

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

Fiscal Year 2003



Cover: “Mountains and circles” artwork by Regina One Star, Sicangu (Rosebud)  
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Back cover: Turtle artwork by Ryan Holy Eagle

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

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

Fiscal Year 2003



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

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

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# Contents

	Page
List of Tribes or Tribal Governments Mentioned in the Report .....	iv
Organizations or Events Related to American Indians or Alaska Natives in the Report.....	viii
States Mentioned in the Report.....	xii
Introduction.....	1
Highlights of Fiscal Year 2003 .....	7
Educational Activities.....	15
Resource and Environmental Activities.....	23
Map of U.S. Geological Survey Fiscal Year 2003 Activities on American Indian and Alaska Native Lands .....	38
Technical Assistance.....	51
General Coordination and Policy Activities .....	65
Future Opportunities .....	71
USGS Contacts .....	72

This report is organized in the following manner: east to west, 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.



# List of Tribes or Tribal Governments Mentioned in the Report

Tribal Name*	Page
Akutan, Native Village of (AK).....	48
Aleut Community of St. Paul Island (AK).....	48
Arikara Tribe (see Three Affiliated Tribes) (ND).....	67
Atka, Native Village of (AK).....	48
Bad River Band of Lake Superior Chippewa Indians (WI).....	25, 26, 53, 58
Blackfeet Nation (MT).....	29, 30, 59
Bois Forte Band of Chippewa (MN).....	26, 58
Bristol Bay Borough (AK).....	18, 47, 71
Campo Band of Kumeyaay Indians (CA).....	18
Central Council of Tlingit and Haida Tribes of Alaska (AK).....	60
Cheesh'Na Tribal Council (AK).....	46, 60
Chevak Native Village (AK).....	19
Cheyenne River Sioux Tribe (SD).....	67
Chistochina Village (AK).....	46
Chippewa Cree Tribes of the Rocky Boy's Reservation (MT).....	30, 59, 67
Citizen Potawatomi Nation (OK).....	59
Cochiti Pueblo (NM).....	31
Coeur d'Alene Tribe (ID).....	7, 8, 36, 60, 66
Confederated Salish and Kootenai Tribes (MT).....	29, 30, 59
Confederated Tribes of the Colville Reservation (WA).....	7, 40, 41, 52
Confederated Tribes of the Umatilla Indian Reservation (OR).....	7, 45, 60
Confederated Tribes of the Warm Springs Reservation (OR).....	7, 44, 45, 51, 60
Confederated Tribes and Bands of the Yakama Nation (WA).....	7, 42, 43, 44, 60, 66, 68
Crow Tribe of Indians (MT).....	52, 61, 67
Douglas Indian Association (AK).....	46
Eastern Shoshone Tribe (Wind River Reservation) (WY).....	59
Emmonak Village (AK).....	7
Eklutna, Native Village of (AK).....	47, 60
Fairbanks, City of (AK).....	7, 46
Fallon Paiute Shoshone Tribe (Fallon Colony) (NV).....	37
False Pass, City of (AK).....	48
Flathead Reservation (see Confederated Salish and Kootenai Tribes) (MT).....	30
Fond du Lac Band of Lake Superior Chippewa (MN).....	26
Fort Apache (see White Mountain Apache Tribe) (AZ).....	51, 52, 56, 60, 65
Fort Berthold Reservation (see Three Affiliated Tribes) (ND).....	67
Fort McDowell Yavapai Nation (AZ).....	35, 36
Fort Peck Assiniboine and Sioux Tribes (MT).....	29, 59, 61
Fort Totten (see Spirit Lake Tribe) (ND).....	16
Galena, Native Village of (AK).....	7
Gila River Indian Community (AZ).....	34, 36
Grand Portage Band of Lake Superior Chippewa (MN).....	26, 58

---

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# List of Tribes or Tribal Governments Mentioned in the Report

