contact: Jennifer L. Nielsen, 907-786-3670, *jennifer_nielsen@usgs.gov*

USGS Alaska Science Center Provides Digital Data to Native Communities

The USGS Alaska Science Center provided digital orthoimagery over the remote Pribilof Islands of St. George and St. Paul to the St. George Tanaq Corporation and the Tanadgusix Village Corporation of St. Paul Island. Digital orthoimagery is produced from aerial imagery that has been geometrically corrected. The Tanadgusix Village Corporation will use these data for remote sensing purposes supporting its wind generation and wireless broadband distribution mapping effort. St. George Tanaq will use these data for natural resource and infrastructure assessments on the island of St. George. Contact: A.C. Brown, 907-786-7002, *acbrown2@usgs.gov*

Surface-Water Monitoring Stations

Tribes cooperate with the USGS to gage the flow of surface water for diverse reasons, including determining streamflow trends, monitoring flows necessary for subsistence and commercial agriculture (examples: wild rice; fisheries), and commercial development. The USGS Water Science Centers operated the following surface-water monitoring stations in FY 2006, usually with cooperative funding from the Tribe, the Bureau of Indian Affairs (BIA), or a third party (please see table on following two pages):

Table 1. Streamgages operated by the U.S. Geological Survey in cooperation with the Tribes.

Number of stations	Cooperator	USGS contact
2	Houlton Band of Maliseet Indians	
1	Houlton Band of Maliseet Indians & Houlton Water Company	
1	Passamaquoddy Tribe of Maine (Libby Brook)	Greg Stewart (Maine), 207-622-8205, ext. 118, *gstewart@usgs.gov*
2	Seminole Tribe of Florida & South Florida Water Management District (includes 2 continuous recorders with tribal nutrient autosamplers)	Carolyn Price (Florida), 954-377-5943, *eprice@usgs.gov* or Rick Solis, 954-377-5948, *rsolis@usgs.gov*
4	Keweenaw Bay Indian Community	Tom Weaver (Michigan), 517-887-8923, *tlweaver@usgs.gov*
2	Sokaogon Chippewa Community (Mole Lake)	
1	Bad River Band of Lake Superior Chippewa Indians	
2	Menominee Indian Tribe of Wisconsin	
1	Oneida Tribe of Wisconsin	
1	Stockbridge-Munsee Community (Mohican Nation)	
2	Lac du Flambeau Band of Lake Superior Chippewa Indians	Rob Waschbusch (Wisconsin), 608-821-3868, *rjwaschb@usgs.gov*
2	Grand Portage Band of Lake Superior Chippewa	
3	Bois Forte Band of Chippewa, Nett Lake Community	
1	Fond du Lac Band of Lake Superior Chippewa	Kevin Guttormson (Minnesota), 218-326-1297, *kgguttor@usgs.gov*
3	Three Affiliated Tribes; Mandan Hidatsa, Arikara	Steve Robinson (North Dakota), 701-250-7404, *smrobins@usgs.gov*
3	Oglala Sioux Tribe	
2	Rosebud Sioux Tribe	
2	Standing Rock Sioux Tribe	
1	Oglala Sioux Tribe (crest stage gage)	
3	Lower Brule Sioux Tribe (crest stage gage)	Joyce Williamson (South Dakota), 605-394-3239, *jewillia@usgs.gov*
2	Omaha Tribe of Nebraska and Iowa	
2	Santee Sioux Nation, Nebraska	
1	Winnebago Tribe of Nebraska	Phil Soenksen (Nebraska), 402-328-4150, *pjsoenks@usgs.gov*
1	Citizen Potawatomi Nation	
1	Osage Nation	Robert Blazs (Oklahoma), 405-810-4419, *rblazs@usgs.gov*
7	Blackfeet Nation	
1	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	Wayne Berkas (Montana), 406-457-5900, *wrberkas@usgs.gov*
21	Wyoming Department of Environmental Quality and Joint Business Council of the Northern Arapaho and Eastern Shoshone Tribes (Wind River Reservation)	Kirk Miller (Wyoming), 307-775-9168, *kmiller@usgs.gov*
2	Southern Ute Indian Tribe	
1	Ute Mountain Ute Tribe	Joe Sullivan (Colorado), 970-245-5257, ext. 20, *jrsulliv@usgs.gov*
4	Cochiti Pueblo and U.S. Army Corp of Engineers	
2	Isleta Pueblo, New Mexico State Engineer, City of Albuquerque	
2	Navajo Nation, New Mexico State Engineer, Bureau of Reclamation	
1	San Felipe Pueblo and New Mexico State Engineer	
1	San Ildefonso Pueblo and New Mexico State Engineer	
2	Taos Pueblo, New Mexico State Engineer, and Bureau of Reclamation	

Table 1. Streamgages operated by the U.S. Geological Survey in cooperation with the Tribes.—Continued

Number of stations	Cooperator	USGS contact
2	Pueblo of Zuni	
1	Jicarilla Apache Nation	Lynn Miller (New Mexico), 505-830-7908, *lkmiller@usgs.gov*
1	Shoshone Bannock Tribe and Bureau of Indian Affairs	Thomas S. Brennan (Idaho), 208-387-1366, *tbrennan@usgs.gov*
2	Pyramid Lake Paiute Tribe	
1	Summit Lake Paiute Tribe	
1	Shoshone-Paiute Tribes	
9	Walker River Paiute Tribe	Kerry Garcia (Nevada), 775-887-7659, *ktgarcia@usgs.gov*
3	Bureau of Indian Affairs & Peabody Western Coal Co. (Hopi Reservation)	
2	Bureau of Indian Affairs (Navajo Reservation)	
2	Hopi Tribe	
2	Havasupai Tribe	
3	Hualapai Tribe	
2	Yavapai-Prescott Indian	
3	Pueblo of Zuni	
3	White Mountain Apache Tribe	
6	Arizona Department of Water Resources (1-Navajo Nation and 5-White Mountain Apache)	Christopher Smith (Arizona), 520-670-6671, ext. 251, *cfsmith@usgs.gov*
4	Confederated Tribes of the Umatilla Indian Reservation	
4	Confederated Tribes and Bands of the Yakama Nation	
1	Hoh Indian Tribe	
6	Lummi Nation	
1	Makah Nation	
2	Nisqually Indian Tribe	
2	Quileute Tribe	
1	Quinault Indian Nation	
1	Skokomish Tribe of Indians	
4	Spokane Tribe of Indians	
1	Squaxin Island Tribe	
5	The Tulalip Tribes	
2	Bureau of Indian Affairs	Robert Kimbrough (Washington), 253-552-1608, *rakimbro@usgs.gov*
9	Confederated Tribes of the Warm Springs Reservation	
1	Nez Perce Tribe	Thomas A. Herrett (Oregon), 503-251-3239, *herrett@usgs.gov*
1	Karuk Tribe of California	
1	Tule River Tribal Council	Jim Bowers (California), 760-247-1401, *jcbowers@usgs.gov*
1	Atqasuk Village (related to National Petroleum Reserve-Alaska)	
1	Native Village of Eklutna	
2	Illiama (Bristol Bay Native Corporation, cooperator)	
1	Organized Village of Kake (U.S. Army Corps of Engineers, cooperator)	
1	Native Village of Newtok (U.S. Army Corps of Engineers, cooperator)	Steven Frenzel (Alaska), 907-786-7000, *sfrenzel@usgs.gov*

Water-Quality Monitoring Stations

Tribes cooperate with the USGS to monitor water quality for diverse reasons, including determining whether the water meets standards for domestic and commercial uses. The USGS Water Science Centers operated the following water-quality monitoring stations in FY 2006, usually with cooperative funding from the Tribe, the Bureau of Indian Affairs (BIA), or a third party.