Tribal Name*	Page
Habematolel Pomo of Upper Lake (CA) .....	57
Haida Corporation (AK) .....	60
Havasupai Tribe (AZ) .....	32, 35, 60
Hidatsa Tribe (see Three Affiliated Tribes) (ND).....	8
Ho-Chunk Nation (WI) .....	16, 53, 54, 55
Hoopa Valley Tribe (CA).....	46, 56, 60
Hopi Tribe (AZ).....	33, 34, 35, 56, 60, 61, 62
Houlton Band of the Maliseet Indians (ME).....	23, 52, 58
Hualapai Tribe (AZ).....	32, 34, 35, 56, 60
Isleta, Pueblo of (NM) .....	32, 68
Jamestown S'Klallam Tribe (WA) .....	60
Kaibab Band of Paiute Indians (AZ) .....	35, 61
Kalispel Tribe of Indians (WA) .....	66
Karuk Tribe of California (CA) .....	46, 60, 61
Kawbawgam Road Community (see Keweenaw Bay Indian Community) (MI) .....	25
Keweenaw Bay Indian Community (MI).....	25, 52, 58
King Cove, City of (AK).....	48
Klamath Tribes, The (OR) .....	45, 46
Kootenai Tribe of Idaho (ID) .....	29, 30, 36, 37, 59
Lac du Flambeau Band of Lake Superior Chippewa Indians (WI).....	58
Lac Vieux Desert Band of Lake Superior Chippewa (MI) .....	52
La Jolla Band of Luiseno Indians (CA) .....	18
Lake Traverse Reservation (see Sisseton-Wahpeton Sioux Tribe) (ND, SD).....	58
Lower Brule Sioux Tribe (SD).....	51, 58, 67
Lower Elwha Tribal Community of the Lower Elwha Reservation (WA).....	56
Lummi Nation (WA) .....	56, 60
Makah Nation (WA).....	.....
Mandan Tribe (see Three Affiliated Tribes) (ND).....	8, 67
Menominee Indian Tribe of Wisconsin (WI).....	26, 53, 54, 58
Mole Lake Reservation (see Sokaogon Chippewa Community) (WI) .....	58
Morongo Band of Mission Indians (CA) .....	46, 61
Naknek Native Village (AK).....	48
Nambe Pueblo (NM).....	31, 52
Navajo Nation (AZ, NM, UT) .....	10, 32, 33, 34, 35, 55, 60, 61, 71
Nelson Lagoon (AK).....	48
Nenana Native Village (AK).....	7
Nez Perce (Ni Mii Pu) Tribe (ID) .....	37, 59, 60, 66
Nisqually Indian Tribe (WA) .....	60
Nondalton Village (AK).....	18
Nooksack Indian Tribe (WA).....	40, 60

---

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



# List of Tribes or Tribal Governments Mentioned in the Report

Tribal Name*	Page
Northern Arapaho Tribe (Wind River Reservation) (WY) .....	59
Northern Cheyenne Tribe (MT) .....	31, 52, 59, 61
Nottawaseppi Huron Band of Potawatomi (MI) .....	52
Oglala Sioux Tribe (Pine Ridge Reservation) (SD).....	16, 17, 28, 58, 67
Omaha Tribe of Nebraska and Iowa (NE) .....	59, 67
Oneida Tribe of Wisconsin (WI).....	15, 16, 54, 58
Onondaga Nation (NY).....	24
Osage Nation (OK) .....	28, 29, 55
Pala Band of Mission Indians (CA) .....	18
Passamaquoddy Tribe (ME).....	23
Pechanga Band of Mission Indians (CA).....	61
Penobscot Nation (ME).....	24
Perryville, Native Village of (AK) .....	48
Pine Ridge Reservation (see Oglala Sioux Tribe) (SD).....	17, 28, 67
Pojoaque Pueblo (NM) .....	31
Prairie Band of Potawatomi Nation (KS) .....	28
Prairie Island Indian Community (MN).....	27, 55, 62
Puyallup Tribe of Indians (WA).....	41, 42
Pyramid Lake Paiute Tribe (NV) .....	37, 59, 61
Quileute Tribe (WA) .....	60
Quinault Indian Nation (WA).....	41
Rosebud Sioux Tribe (SD).....	11, 15, 17, 19, 27, 28, 58, 65, 67, 68
Rocky Boy’s Reservation (see Chippewa Cree Tribes of the Rocky Boy’s Reservation) (MT) .....	30, 59, 67
Saginaw Chippewa Indian Tribe of Michigan (MI).....	10
Saint George Traditional Council (AK).....	48
Saint Paul Island, Tribal Government of (AK) .....	48
St. Regis Mohawk Tribe, The (NY).....	24
Salish and Kootenai Tribes (see Confederated Salish and Kootenai Tribes).....	29, 30, 59
San Carlos Apache Tribe (AZ) .....	36
San Ildefonso, Pueblo of (NM).....	31, 32
San Juan Pueblo (NM).....	31, 35
San Juan Southern Paiute (AZ).....	35
Santee Sioux Tribe of Nebraska (NE).....	59
Santa Clara Pueblo (NM).....	31
Seminole Tribe of Florida (FL).....	24, 25, 58
Shoalwater Bay Indian Tribe (WA).....	42
Shoshone-Paiute Tribes (NV) .....	59
Sisseton-Wahpeton Sioux Tribe (Lake Traverse Reservation) (SD, ND).....	58

---

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



# List of Tribes or Tribal Governments Mentioned in the Report

Tribal Name*	Page
Skokomish Tribe of Indians (WA) .....	60
Sokaogon Chippewa Community (WI).....	58
Spirit Lake Nation (ND) .....	16, 55
Southern Ute Indian Tribe (CO) .....	59
Spokane Tribe of Indians (WA) .....	41, 60
Standing Rock Sioux Tribe (ND, SD) .....	58, 67
Stockbridge-Munsee Band of Mohican Indians (WI).....	54, 58
Summit Lake Paiute Tribe (NV).....	59
Sycuan Band of the Kumeyaay Nation (CA).....	18
Tanana, Native Village of (AK) .....	7
Tesuque, Pueblo of (NM).....	31
Three Affiliated Tribes of the Fort Berthold Reservation (ND) .....	8, 58, 67
Tohono O’odham Nation (AZ) .....	60
Tule River Tribe (CA).....	60
Tulalip Tribes, The (WA).....	41, 60
Turtle Mountain Band of Chippewa Indians (ND) .....	61
Umatilla Tribes (see Confederated Tribes and Bands of the Umatilla Reservation) (OR)....	7, 44, 45, 60, 66
Unalaska, City of (AK) .....	48
Ute Mountain Ute Tribe (UT, CO, NM) .....	32, 52, 59
Viejas Band of Kumeyaay Indians (CA).....	18
Walker River Paiute Tribe (NV) .....	56, 59, 61
Warm Springs Tribes (see Confederated Tribes and Bands of the Warm Springs Reservation) (OR).....	7, 44, 45, 51, 60, 66
White Earth Band of the Minnesota Chippewa Tribe (MN).....	26
White Mountain Apache Tribe (AZ) .....	51, 56, 60, 65
Wind River Reservation (Northern Arapaho Tribe or Eastern Shoshone Tribe) (WY) .....	44, 59
Winnebago Tribe of Nebraska (NE) .....	59
Yakama Nation (see Confederated Tribes and Bands of the Yakama Nation) (WA).....	7, 42, 43, 44, 60, 66, 68
Yankton Sioux Tribe (SD) .....	8, 9, 27, 58, 67
Yavapai-Prescott Indian Tribe (AZ).....	35, 36, 56, 60
Yurok Tribe (CA) .....	46
Zeba Community (see Keweenaw Bay Indian Community) (MI).....	25
Zuni, Pueblo of (NM) .....	34, 35, 60, 62

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# Organizations or Events Related to American Indians or Alaska Natives Mentioned in the Report

Organization/Event*	Page
1854 Authority .....	26
Agency for Toxic Substances and Disease Control (U.S. Department of Health and Human Services).....	23, 33
Agriculture, Department of (US) .....	66, 67
Ahtna Incorporated .....	48
Akutan Corporation .....	48
Alaska Department of Environmental Conservation .....	46
Alaska Department of Natural Resources.....	47
Alaska Historical Commission .....	48
Alaska Native Tribal Health Consortium.....	60
Aleut Corporation, The .....	48
Alliance of Tribal Tourism Advocates .....	8
American Fisheries Society .....	44
American Indian Science and Engineering Society (AISES) .....	2
Arizona Department of Water Resources.....	60
Army Corps of Engineers .....	24, 29, 42, 43, 66
Big Cypress National Preserve .....	24
Blue Cloud Abbey.....	8, 9, 65
Board of Geographic Names (US).....	48
Bonneville Power Administration.....	41
Bristol Bay Corporation (AK) .....	47, 71
Bureau of Indian Affairs (BIA).....	1, 10, 15, 23, 29, 31, 36, 42, 56, 57, 58, 59, 60, 61, 66, 67, 71
Bureau of Land Management (BLM) .....	36, 46
Bureau of Reclamation .....	35, 37, 42, 45, 55
Calista Corporation .....	47
Canyon De Chelly National Monument .....	32, 34
Chippewa Ottawa Resource Authority.....	9, 10, 66
Chippewa Township (MI) .....	10
Chugach Alaska Corporation.....	48
Colorado Plateau Data Coordination Group.....	71
Columbia River Inter-Tribal Fish Commission .....	41
Cook Inlet Region Incorporated (CIRI).....	48
Diné College .....	33
Doyon Limited.....	47
Energy, Department of (US) .....	29, 33
Environment Canada.....	9
Environmental Protection Agency (US) .....	2, 23, 29, 33, 36, 46, 66

---

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# Organizations or Events Related to American Indians or Alaska Natives Mentioned in the Report