Table 2. Water-quality monitoring stations operated by the U.S. Geological Survey in cooperation with the Tribes.

Number of stations	Cooperator	USGS contact
1	Osage Nation	Kelli DeHay (Oklahoma), 918-254-6651, *kdehay@usgs.gov*
1	Northern Cheyenne Tribe; Crow Tribe of Indians (Tongue River)	
2	Fort Peck Assiniboine and Sioux Tribes	John Lambing (Montana), 406-457-5900, *jlambing@usgs.gov*
1	Wyoming Department of Environmental Quality (Quarterly water-quality sampling on Northern Arapaho and Eastern Shoshone Tribes, Wind River Reservation)	Kirk Miller (Wyoming), 307-775-9168, *kmiller@usgs.gov*
1	Pyramid Lake Paiute Tribe	
4	Walker River Paiute Tribe	Kerry Garcia (Nevada), 775-887-7659, *ktgarcia@usgs.gov*
3	Confederated Tribes of the Colville Reservation	
1	Nooksack Indian Tribe	
1	Muckleshoot Indian Tribe	Robert Kimbrough (Washington), 253-552-1608, *rkimbro@usgs.gov*
9	Confederated Tribes of the Warm Springs Reservation	
1	Nez Perce Tribe	Thomas A. Herrett (Oregon), 503-251-3239, *herrett@usgs.gov*
1	Karuk Tribe of California	James Bowers (California), 760-247-1401, *jcbowers@usgs.gov*

Ground-Water Monitoring Stations

The USGS Water Science Centers operated the following ground-water monitoring stations in FY 2006, usually with cooperative funding from the Tribe:

Table 3. Ground-water monitoring stations operated by the U.S. Geological Survey in cooperation with the Tribes.

Number of stations	Cooperator	USGS contact
1	National Stream Information Program (NSIP) (observation well located on Kaibab Paiute Reservation)	
1	National Park Service (Kaibab Paiute Tribe)	
9	Bureau of Indian Affairs (Navajo Nation, Hopi Tribe, White Mountain Apache Tribe)	Christopher Smith (Arizona), 520-670-6671, ext. 251, *cfsmith@usgs.gov*
15	Pechanga Band and Morongo Band of Mission Indians (wells for monthly depth to water)	Jim Bowers (California), 760-247-1401, *jcbowers@usgs.gov*

U.S. Geological Survey employee at a streamgage. Photograph by U.S. Geological Survey.

Lake/Reservoir-Stage Monitoring Stations

Tribes cooperate with the USGS to monitor lake levels for diverse reasons, including flood and irrigation management, and commercial and tribal recreation. The USGS Water Science Centers operated the following lake-stage monitoring stations, to determine lake levels in FY 2006, usually with cooperative funding from the Tribe:

Table 4. Lake/reservoir-stage monitoring stations operated by the U.S. Geological Survey in cooperation with the Tribes.

Number of stations	Cooperator	USGS contact
1	Lac Vieux Desert Band of Lake Superior Chippewa Indians	Tom Weaver (Michigan), 517-887-8923, *tlweaver@usgs.gov*
1	Bois Forte Band of Chippewa, Nett Lake Community	Kevin Guttormson (Minnesota), 218-326-1297, *kgguttor@usgs.gov*
2	Prairie Island Indian Community	Don Hansen (Minnesota), 763-783-3250, *dshansen@usgs.gov*
1	Walker River Paiute Tribe	
1	Pyramid Lake Paiute Tribe	Kerry Garcia (Nevada), 775-887-7659, *ktgarcia@usgs.gov*

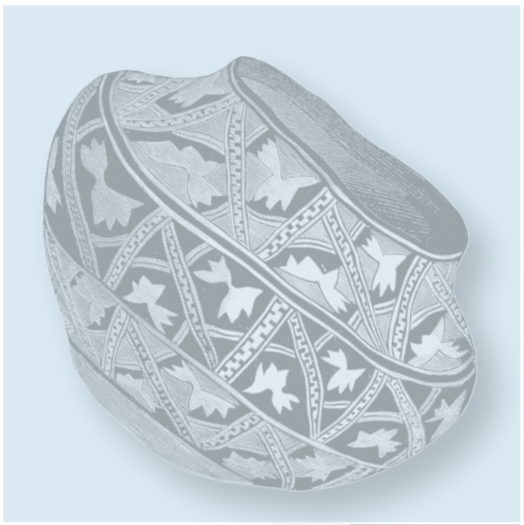
Sediment-Monitoring Stations

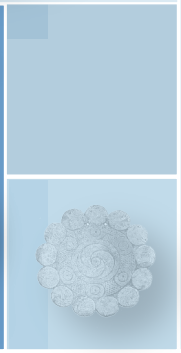
The USGS Water Science Centers operated the following sediment-monitoring stations in FY 2005, usually with cooperative funding from the Tribe:

Table 5. Sediment-monitoring stations operated by the U.S. Geological Survey in cooperation with the Tribes.

Number of stations	Cooperator	USGS contact
3	Hopi Tribe	
1	Pueblo of Zuni	Christopher Smith (Arizona), 520-670-6671, ext. 251, *cfsmith@usgs.gov*

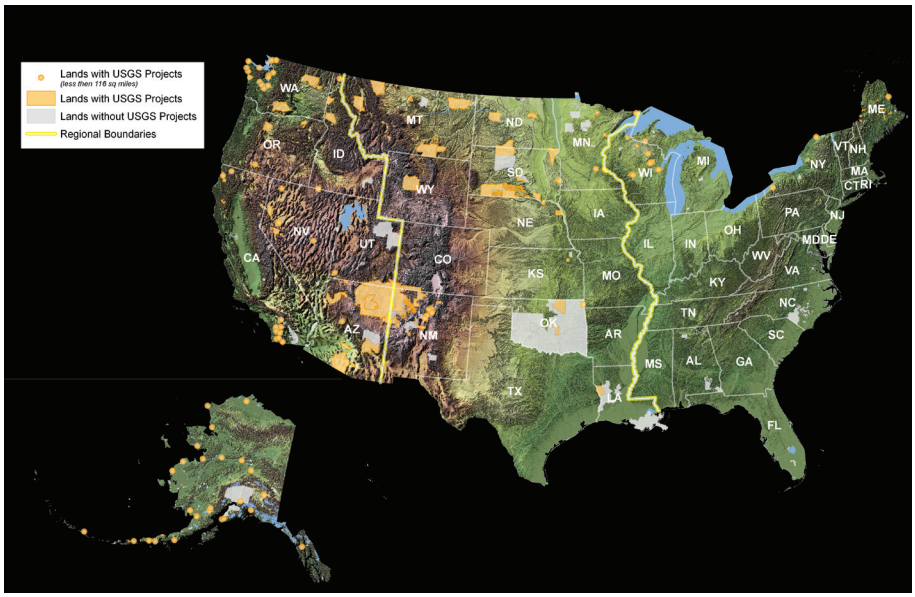
General Coordination





Indian Lands Map (National)

A digital map of Indian lands has been compiled for internal use. The map, developed by staff at the USGS Center for Earth Resources Observation and Science (EROS), is based on the most recent digital data from the Bureau of Indian Affairs. The digital map shows external reservation boundaries and will be used in the annual Indian activities reports. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*



Map showing U.S. Geological Survey activities in fiscal year 2006 on American Indian and Alaska Native lands. Please see pages xii–xiii at the beginning of this report for a larger version of this map.