Organization/Event*	Page
Fallon Naval Air Station .....	37
Federal Energy Regulatory Commission .....	45
Fish and Wildlife Service (US).....	7, 15, 25, 26, 44, 45, 46, 67, 71
Florida Atlantic University .....	24
Grand Canyon National Park .....	32, 33, 34, 35
Great Lakes Fishery Commission.....	66
Great Lakes Indian Fish & Wildlife Commission .....	66
Haskell Indian Nations University .....	17, 32
Hubbell Trading Post National Historic Site .....	32
Indian Health Service.....	2, 11, 33, 55, 66
Indian Pueblo Cultural Center .....	10
International Joint Commission .....	24
Intertribal GIS Council .....	8
Inter-Tribal Council of Michigan.....	41, 66
Keweenaw Bay Indian Community Environmental Department.....	25, 52
Klamath River Fishery Restoration Program.....	46
La Crosse School District .....	16
Lake Clark National Park and Preserve .....	18
Los Alamos National Laboratory.....	32
Los Angeles Department of Water and Power.....	57
Lower Kuskokwim School District.....	18, 19
Maine Atlantic Salmon Committee .....	24
Maine Department of Environmental Protection .....	23
Menominee Reservation Lake Sturgeon Enhancement Committee.....	26
Mesa Verde National Park .....	32
Michigan Department of Environmental Quality .....	25
Michigan, State of.....	66
Michigan State University .....	9
Michigan Tribal Environmental Group.....	66
Minnesota Department of Natural Resources .....	26
National Aeronautics and Space Administration.....	17
National Indian Education Association .....	15
National Oceanic and Atmospheric Administration (NOAA).....	15, 32, 48

---

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# Organizations or Events Related to American Indians or Alaska Natives Mentioned in the Report

Organization/Event*	Page
National Park Service .....	8, 18, 30, 32, 33, 35, 56
National Science Foundation .....	32
Native American Fish and Wildlife Society .....	66
Navajo National Monument.....	32
Navajo Nation Data Resource Center .....	71
Navajo Nation Department of Health .....	33
Navajo Nation Environmental Protection Agency.....	33
Navajo Nation Historic Preservation Department.....	33
Navajo Nation Water Resources Department .....	55
Navajo Natural Heritage Program.....	33
Navajo Tribal Utility Authority .....	33
Navy.....	37
New Mexico Bureau of Geology and Mineral Resources .....	31
New Mexico State University .....	15
Nevada Division of Water Resources.....	37
Northwest Indian Fisheries Commission.....	40
Office of Response and Restoration (a NOAA bureau).....	48
Oglala Lakota College .....	16, 17
Oklahoma State University .....	29
Oregon Water Resources Department.....	45
Osage Nation Environmental and Natural Resource Department .....	28, 55
Ounalashka Corporation .....	48
Owens Valley Indian Water Commission .....	57
Oyate Singers and Dancers .....	8
Pacific Northwest Regional Tribal Watershed Roundtable.....	7
Palomar College.....	18
Peabody Western Coal Company.....	60
Pipe Spring National Monument .....	35
Pipestone National Monument.....	8
Portland General Electric.....	45
Pribilof Islands .....	48
Rural Geospatial Innovations in America (RGIS) .....	66
Saint George Tanaq Corporation.....	48
St. Regis Mohawk Tribe (The), Environmental Division .....	24
San Diego Science Alliance.....	18
San Diego State University .....	18

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# Organizations or Events Related to American Indians or Alaska Natives Mentioned in the Report

Organization/Event*	Page
Sinte Gleska University .....	8, 15, 17, 55, 67
Skagit System Tribal Cooperative (composed of the Sauk-Suiattle, Swinomish, and Upper Skagit Tribes) (WA) .....	41
South Florida Water Management District .....	24, 58
Southern Paiute Consortium (composed of the Kaibab Paiute Tribe and the Shivwits Band of the Paiute Indian Tribe of Utah) .....	34, 35
Southwest Strategy.....	10
Southwestern Indian Polytechnic Institute (SIPI).....	17
Summer of Applied Geophysics Experience .....	32
Tanadgusix Corporation.....	48
Tatitlek Corporation, The.....	48
Toppenish National Wildlife Refuge .....	44
University of Alaska Anchorage.....	48
University of Maine Analytical Environmental Chemistry Laboratory.....	23
University of New Mexico.....	31
University of South Dakota.....	8
University of Tulsa.....	29
Upper Columbia River White Sturgeon Recovery Team.....	41
Warm Springs National Fish Hatchery .....	45
Washington State Department of Ecology.....	42
Water Survey of Canada.....	46
White Salmon Watershed Management Council .....	44
Wind River Watershed Council.....	44
Wisconsin Department of Natural Resources .....	26
Yavapai County, Arizona .....	35
Yavapai County Water Advisory Committee.....	35
Yucca House National Monument .....	32

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## States Mentioned in the Report