Workshop on Wildlife Diseases and Avian Influenza Surveillance (National)

In August 2006, a member of the USGS National Wildlife Heath Center Field Investigations Team presented a workshop in Albuquerque, New Mexico, on Wildlife Diseases and Avian Influenza Surveillance in cooperation with the Southwest Region of the U.S. Fish and Wildlife Service. Of the 29 attendees from various federal, state and tribal agencies, six were from tribal governments: San Carlos Apache Tribe (2), Hopi Veterinary Service (2), Jemez Pueblo Department of Resource Protection (1), and Hopi Wildlife and Ecosystem Management Program (1). Workshop topics included an overview of wildlife diseases in the southwestern United States, avian influenza, disease contingency planning, techniques for sample collection and shipping, personal protective equipment, and investigation of wildlife disease. Contact: Kathryn Converse, 608-270-2445, *kathy_converse@usgs.gov*

USGS
science for a changing world

November is
Native American Heritage Month

The Warrior Tradition Continues

Historically, Native Americans have the highest record of military service, per capita, when compared with other ethnic groups. Native Americans have distinctive cultural values which drive them to serve their country. One such value is their proud warrior tradition.

"Ozuye Wicasa" - A Warrior Man on horse-back near the backwaters of the river bottoms near Yankton or Greenwood, S.D., between 1886 and 1900.

The warrior tradition is best exemplified by the following qualities inherent to most, if not all, Native American societies:

Strength - wowasake* (WO-wa-shak-ay): To be an American Indian warrior is to have physical, mental, and spiritual toughness. Many traditional cultures recognize that war disrupts the natural order of life and causes spiritual disharmony. Military service is a unique way to develop an inner strength that is valued in Native American communities.

Honor - woyuonihan* (WO-you-o-nee-han): Before going into service and after their return, warriors are recognized by family and community. Recognition takes place through private family gatherings, or through public ceremonies, such as tribal dances or intertribal events.

Pride - wowitan* (WO-wee-tan): Being a warrior in traditional Native American society gives one a sense of pride and a sense of accomplishment at a time in life when self-esteem is just developing. Becoming a warrior brings status to young men and women in the Native American culture.

Charnel Petersen
Captain – U.S. Army, 1978-1995
Sisseton-Wahpeton Oyate

Devotion; also to believe in - wowicala* (WO-wee-cha-la): Native American warriors are devoted to the survival of their people and their homeland. If necessary, warriors will die to preserve their culture, for death to the Native American warrior is another step in the advancement of life. It is understood that the warrior's spirit lives on eternally.

Wisdom - woksape* (WOK-sa-pay): In times of war, Native Americans seeing heavy combat had to learn how to survive, often using skills that many unit commanders thought were inherent to the Native American's cultural background. Military service offers excellent educational and job skill opportunities for Native American men and women who often come from educationally disadvantaged communities.

As we celebrate Veterans Day and Native American Heritage Month in November, the United States military can be expected to provide continuing opportunities for Native American men and women. For their part, Native Americans can be expected to carry on their centuries-old warrior tradition – serving with strength, honor, pride, courage, and distinction.

James King**
Sgt. – U.S. Army,
1871-1886
Sisseton-Wahpeton
Oyate

Felix Renville, Sr.**
U.S. Army, 1914-1918
Sisseton-Wahpeton
Oyate

Thomas Brant**
Staff Sgt. – U.S. Army,
1939-1945
U.S. Air Force,
1950-1953
Sisseton-Wahpeton
Oyate

Woodrow Keeble**
Master Sgt. – U.S.
Army, 1939-1945
Sisseton-Wahpeton
Oyate

Arden Keith
"Jacky" Renville**
Medic – U.S. Army,
1966-1968
Sisseton-Wahpeton
Oyate

M. Jay Renville
U.S. Army, 1987-1991
Sisseton-Wahpeton
Oyate

Justin Chanku
Medic – U.S. Army,
2001-2004
Sisseton-Wahpeton
Oyate

Background image: Rosebud Agency 1889
*Lakota Sioux Language **Deceased

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

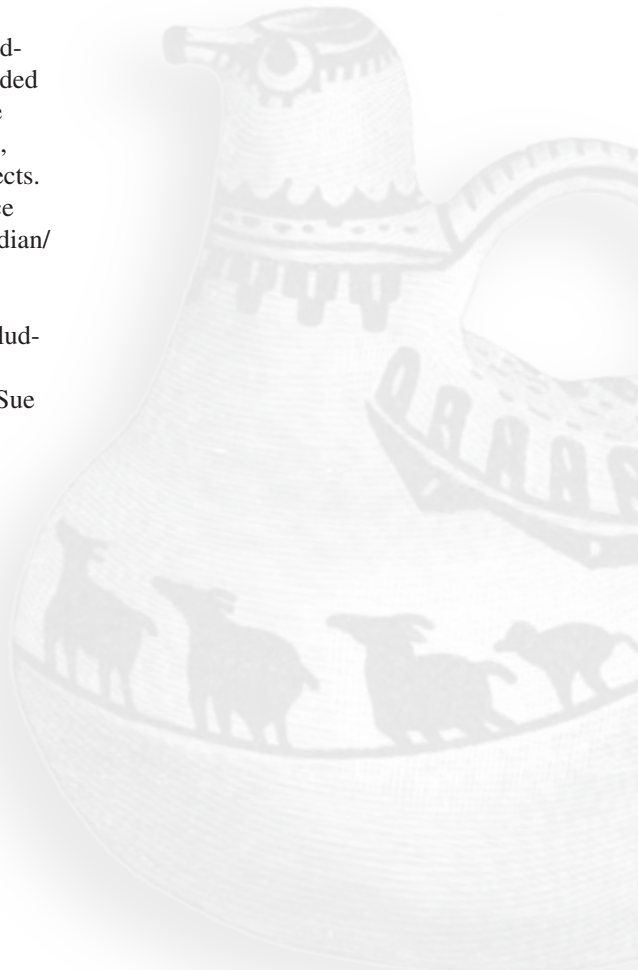
Sarah Jenkins, U.S. Geological Survey contract employee, designed this poster for Native American Heritage Month.

USGS Celebrates Native American Heritage Month (National)

During Native American Heritage Month in November 2006, the USGS recognized the achievements of Native Americans. At the USGS headquarters in Reston, Virginia, a month-long commemoration depicted a journey through Indian Country, weaving science mysteries and USGS research with art, photographs, and stories from Tribes throughout the United States. The key message for the exhibit was that USGS scientists and indigenous people have considered the causes of natural phenomena. Unlocking mysteries about the earth is a strong component of American Indian and Alaska Native cultures and is also in the hearts of scientists who emerged from youthful curiosity to their current mission-driven studies. Native American artists displayed their works as part of the headquarters events. A poster, used nationally throughout the USGS, recognized the achievements of American Indian veterans as well as their contributions to the national heritage. As Native American Heritage Month and Veterans Day observances overlap, so do the contributions of American Indians to the defense of the Nation. A poster was designed using images from the Blue Cloud Abbey historic photo collection and veterans from the Sisseton-Wahpeton Oyate. The text on the posters described the characteristics of the American Indian warrior tradition. The poster was created at the USGS Center for EROS in Sioux Falls, South Dakota. Posters were displayed in the main atrium at EROS, at USGS Headquarters in Virginia, and were posted online for use nationwide. In addition to the posters, USGS EROS exhibited 17 matted and framed historic American Indian photographs during the month of November from the Sisseton-Wahpeton Oyate, Agency Village, South Dakota. Contact: Mark Barber, 605-594-6176, *barber@usgs.gov* or Alexandra Hadley, 703-648-4460, *ahadley@usgs.gov*

Native American Fish and Wildlife Society and USGS (National, Maine)