State	Page
Alaska .....	1, 2, 7, 18, 19, 46, 47, 48, 51, 57, 60, 67, 71, 72
Arizona.....	10, 33, 34, 35, 36, 51, 60, 61, 62, 65
California .....	18, 29, 45, 46, 60, 61
Colorado.....	29, 31, 33, 34, 56, 59, 71
Florida.....	24, 25, 58
Idaho .....	8, 36, 37, 59, 66
Kansas .....	28
Maine .....	23, 24, 52, 58
Massachusetts .....	26
Michigan .....	9, 10, 25, 52, 58, 66, 67
Minnesota.....	8, 26, 58
Montana .....	29, 30, 31, 36, 37, 59, 61
Nebraska .....	27, 59, 67
Nevada .....	10, 37, 59, 61
New Mexico.....	10, 15, 31, 32, 59, 67, 68, 71
New York .....	24, 71
North Dakota.....	16, 58, 61
Oklahoma.....	28, 29, 59
Oregon.....	44, 45, 60
South Carolina .....	15
South Dakota.....	7, 8, 9, 16, 17, 27, 28, 51, 58, 65
Utah.....	3
Virginia .....	8, 15, 29, 51
Washington .....	7, 8, 36, 40, 41, 42, 44, 60, 66, 68
Washington, D.C.....	8
West Virginia.....	15
Wisconsin.....	10, 15, 16, 25, 26, 52, 53, 54, 58, 66
Wyoming.....	59

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# Introduction





# U.S. Geological Survey Activities Related to American Indians and Alaska Natives Fiscal Year 2003

## Introduction

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

The USGS works in cooperation with American Indian and Alaska Native governments, conducting research on: water energy and mineral resources; animals and plants of environmental, economic, or subsistence importance; and natural hazards. Digital data on cartography, energy and mineral resources, streamflow, biota, and other topics are available to American Indian and Alaska Native individuals and institutions. The USGS also recognizes the need to learn from and share knowledge with Native peoples. This report describes most of the activities that the USGS conducted with American Indian and Alaska Native governments, educational institutions, and individuals during Federal fiscal year (FY) 2003. Some of these USGS activities were conducted cooperatively with the Bureau of Indian Affairs (BIA) or other Federal entities. Others were collaborations with Tribes, Tribal organizations, and professional societies.

Growing numbers of Tribal governments, educational institutions, and other Tribal organizations are using geographic information systems and other digital technologies that can use USGS data for specific Native purposes. Using these technologies provides Tribal governments with additional means of managing lands and resources for the benefit of current and future generations. The USGS recognizes the need to make its information available to Tribal governments and to work with those governments and other institutions to improve data management capabilities.

A goal of the USGS is to respond to these needs by increasing the transfer of scientific information to American Indian and Alaska Native governments and by training employees of those governments to conduct scientific studies and improve scientific data management. Other USGS goals are to encourage American Indians and Alaska Natives to pursue careers in science and to create internships and other means of providing jobs for American Indian and Alaska Native students. The USGS is striving to increase the job opportunities for Native American students by identifying, improving, and disseminating information about available hiring mechanisms and by alerting USGS managers to the pool of qualified Native students.

The USGS is the Federal science bureau within the Department of the Interior (DOI). The USGS is non-regulatory and is not a significant manager of Federal or Trust lands or assets. However, as described in this report, there are many USGS activities that involve American Indians, Alaska Natives, and their lands. A USGS website, dedicated to making USGS more accessible to American Indians, Alaska Natives, their governments, and institutions, is available at <http://www.usgs.gov/indian>. This website includes information on how to contact USGS American Indian/Alaska Native Liaisons, training opportunities, and links to other information resources. This report and previous editions are also available through the website.

The USGS realizes that traditional Native knowledge and cultural traditions of living in harmony with nature result in unique Native perspectives that enrich USGS studies. USGS seeks to increase the sensitivity and openness of our scientists to the wealth of Native knowledge, expanding the information on which our research is based.

One type of USGS activity described in this report occurs in the course of formal studies, conducted through existing USGS programs, that involves collection of specific types of data as well as investigative and research projects. These projects typically last 2 or 3 years, although a few are parts of longer-term activities. Some projects



are funded through cooperative agreements, from monies provided to the USGS by individual Tribal governments or by the BIA. The USGS provides matching funds for cooperative projects. These formal projects may also receive funding from the U.S. Environmental Protection Agency (USEPA), the Indian Health Service (part of the Department of Health and Human Services), or other Federal agencies. The USGS routinely works with its sister bureaus in the Department of the Interior to provide the scientific information and expertise needed to meet the Department's science priorities.

The second type of USGS activity is less formal and is designed and conducted by USGS employees typically as collateral tasks that result from one or more USGS employee identifying and responding to an observed need. These endeavors are prompted by employee interests and frequently involve educational activities. The education is often a reciprocal learning and teaching experience for both USGS employees and Native participants. Through these activities, USGS employees help fulfill a mission of the USGS—to prove scientific relevance—while helping their fellow citizens. Increasingly, some of the educational activities are becoming parts of formal USGS projects.