The USGS continues to coordinate with the Native American Fish and Wildlife Society (NAFWS) to share information of mutual interest. USGS staff attended the annual national meeting of the NAFWS in Bar Harbor, Maine, hosted by the Penobscot Indian Nation. Many Tribes were represented at the national meeting, which provided a forum to share information on many important technical subjects. The USGS Associate Director for Biology discussed research on the surveillance and transmission of highly pathogenic avian influenza. The USGS American Indian/Alaska Native Liaison for Geospatial Information presented an update on tribal activities with the Federal Geographic Data Committee. A USGS exhibit booth provided participants with topical information on studies related to wildlife, including fish, diseases, and invasive species. Contact: Janet Cushing, 703-648-4093, *jcushing@usgs.gov*, Bonnie Gallahan, 703-648-6084, *bgallahan@usgs.gov*, or Sue Marcus, 703-648-4437, *smarcus@usgs.gov*



Traditional Ecological Knowledge and Science Effects (National, South Dakota)

The USGS Center for Earth Resources Observation and Science (EROS) is supporting the Indigenous Knowledge Center for Education and Science Impacts (IKCE SI) at Sinte Gleska University. The IKCE SI is continuing to develop ways of including indigenous knowledge in natural and social sciences to expand scientific perspectives and knowledge. Research from this project is intended to identify tribal decision-making processes so that USGS information can be used more readily by tribal governments. The second year of the collaboration used Northern Plains indigenous lifeways to develop methods and tools that can be extended across North America and ultimately to indigenous cultures throughout the world. This effort includes an evaluation of social-memory learning required to translate indigenous views of the landscape into scientific descriptors (where possible). Another effort is the development of knowledge-management tools. Ultimately, this project may identify ways that USGS information and expertise can be combined with traditional knowledge to support tribal land and resource planning decisionmaking. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

National Forum on Tribal Environmental Science (National, Oklahoma, South Dakota, Washington)

The first tribal science forum sponsored by the U.S. Environmental Protection Agency's national Tribal Science Council was hosted by the Quinault Tribe in Ocean Shores, Washington, in September 2006. The Forum theme, "Tribal Science Priorities and Success Stories," featured four tracks: Air, Water, Earth, and Community Health. Several USGS scientists were invited to give presentations, and the USGS also had an exhibit booth. The Director of the USGS Oklahoma Water Science Center delivered a presentation titled "Emerging Contaminants" that included a discussion of pharmaceuticals and personal-care products in rivers, streams, and ground water and how the USGS has detected them. A Native American USGS scientist discussed her studies on the Navajo Nation related to the effects of climate change and land use. She also participated in a climate-warming panel. A presentation by the USGS Center for Earth Resources Observation and Science (EROS) in South Dakota focused on projects supporting three environmental science activities conducted on the Rosebud Sioux Reservation over the last several years. The USGS Washington Science Center Director delivered the keynote address at the closing ceremony on success stories of USGS partnerships with tribal nations in Washington State. The USGS Washington Science Center hosted a USGS exhibit on "Environmental Contaminants" that complemented the four presentations. The forum provided an opportunity for tribal scientists, leaders, environmental professionals and staff to learn from and network with peers in other Tribes on shared scientific issues and concerns. Data and information were shared through formal presentations of cutting-edge tribal environmental science case studies, technical training, networking, poster sessions, and field trips. The forum attracted more than 300 attendees, representing at least 125 American Indian and Alaska Native governments, intertribal consortia, academic institutions, Federal, State, and local governments as well as private and nonprofit organizations. Contact: Cindi Barton, 253-552-1602, *cbarton@usgs.gov,* Kim Winton, 405-810-4400, *kwinton@usgs.gov*, Margaret Hiza, 928-5667366, mhiza@usgs.gov, or David Meyer, 605-594-6046, *dmeyer@usgs.gov*

Inter-Tribal Environmental Council (ITEC) (National, Oklahoma)

The USGS Oklahoma Water Science Center managed a display featuring USGS hydrologic studies at the 11th Annual Inter-Tribal Environmental Council Conference in Oklahoma City, Oklahoma, in July 2006. Representatives from more than 30 Tribes, the U.S. Environmental Protection Agency, and many consultants attended the conference. Contact: Kim Winton, 405-810-4417, *kwinton@usgs.gov*

Avian Influenza Virus Surveillance in Hunter- and Subsistence-Killed Birds (National, Wisconsin, Idaho)

Throughout 2006, the USGS National Wildlife Health Center has worked with federal, state, and tribal organizations to collect samples from hunter-harvested birds in Idaho from the Shoshone-Bannock Tribes and subsistence-harvested birds from Alaska Native community hunters. This effort was undertaken as a part of the National Surveillance Strategy for early detection of H5N1 virus. During 2006, the USGS received and analyzed 4,618 samples from American Indian and Alaska Native hunters. All samples have been negative under the testing procedure for the highly pathogenic avian influenza H5N1 virus being transmitted in many Asian, European, and African countries during FY 2006. Contact: Bob Dusek, 608-270-2403, *rdusek@usgs.gov*

At the first annual National Forum On Tribal Environmental Science, the theme of the USGS exhibit was "Environmental Contaminants," featuring USGS information products about contaminants in fish, ground water, and rivers. Photograph by John Clemens, U.S. Geological Survey.

USGS Office Helps Tribes and Tribal Colleges Meet Their Information Needs (National, South Dakota)

The Central Region American Indian Activities Office at the USGS Center for Earth Resources Observation and Science (EROS) in Sioux Falls, South Dakota, promoted geographical and earth science information and contacts. The USGS routinely responded to requests from Tribes and tribal colleges for earth science and geospatial information, maps, aerial photography, and satellite data. The American Indian activities office at EROS assisted in fulfilling by researching the requests, facilitating, and providing the data as available to meet the specific needs of each tribal agency or educator. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

Biological Information for Committees of the Great Lakes Fishery Commission (Michigan, Minnesota, Wisconsin)

The Great Lakes Fishery Commission has established interagency committees to coordinate fishery resource management in individual lakes. The USGS Great Lakes Science Center and Native American organizations, such as the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish and 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: Sandra Morrison, 734-214-9391, *smorrison@usgs.gov*

Native American Fish and Wildlife Society Participates in the Midwest Association of Fish and Wildlife Agencies Meeting (Wisconsin, Montana, South Dakota)

In May 2006, the USGS National Wildlife Health Center hosted a meeting of the Midwest Association of Fish and Wildlife Agencies Wildlife and Fish Health Committee. Three biologists from the Menominee Indian Tribe of Wisconsin, the Cheyenne River Sioux Tribe, and the Crow Tribe of Indians represented the Native American Fish and Wildlife Society (NAFWS). The Wildlife and Fish Health Committee's role is to discuss issues relating to fish and wildlife health in the Midwestern states and Canadian provinces, and to provide relevant information and guidance to the natural resource agencies in the governments of that region. The group meets annually for 1 to 2 days. The meetings include updates from each attending partner agency and numerous presentations. About 20 representatives from the states, Federal agencies, and the NAFWS attended the committee meeting and USGS workshop. Topical presentations and discussions during the workshop included plague, highly pathogenic avian influenza, and chronic wasting disease. Contact: Bryan Richards, 608-270-2485, *brichards@usgs.gov*

USGS booth at Lewis and Clark Bicentennial Signature Event, Reunion at the Home of Sakakawea, Three Bears Casino Event Center, New Town, North Dakota, August 17–20, 2006.

Lewis and Clark Bicentennial Commemoration Reunion at the Home of Sakakawea (North Dakota)

The Mandan, Hidatsa, and Arikara Nation (Three Affiliated Tribes of the Fort Berthold Reservation) hosted one of the Lewis and Clark bicentennial Signature Events during August 2006 at New Town, North Dakota. The USGS North Dakota Water Science Center provided a booth in the "trade center" area of the event. The booth displayed coal, scoria, ammonites, cannonballs, and concretions. Other items on exhibit included a log line, numerous sediment samples from the Missouri River Basin and one from Devils Lake, North Dakota, pictures of Devils Lake, and various free USGS informational materials. The geologic items and sediment samples were displayed with interpretive information and excerpts from the journals of Lewis and Clark. The informational materials included USGS publications relating to Lewis and Clark, North Dakota Water Science Center fact sheets, and a wide variety of USGS educational resources. Visitors were most interested in the Missouri River Basin sediment samples, the Devils Lake water samples and pictures, and the log line. The display attracted a large and diverse audience, including many families. Contact: Karen R. Ryberg, 701-250-7422, *kryberg@usgs.gov*

Coordination with Indian Health Service Water on Sewer Mapping Project (Iowa, South Dakota)

Representatives of the Indian Health Service (IHS) from Aberdeen, South Dakota, and Sioux City, Iowa, visited the USGS Center for Earth Resources Observation and Science (EROS) in Sioux Falls, South Dakota, October 2, 2006, to discuss IHS work involving sanitation facilities (water and sewer) for communities and individual homes on nearly 24 Indian Reservations in the Aberdeen IHS Region. The IHS staff learned about USGS data and technology to help them develop a design tool for future sewer and water needs on 19 Reservations in North Dakota, South Dakota, Nebraska, and Iowa. The IHS representatives want to develop a digital composite of infrastructure drawings with geographic information system software to eliminate paper copies to aid the IHS planning process. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov* or Mark Bader, 605-226-7606, *mark.bader@ihs.gov*

Celebrating Rare, Historical Native American Imagery (North Dakota, South Dakota)

The American Indian Culture Research Center (AICRC), at the Blue Cloud Abbey, near Marvin, South Dakota, is home to a collection of thousands of historical photographs of American Indians, some taken more than 100 years ago. In May 2006, the Center held an open house and dedicated a newly constructed digital image library that will archive and preserve the images, as well as serving Americans Indians and researchers. The open house honored the life-long commitment of Father Stanislaus "Stan" Maudlin, Order of Saint Benedict, and founder of the AICRC. Fr. Stan, or "wambdi wicasa—the eagle man," as the Dakota Sioux named him, conserved the photoarchive. The National Park Service provided a grant through the Lewis and Clark National Historic Trail 2005 Challenge Cost-Share Program that allowed the conservation of many of the photographs. The USGS Center for EROS, near Sioux Falls, South Dakota, provided the image restoration expertise based on its experience in conserving diverse imagery of the earth. Although Father Stan passed away in February 2006 at the age of 89, his life's work with American Indians lives on through the collaborative efforts of the National Park Service and the USGS on this cultural preservation and outreach project. Earlier in 2006, the Center in partnership with the USGS and the Sisseton-Wahpeton Oyate (Dakota Sioux) Tribe, held a photographic exhibition on March 27, 2006, at the Sisseton-Wahpeton Tribal College. Some of the photographs at the AICRC included images of people and activities of the Sisseton-Wahpeton Oyate, on the Lake Traverse Reservation. The public exhibition was a successful community outreach and education event for the Sisseton-Wahpeton Oyate, the USGS, and the Center. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov* or Mark Barber, 605-594-6176, *barber@usgs.gov*

Members of the Sisseton-Wahpeton Sioux Tribe take a closer look at one of 17 historical images on exhibit at Sisseton-Wahpeton Tribal College, March 27, 2006. Photograph by Mark Barber, USGS contractor.

USGS Memorandum of Understanding with Bureau of Indian Affairs (Nebraska, North Dakota, South Dakota)

USGS and Bureau of Indian Affairs officials signed a Memorandum of Understanding to enhance collaborative efforts. On May 9, 2006, USGS Central Region Director, Tom Casadevall, signed an agreement with the Bureau of Indian Affairs Great Plains Regional Director, Bill Benjamin, which enables the organizations to share capabilities in science projects, geographic information systems and remote sensing training, and new initiatives. The cooperation and coordination of these two U.S. Department of the Interior bureaus will provide each bureau and American Indians with better information, more efficiently, than either bureau could provide alone. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

Tom Casadevall, USGS Central Regional Director (left) and Bill Benjamin, Director of the Bureau of Indian Affairs Regional Office in Aberdeen, South Dakota, sign a Memorandum of Understanding on May 9, 2006. Photograph by Mark Barber, USGS contractor.

South Dakota State Archives Presentation

In October 2006, a USGS EROS and American Indian activities overview was presented to the staff at the South Dakota Cultural Heritage Center in Pierre, South Dakota, for National Archive Month. The USGS and the South Dakota State Archivist have collaborated in the past by scanning historical maps detailing American Indian Reservations in the State. The historical map data have been cleaned and scanned at the USGS Center for EROS, where they are used in work with Tribes. Contact: Mark Barber, 605-594-6176, *barber@usgs.gov*

USGS Collaboration with the Rosebud Sioux Tribe (South Dakota)

Following a traditional Wolakota ceremony for strength and unity, Acting USGS Director Pat Leahy, Rodney Bordeaux, Chairman, Rosebud Sioux Tribe, and Dr. Lionel Bordeaux, President, Sinte Gleska University in Mission, South Dakota, signed a document that expanded mutual cooperation on May 12, 2006. Sinte Gleska University was founded by the Rosebud Sioux Tribe to meet the needs of its people. The Wolakota ceremony included Native American prayers, singing, and the traditional burning of sage. Five years ago, Sinte Gleska University and USGS established a multiyear Memorandum of Understanding that identified opportunities to expand the capabilities of the University to improve education, contribute positively to the Rosebud Sioux Tribe, and enhance University and USGS programs. This agreement is an example of a successful partnership that improves each participant's ability to serve American Indians and its own organization. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov*

Dr. Lionel Bordeaux, President (left to right), Sinte Gleska University; Rodney Bordeaux, Chairman, Rosebud Sioux Tribe; Dr. Pat Leahy, USGS; and Albert White Hat, Lakota Studies Department, Sinte Gleska University. Photograph by Mark Barber, USGS contractor.

NativeView, Inc. Presentation by USGS/Sinte Gleska Interns (Montana, South Dakota, California)

In August 2006, USGS student interns Ione Quigley and Sarah Wolfe presented posters on their earth science research at the NativeView, Inc. Forum. The two interns also are affiliated with the Rosebud Sioux Tribe's Sinte Gleska University, in Mission, South Dakota. Tammie Grant, of Salish Kootenai College, coordinated the student presentations. These presentations showcased students' work using NativeView, Inc. applications on projects concerning American Indian issues and concerns. The Forum was held in conjunction with the Environmental Systems Research Institute, Inc. (ESRI) User's Conference in San Diego, California. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov* or Tammie Grant, Salish Kootenai College, *tamgrant@comcast.net*

White Earth Tribal and Community College Educators Visit USGS EROS (Minnesota, South Dakota)

Science Program Extension Educators Steve Dahlberg and Pierre Callies from White Earth Tribal and Community College (WETCC), Mahnomen, Minnesota, visited USGS Center for Earth Resources Observation and Science (EROS) in August 2006. The WETCC representatives toured the Sioux Falls, South Dakota, facility and discussed USGS support for a Department of Defense grant proposal that could include Geographic Information Systems (GIS)/Global Positioning Satellite (GPS) training and a summer technology camp for WETCC students. Based on the discussions, the USGS American Indian Liaison for Geography and the Central Region drafted a letter supporting training for the WETCC Science, Technology, and Math faculty and planning and implementing the summer technology camp. In a separate trip, 54 students and staff with the Summer Youth Employment Program from the Lower Sioux Indian Community, near Morton, Minnesota, and representatives from WETCC visited EROS, August 9–10, 2006. The group toured the radome, which protects the Landsat satellite antenna, and learned about possible careers in earth science with the USGS. In addition to learning about career and satellite paths, students toured the building and participated in a question and answer session in the auditorium. Contact: Gene Napier, 605-594-6088, *enapier@usgs.gov* or Mark Barber, 605-594-6176, *barber@usgs.gov*

Students from the Lower Sioux Indain Community, near Morton, Minnesota, tour the radome at the USGS Center for Earth Resources Observation and Science, Sioux Falls, South Dakota. Photograph by Carrie Jucht.