USGS employees have also taken the initiative in assisting American Indians and Alaska Natives through participation in several organizations that were created to 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 (AISES). This group sponsors an annual national meeting in which USGS employees participate. USGS employees join this organization on a voluntary basis, bringing the benefits of this expanded network to the USGS, as many employees do with other professional organizations.

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

**How to use this report:** In the following pages, diverse USGS activities related to American Indians and Alaska Natives are grouped into several categories: Highlights of Fiscal Year 2003, Educational Activities, Resource Activities, Technical Assistance, General Coordination, and Future Opportunities. If you find an interesting activity that you think might be appropriate to undertake in your area, contact the person(s) listed to learn how the activity was carried out. Ask about other USGS employees who could assist you in developing a similar activity in your area. If in doubt as to how to proceed, contact the USGS employees listed on the inside of the back cover. Within the USGS, this report will help staff develop outreach, educational, and program documents for future use. It is hoped that USGS employees, American Indians, and Alaska Natives will adapt these activities in new settings and will use the USGS contacts to expand the relevance of the USGS to more Americans.

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

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- Gene Napier, Central Region and Geography Discipline
- Elaine Padovani, Western Region
- Bonnie Gallahan, Geographic Information Discipline
- Hardy Pearce, Biological Resources Discipline
- Lynne Sendejo, Office of Equal Opportunity
- Sharon Swanson, Geologic Discipline
- Glenn Patterson, Water Resources Discipline

Thanks to Sharon Powers for creating the graphic layout of the report, Regina One Star for the cover art, John Evans for designing the cover, and Patricia Packard for the center map.

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

A general point of contact is Susan Marcus, Director's Office, 703-648-4437; [smarcus@usgs.gov](mailto:smarcus@usgs.gov)





**Tribes and Tribal Information Relevant to U.S. Geological Survey for more than 125 years**



John Wesley Powell became the second Director of the U.S. Geological Survey in 1881, after surveying and mapping parts of the canyonlands and Rocky Mountains of the southwest. Powell, like the Native Americans he met, viewed people and their environment as intrinsically interconnected-precursors to USGS multidisciplinary studies of today.

Major John Wesley Powell in Native American dress with Tau-ruv, a member of the Paiute Indian Tribe. In Uintah Valley on the eastern slope of the Wasatch Mountains, now part of the State of Utah. Photograph by J.K. Hillers sometime in the 1870's. Smithsonian Institution photograph courtesy of U.S. Geological Survey Photographic Library.



Major John Wesley Powell talking with a member of the Paiute Tribe in Uintah Valley on the eastern slope of the Wasatch Mountains, now part of the State of Utah. Photograph by J.K. Hillers sometime in the 1870's. Photograph courtesy of U.S. Geological Survey Photographic Library.



U.S. Geological Survey Director Chip Groat (second from left) with Tribal College leaders and USGS employees at the USGS EROS Data Center. USGS is working with Tribal Colleges and Universities to provide technology that will help train Native students for careers that will benefit themselves, their Tribes, and the Nation. Native people enrich the USGS understanding of natural sciences. The path of communication and cooperation, started by John Wesley Powell, will continue into the future. Photograph courtesy of U.S. Geological Survey EROS Data Center.







# Highlights of Fiscal Year 2003





## Highlights of Fiscal Year 2003

### **Tribal Colleges Forum Convened at USGS EROS Data**

**Center.** On September 19th, 2003, the Second Tribal College Forum was convened at the EROS Data Center, near Sioux Falls, South Dakota. Thirty-four Tribal Colleges participated in the meeting, which was coordinated by the Leadership Team which includes eight of these schools. The Forum addressed how information and technologies from the USGS can assist Tribal Colleges and Universities (TCUs) in providing economic opportunities for their students and communities. The meeting was very successful with presentations by Ron His Horse Is Thunder, Chairman of the President's Advisory Board on TCUs, Chip Groat, USGS Director, the Central Region's Executive Leadership Team, and representatives from many of the TCUs. Contact person: Gene Napier, 605-594-6088, enapier@usgs.gov

### **Ichthyophonus Infections of Yukon River Chinook**

**Salmon.** Scientists at the Western Fisheries Research Center conducted the final year of a five-year study on the prevalence and intensity of *Ichthyophonus* infections in returning adult Chinook salmon in the Yukon River. This project was principally supported by the U.S. Fish and Wildlife Service. The pathogen, similar to a fungus, appears to be an increasing problem in these important stocks. Historical data and reports from Tribal elders suggest that increasing temperatures in the Yukon River in the past few decades may be associated with the increased severity of disease, causing adverse flesh quality and possible pre-spawning losses. USGS fisheries biologists conducted field and laboratory studies to (1) sample Chinook at multiple sites within the Yukon River system to assess prevalence of *Ichthyophonus* infection and disease severity; (2) relate annual changes in disease severity to changes in river conditions (especially temperature); (3) determine if infected adults (especially females) die before reaching their natal streams; determine the source of *Ichthyophonus* infections in Yukon River Chinook salmon, and (4) determine the effect of water temperature on the growth rate and pathogenicity of *Ichthyophonus*. From 1999 to 2003, the field studies confirmed that more than 25 percent of Yukon River Chinook salmon enter the river already infected with *Ichthyophonus*. Infection prevalence remained relatively constant until fish reached the upper Yukon where it dramatically dropped to 1 percent or less. Clinical signs of disease were minimal when fish entered