Database Tools and Analysis Techniques for Improved Wildlife Telemetry Results, Southern Ute Tribe (Colorado)

In May 2006, the Colorado Department of Transportation hosted a meeting in Durango, Colorado, addressing effects of motorized vehicle use on wildlife. At this meeting, biologists from the Southern Ute Tribe and the USGS Fort Collins Science Center met and discussed applications and analysis of wildlife telemetry data from Global Positioning Satellites (GPS). The tribal biologist requested and received information from the USGS scientist on analysis techniques (for distance calculations) as well as database tools to assist the Tribe with its GPS wildlife location data. Contact: Doug Ouren, 970-226-9476, *doug_ouren@usgs.gov*

Nez Perce Tribe National Map Server and Data Enhancement Project (Idaho)

The Nez Perce Tribe entered a cooperative agreement with the USGS to enhance tribal geospatial data holdings and data server capability. The Tribe collaborated with the USGS to acquire high resolution infrared imagery over tribal lands. These data and additional tribal imagery and geospatial data will be served to The National Map using a dedicated Internet Map Service acquired in collaboration with USGS. The data and map services will be used to support resource management activities on tribal lands. USGS and tribal personnel developed a plan for long-term data maintenance and display. This project was completed in FY 2006. Contact: Tracy Fuller (USGS), 303-202-4172, *tfuller@usgs.gov* or Laurie Ames (Nez Perce Tribe), 208-843-7392, *lames@nezperce.org*

Review of River Restoration Alternatives (California)

In June 2006, a USGS geologist met with representatives of the Round Valley Indian Tribes in Covelo, California, to examine past restoration efforts on Mill Creek and to discuss future restoration actions and monitoring activities. The outcome of the field trip was that the USGS scientist facilitated the hiring of a Humboldt State University graduate student by the Round Valley Indian Tribes to conduct a detailed study of the river restoration site. Contact: Mary Ann Madej, 707-825-5148, *mary_ann_madej@usgs.gov*

Cooperation with the U.S. Environmental Protection Agency's Region 8 Tribal Water-Quality Programs (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming)

In September 2006, the USGS Colorado Water Science Center signed a 2-year interagency agreement with the U.S. Environmental Protection Agency (USEPA) to provide the USEPA Region 8 Tribal Assistance Program Office with technical assistance on water-quality programs for Tribes funded by sections 106 and 319 of the Clean Water Act. Under the terms of the agreement, the USGS is providing a Colorado Water Science Center hydrologist to work with USEPA and the Tribes full time for the next 2 years, providing technical assistance on diverse water-quality issues. The USGS scientist will review proposals for Clean Water Act section 106 funding, advising Tribes on data-collection methods, collection and interpretation of quality-assurance/quality-control data, visiting Reservations and advising tribal government employees on the location of sampling sites, characteristics to sample, and frequency of sampling, technical review of interpretive reports prepared by Tribes, and assisting Tribes in the interpretation of water-quality data. Contact: Tony Ranalli, 303-236-4882, ext. 313, *tranalli@usgs.gov*

Collaborative Planning (Arizona, New Mexico, Utah)

The USGS Grand Canyon Monitoring and Research Center continued collaborative planning for long-term monitoring and research activities with representatives from several southwestern Native American Tribes that have cultural and historical relations with the Grand Canyon and surrounding region. Specifically, in 2006, representatives from the Hopi Tribe, Hualapai Tribe, Navajo Nation, the Kaibab Paiute Tribe, Southern Paiute Tribe of Utah, and the Pueblo of Zuni worked with USGS staff on the preparation of a plan to test and refine monitoring protocols for tracking the condition of archaeological sites along the Colorado River in Grand Canyon National Park. In addition, Hopi, Zuni, and Hualapai scientists and traditional cultural advisors evaluated the results of a pilot Terrestrial Ecosystem Monitoring project developed and implemented by academic cooperators from Northern Arizona University and the University of New Mexico between FY 2002 and FY 2006. The tribal advisors provided written reviews and recommendations for improving the integration of tribal perspectives in the long-term terrestrial ecosystem monitoring plan. With funding from the Bureau of Reclamation, the six Tribes have been actively working on developing Tribe-specific monitoring approaches for tracking the status and trends of ethnobotanical and other culturally important resources with the Colorado River ecosystem, with the intention of implementing these monitoring programs on a trial basis during FY 2007 and FY 2008. Contact: Helen Fairley, 928-556-7285, *hfairley@usgs.gov*

Sharing Employment Opportunities (Arizona, Colorado, Kansas, New Mexico)

Job openings at the USGS Canyonlands Research Station (Moab, Utah) of the Southwest Biological Science Center (Flagstaff, Arizona) are regularly posted with the Haskell Indian Nations University and the Navajo Nation in an effort to encourage Native Americans to consider working for the USGS. Contact: Sue Phillips, 435-719-2337, *sue_phillips@usgs.gov*

Southwest Strategy Tribal Relations Support Team Presented an Executive Tribal Relations Symposium (Arizona, New Mexico)

In January, 2006, the Southwest Strategy Tribal Relations Support Team sponsored a symposium on tribal relations for executives of diverse governments. The theme was communicating, consulting, and cooperating with tribal governments in support of conservation. More than 120 attendees included tribal chairs and presidents, members of 14 Tribes, representatives of universities, State agencies, the private sector, and Federal executives and managers from 10 agencies. Tribal members, university and Federal lawyers, and cultural affairs officers provided information and insights on tribal law, government, and culture during the 2-day symposium. This event was designed help senior managers work more effectively with tribal governments by gaining understanding of the unique laws, policies, procedures, cultural issues, and history that apply to tribal lands. Contact: Wes Ward, 520-670-5584, *wward@usgs.gov* or Randy Updike, 303-236-5440, *updike@usgs.gov*

Discussing Invasive Plant Data Collection and Management (Arizona)

A scientist from the Sonoran Desert Research Station of the USGS Southwest Biological Science Center spoke with natural resource managers of the Hopi Tribe and the Navajo Nation at Kykotsmovi, Arizona. They discussed collection and management of invasive plant data. The purpose of the meeting was to assist the Navajo and Hopi managers by providing information that will be used by each Tribe as it creates new weed management areas. Contact: Kathryn A. Thomas, 520-670-5534, *kathryn_a_thomas@usgs.gov*

White Mountain Apache Stream-Gaging Cooperation (Arizona)

The White Mountain Apache Tribe permitted USGS employees to access streamgages on tribal lands under the terms of an Intergovernmental Agreement. USGS Arizona Water Science Center staff provided training to White Mountain Apache tribal staff in water-quality and surface-water data-collection techniques. Also, the USGS collected water-quality samples for the Tribe and delivered them to a commercial laboratory for analysis. The Science Center staff continues to provide technical assistance and training on the USGS Automated Data Processing System that is used to manage hydrologic data. Contact: Christopher Smith, 520-670-6671, ext. 251, *cfsmith@usgs.gov*

Disaster Emergency Planning Tribal Training (Arizona, Washington)

In June 2006, the USGS Oregon Geospatial Liaison made a presentation on behalf of the Federal Geographic Data Committee at the 3-day Tribal Training Workshop in Rochester, Washington, sponsored by the Federal Emergency Management Agency. The USGS presentation covered information about the Federal Geographic Data Committee and its Cooperative Agreements Program Grants. The workshop was attended by representatives from several federally recognized Tribes in Washington State. Training staff included representatives from the Northwest Tribal Emergency Management Council, the Emergency Management Institute, the Department of Homeland Security–Office of Grants and Training, the Federal Emergency Management Agency's Region VIII Tribal Liaison, and the Gila River Indian Community's Office of Emergency Management from Arizona. The workshop was hosted by the Confederated Tribes of the Chehalis Reservation, and the opening ceremony was conducted by Dave Burnett, Chairman of the Chehalis Tribes. The training was designed to help tribal emergency response staff plan and prepare their emergency operations centers and emergency response plans to protect their tribal lands and members from the effects of natural or human-caused disasters. Contact: Sheri Schneider, 503-231-3210, *sschneid@usgs.gov* (2006 work done by Nancy Tubbs, now retired)

Activities in the Upper Columbia River/Lake Roosevelt Region (Washington)

Lake Roosevelt is the 150-mile long reservoir impounded behind Grand Coulee Dam in northeast Washington. The lake has accumulated metals discharged from one of the world's largest lead-zinc smelters. The smelter, in Trail, British Columbia, Canada, and currently (FY 2006) owned by Teck Cominco, has been in operation since the late 1800s. Though contaminant discharges have decreased considerably in recent years, historically millions of tons of slag have been discharged into the upper Columbia River. The U.S. Department of the Interior (DOI) has trust interests in the reservoir and surrounding lands, among them operation of the dam, management of the Lake Roosevelt National Recreation Area, threatened and endangered fish in the reservoir, the interests of the Spokane Tribe of Indians and Confederated Tribes of the Colville Reservation, and several abandoned mines on Federal lands. The health of the Lake's ecosystem is crucial to the Tribes' cultural heritage and to their economies. The DOI at present is participating in the implementation of the Upper Columbia River Site under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund. The CERCLA Remedial Investigation and Feasibility Study (RI/FS) is being conducted in accordance with a June 2, 2006, settlement agreement between Teck Cominco and the U.S. Environmental Protection Agency (USEPA). Under the agreement, USEPA is completing the initial RI/FS studies it started, and Teck Cominco is planning for RI/FS studies in FY 2007. USGS is assisting in reviewing the plans and study results of both entities, providing information to the DOI to make sure all studies are properly conducted and that the Department's interests are met. This is done primarily through USGS participation on the DOI's Technical Advisory Group and Case Management Team. Teck Cominco has provided funding to cover costs incurred by USGS for reviewing the plans and reports, and otherwise participating in the RI/FS process. Contact: Gary Turney, 253-552-1626, *glturney@usgs.gov*

Steelhead Restoration (Washington)

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: Pat Connolly, 509-538-2299, ext. 269, *patrick_connolly@usgs.gov*

Geospatial Data Tribal Governments in the Pacific Northwest (Oregon, Washington)

Several geospatial information activities that can benefit Tribes in the Pacific Northwest began in 2006. The National Agriculture Imaging Program Imagery Collection was initiated in FY 2006 and will provide a consistent high resolution imagery dataset for all tribal lands that can be used to help Tribes manage land and resources. As part of a regional program that covers the States of Washington and Oregon, these are base data for critical concerns, such as economic development analyses and emergency response issues. As part of another project, the collection of LiDAR (Light Detection and Ranging) elevation data over large areas of Skagit and Whatcom Counties in Washington provides coverage over several tribal land areas. Digital hydrological information of the region will improve through the development of the Pacific Northwest Hydrography Framework at a scale of 1:24,000 or better. The hydrologic framework can be used by Tribes in fisheries and water management. An interactive map showing the very detailed 0.5-meter imagery for the entire State of Oregon is now available at *http://www.oregonexplorer.info/imagery* and can be used for a wide variety of analysis and management decisions. These data also are available as a thematic layer for geographic information systems. Contact: Sheri Schneider (Oregon), 503-310-1531, *sschneider@usgs.gov* or Allyson Jason (Washington), 253-552-1682, *ajason@usgs.gov*

Collaboration with the Torres Martinez Desert Cahuilla Indians on Restoration of the Salton Sea (California)

The Salton Sea Science Office of the USGS participates with a consortium of Federal, State, and local agencies and the Torres Martinez Tribe in activities related to restoration of the Salton Sea ecosystem in California. The Tribe is a major landowner around the Sea and is interested in rehabilitation of the area. Tribal representatives participate on the Salton Sea Authority and the Science Advisory Committee. They are concerned with the economic and recreational future of the region, and specifically with air quality, watershed contamination, and wetlands and wildlife enhancement. Contact: Lee Case, 760-777-1564, *hlcase@usgs.gov*

Yukon River Intertribal Watershed Council (Alaska, Canada)

The Yukon River Intertribal Watershed Council (YRITWC) has designed and implemented a water-quality monitoring program that covers much of the 2,100-mile reach of the Yukon River in Alaska and Canada. The partnership between YRITWC and USGS began in 2004 and has evolved into a mutually beneficial, long-term database. The database will help the indigenous people along the Yukon River manage resources and help USGS researchers better understand the effects of climate change. The YRITWC worked with the USGS to develop sampling methods, protocols, and a training structure modeled on existing USGS methods. During 2005, sampling sites were established between Dawson City, Yukon Territory, Canada, and Pilot Station, Alaska (an area the size of Texas). Training focused on educating water technicians about the hydrology of the Yukon River and the importance of collecting baseline water-quality data. In March 2006, under the supervision of the YRITWC and the USGS, the water technicians collected the first water-quality samples. Once the technicians were trained to independently collect samples, the monitoring program officially began. The first field season was very successful with more than 90 samples taken from about 20 sites throughout the Yukon River Basin by 47 volunteer water technicians, most of whom are Native American. Analysis of the 2006 data indicates a strong consistency between the USGS data collected from 2001 through 2005 and the YRITWC data collected in 2006, demonstrating the success of this program. The YRITWC is being funded by an Administration for Native Americans grant for regulatory enhancement and the USGS provides analytical services. Contact: Paul Schuster, 303-541-3052, *pschuste@usgs.gov*

Alaska Native Corporation Joins the Alaska Geographic Data Committee

The Arctic Slope Regional Corporation became an official member of the Alaska Geographic Data Committee in 2006. The Arctic Slope Regional Corporation is one of 13 regional corporations established by the Alaska Native Claims Settlement Act of 1971. The Alaska Geographic Data Committee is a consortium of Federal agencies, State and local governments, Native entities, and academia working together to build a solid geospatial data foundation for the people of Alaska. The Data Committee is co-chaired by the USGS. The objective of the Alaska Geographic Data Committee is to provide a forum for the coordination of spatial data development projects, development of coordinated methodologies for implementing standards and policies, and review and response to Federal Geographic Data Committee initiatives. This membership will strengthen and broaden Native participation in the activities of the Alaska Geographic Data Committee. Contact: A.C. Brown, 907-786-7002, *acbrown2@usgs.gov*

Workshop on Early Detection of Highly Pathogenic Avian Influenza (Alaska, Wisconsin)

A 2-day workshop was held in January 2006 in Anchorage, Alaska, to discuss surveillance strategies and plans for the early detection of Highly Pathogenic Avian Influenza in Alaska. The goals of the workshop were to develop a field sampling plan, to coordinate sample handling and processing, and to determine data management and dissemination for early detection of Highly Pathogenic Avian Influenza in Alaska. Of the 17 agencies and groups that participated in the workshop, two groups represented the Alaska Native community: the Alaska Native Tribal Health Consortium and the Association of Village Council Presidents. Workshop participants included six USGS staff members from the National Wildlife Health Center in Madison, Wisconsin. A summary report of the workshop can be found on the Alaska Science Center avian influenza website (*http://alaska.usgs.gov*). Contact: Chris Franson, 608-270-2444, *chris_franson@usgs.gov*