the river but increased significantly when fish reached the middle river. Also, among fish from the end of the run, the parasite was disseminated and clinical disease was apparent in multiple organs. Infection and disease prevalence rates in fish from the Tanana River and the mouth of the Chena River were similar to those in the Yukon River. Female spawn-outs collected from the upper Chena River, however, showed little evidence of *Ichthyophonus* infection. This dramatic decrease in infection prevalence in females near the end of their spawning migration was similar to that seen at Whitehorse in other years. Elevated river temperatures within and among years may be an important cause of increased disease among Yukon River Chinook salmon. Initial infection and disease rates in the Yukon River Chinook in June 2003 appear more severe than in the past, probably due to lower water levels and higher temperatures this year. This project has received exceptional interest from Tribal, Federal, and Canadian fisheries managers and direct assistance from Athabascans from Tanana Village, Galena, Fairbanks, and Nenana, as well as Yupiks at Emmonak, Alaska. Contact: Western Fisheries Research Center, Lyman K. Thorsteinson, 206-526-6282, lyman\_thorsteinson@usgs.gov

### **Yakama Nation – 1<sup>st</sup> Regional Tribal Watershed Roundtable.**

USGS Northwest Geographic Science Team (NGST) staff participated in the first PNW (Pacific Northwest) Regional Tribal Watershed Roundtable in May 2003 in Toppenish, Washington, to advance effective coordination with Tribes in the Pacific Northwest. The Yakama Nation hosted the Roundtable, which included the Colville, Umatilla, and Warm Springs Tribes. Current and potential Federal, State, and local partners, private company representatives, and private citizens from the region also participated. A facilitator led the group through several interactive exercises that were designed to open up the lines of communication between Tribal and non-Tribal participants and to build trust between the diverse group of participants. The Roundtable focused on water issues in the region and also provided an opportunity for USGS staff to make initial contact with several Tribal staff related to implementing *The National Map* in the Pacific Northwest. Contact: Nancy Tubbs, 503-251-3210, ntubbs@usgs.gov

**The National Map Partnership and Wildfire Behavior Modeling.** The USGS Northwest Geographic Science Team and EROS Data Center (EDC) are partnering with the Coeur d'Alene Tribe's Geographic Information Systems





(GIS) Team to implement *The National Map* over Tribal lands using Tribal data. The cooperative project will combine data from the Coeur d'Alene Tribe's National Map Implementation and Wildfire Mitigation Application with other data from Federal, State, Tribal, and County sources. The Tribe supported the FY 2002 Washington/Idaho National Map pilot project by providing regional hydrography data set that they produced. Additional training and data will be acquired by the Tribe's GIS Team to develop wildfire-modeling capability. In the future, results from wildfire analysis applications by the Tribe will be displayed for public viewing on The National Map through the Tribe's data server. Additional Tribes in the Pacific Northwest have expressed interest in developing similar partnership opportunities. FY 2003 activities included initial concept presentations and discussions at the InterTribal GIS Council meeting, followed by proposal development and project planning for FY 2004 activities. Contact: Tracy Fuller, 208-387-1351, [tfuller@usgs.gov](mailto:tfuller@usgs.gov), Eric Wood, 605-594-6068, [woodec@usgs.gov](mailto:woodec@usgs.gov), or Frank Roberts, 208-686-5307

### **Eros Data Center 30th Anniversary Shares Native American Culture.**

The USGS EROS Data Center's 30th anniversary open house in September 2003 featured a "Tent of Many Voices" and a "Native American Village" as parts of the public educational experiences. The "Tent of Many Voices" featured two presentations by Duane Hollow Horn Bear, Sicangu Lakota of Sinte Gleska University (SGU). Hollow Horn Bear spoke about the impact of Lewis and Clark on Lakota culture. The Native American Village featured exhibits, displays, demonstrations, and interpretations of Lakota dance and song, courtesy of the Alliance of Tribal Tourism Advocates and the Oyate Singers and Dancers. Amy Mossett, Mandan-Hidatsa of the Three Affiliated Tribes, presented an account of Sagkakawea's life, including her journey with Lewis and Clark. The open house also featured a display from the Pipestone National Monument, Pipestone, Minnesota, and Native American art from the University of South Dakota. Contact: Gene Napier, 605-594-6088, [enapier@usgs.gov](mailto:enapier@usgs.gov)