Avian Influenza Sampling and Surveillance in Alaska

In March 2006, staff from the USGS National Wildlife Health Center presented workshops on avian influenza sampling and surveillance in Alaska; two were held in Anchorage and one in Bethel. The audience included federal, state, and tribal biologists. Workshop topics included information about avian influenza; collecting and submitting diagnostic specimens; personal protection and biosafety; and demonstrations on collecting and submitting appropriate samples from birds for viral testing and packaging dead birds for shipment. Alaska Natives were represented by Alaska Native community members employed by the U.S. Fish and Wildlife Service and leaders and members of the Central Yup'ik communities in the Yukon Delta National Wildlife Refuge. Contact: Scott Wright, 608-270-2460, *swright@usgs.gov*

Alaska Volcanoes and Alaska Natives

Open communication between Alaska Natives and the Alaska Volcano Observatory is crucial in helping to safeguard Alaskan communities from geologic hazards. The Alaska Volcano Observatory (AVO) is a cooperative program of the USGS, the University of Alaska Fairbanks Geophysical Institute, and the Alaska Division of Geological and Geophysical Surveys. Numerous Alaska Native villages and corporations consistently communicate with the AVO. Communication is heightened during periods of increased volcanic activity. Native officials transmit onsite 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 electronic mail lists that provide the activity status of more than 40 historically active volcanoes in the Aleutian Islands. Native villages in the Aleutians, including Nelson Lagoon, Naknek, Unalaska, Akutan, False Pass, Atka, King Cove, and Perryville, are near active volcanoes. The AVO scientists also conduct geological field studies and service seismic-monitoring equipment that provides real-time warnings of volcanic activity and related hazards to aircraft and local communities. The USGS communications and research involved obtaining letters of nonobjection 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. Augustine Volcano in lower Cook Inlet, Alaska, began erupting in January 2006, affecting all communities in the area, either by slight ashfall or the possibility of ashfall. People from the Iliamna Native Village Council, Kokhanok Native Village Office, Igiugig Native Village Council, Pedro Bay, Pope Vanoy Landing, Port Graham Village Corporation, and Port Graham Native Village Council provided timely observations and in some cases collected ashfall samples during the eruption or offered to solicit for ash collectors in their village. People from the Alaska Peninsula Native Corporation in Anchorage and King Salmon offered local contacts for villages where ash plumes were heading; communications with these contacts allowed AVO staff to make timely observations and provide warnings to the communities. Additional communications regarding volcanic ash fall also were consistently held with Alaska Native villagers from Nanwalek, Newhalen, Nondalton, and St. George Island. In winter 2006, a USGS geologist was interviewed about Augustine Volcano by public relations personnel of the Cook Inlet Region, Incorporated (CIRI) for an article in their upcoming newsletter. The article on page 7 of the newsletter is titled, “Augustine Good for Seldovia’s Berries: Volcanic ash is natural mulch” and is available online at *http://www.ciri.com/Media/shareholders/Feb-March2006_CIRI_Newsletter.pdf*. Mount Veniaminof volcano, about 22 miles from the Native village of Perryville, had minor activity throughout 2006. Contact: Tom Murray, 907-786-7443, *tlmurray@usgs.gov* or Jennifer Adleman, 907-786-7019, *jadleman@usgs.gov*

Future Opportunities

The USGS engages Tribes in natural resource studies through cooperative research, information dissemination, and limited internships. Tribal participation is at each Tribe's discretion, with benefits to the Tribes through the acquisition of information to improve tribal resource management practices and economic opportunities for the Tribe and its members through internships and capacity building. USGS invites Tribes and tribal organizations to expand cooperation with the Survey. In FY 2007, the USGS continued developing the internship program to encourage Native American students to pursue careers in the natural sciences. Tribes and tribal organizations can help support this activity by offering to match USGS funds for Native student internships. We welcome dialogue with Tribes and tribal organizations on how USGS can help meet training needs. *What training is needed? Where?* USGS scientists may be able to provide information or expertise to help Tribes write successful grant proposals to other sources. Use the list of liaison contacts at the end of this document to discuss USGS participation in Native American conferences or meetings. The Tribal College Forums and NativeView provide continuing opportunities to build a network supporting Tribes, tribal organizations, and Native American students.

Rainbow over the Yukon River, Alaska. Photograph by Paul Schuster, U.S. Geological Survey.

Publishing support provided by:
Denver Publishing Service Center

Manuscript approved for publication February 16, 2008
Edited by Jon W. Raese
Designed and prepared by Margo VanAlstine

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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.

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

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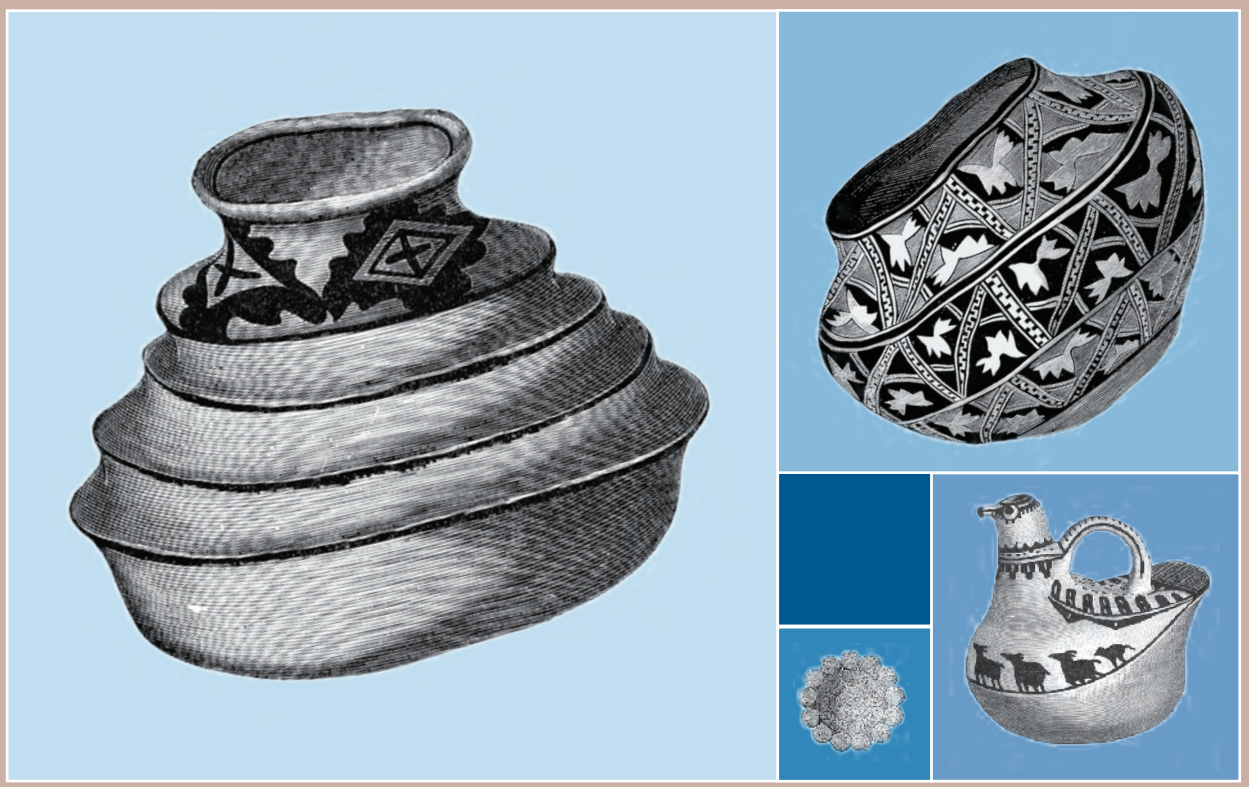

ISBN 978-141132178-6

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Printed on recycled paper