### **USGS Restores Historic Native American Prints.**

A collection of historical photographs was acquired in the late 1800's to early 1900's by Benedictine monks as they traveled throughout Dakota Territory. USGS learned of these images while researching geographic information related to Lewis and Clark's journey, and the commemoration of that journey. The photographs were deteriorating at the Benedictine's Blue Cloud Abbey, near Marvin, South Dakota. Members of the Abbey asked



Amy Mossett, a member of the Mandan-Hidatsa tribe, Alliance of Tribal Tourism Advocates, re-enacts the travels of Sagkakawea with Lewis and Clark, at USGS EROS Data Center's 30th anniversary celebration. U.S. Geological Survey Photographic Library.

for USGS technological assistance in restoring some of the images. This was accomplished by the EDC staff, who expertly and routinely conserve a variety of mostly geographic images. The National Park Service provided restoration support. Several of the images were used to produce a Native American Heritage Month poster that USGS regional directors asked employees to use during the month of November 2003. The poster is on the web at: <http://www.usgs.gov/indian/>. A special exhibit of the Blue Cloud Abbey images was featured in the spring of 2004 at the U.S. Senate Russell Rotunda in Washington, D.C. EDC staff prepared and framed the photographs and explanatory materials for the images. The images were exhibited at the EDC and at the USGS national headquarters in Reston, Virginia. EDC staff provided a framed historic print for a meeting between the USGS and Sinte Gleska University in Mission, South Dakota, in January 2003. The USGS Central Region Director and the EDC Chief participated in the meeting and presented the large-format print to SGU officials. Contact: Gene Napier, 605-594-6088, [enapier@usgs.gov](mailto:enapier@usgs.gov)

### **Supporting Yankton Sioux Pesticide Management Plan.**

The USGS, in cooperation with the USEPA, is compiling and analyzing data to provide background information for a Pesticide Management Plan for the Yankton Sioux Tribe. Numeric and geospatial datasets include pesticide concentrations in ground and surface water, precipitation, soils information, topographic data, geohydrologic features, land cover and use, and pesticide use in the area. The





These historic images are courtesy of the Blue Cloud Abbey at Marvin, South Dakota.

Yankton Sioux Tribe will use the assembled information to develop a Pesticide Management Plan for their lands. Contact: Bryan Schaap 605-352-4241, bdschaap@usgs.gov

**Whitefish Studies with the Chippewa/Ottawa Resource Authority.** The Chippewa/Ottawa Resource Authority (CORA), USGS, Michigan State University, and Environment Canada are cooperating on research to understand the magnitude and potential causes of natural mortality in four lake whitefish populations in Lakes Michigan and Huron. The objectives of the project are to estimate natural mortality over three years in four lake whitefish populations and to determine potential causes and indicators of differences in natural mortality rates among these lake whitefish populations. The study is novel in that traditional stock assessment approaches are combined with comprehensive fish health assessments. The researchers are optimistic that their approach will produce new insights into the mechanisms underlying among-population and among-year differences in population dynamics for one of the most important commercial fish populations in the Great Lakes. The USGS Hammond Bay Biological Station in Millersburg, Michigan, assisted staff of the InterTribal Fisheries Assessment Program of the CORA with a mark and recapture study of lake whitefish (*Coregonus clupeaformis*) in northern Lake Huron during November 2003. The USGS provided staff, vessels, and equipment for the study. Fieldwork for the study involved capturing lake whitefish in commercial trap nets that were placed on

the spawning grounds near Cheboygan, Michigan. The trap nets were lifted by Tribal commercial fishermen contracted by the Chippewa/Ottawa Resource Authority to assist with the study. For each fish caught in the trap net, scientists recorded total length, sex, stage of spawning activity, and sea lamprey marks. The left pectoral fin was removed, a tag was inserted into the fish, and then the fish was released back into Lake Huron. About 1,900 lake whitefish were tagged during the study. In addition, 70 whitefish from the study were killed and sent to Michigan State University in order to measure body composition as an overall assessment of their nutritional status and well being. Researchers will assess body lipids, membrane fatty acid content, disease resistance, viruses, bacteria, and parasite loadings in these 70 fish. During this study, the CORA also provided 106 lake whitefish for an ongoing USGS study of the depths and temperatures occupied seasonally by lake whitefish. Those fish were implanted with data-recording devices that will return up to 33,000 observations of depth and temperature if recaptured. An external tag advertises a \$100 reward for return of a tagged fish. A similar study with lake trout will allow scientists to minimize the need to catch lake trout while researching lake whitefish. Contact: Roger Bergstedt, 989-734-4768, roger\_bergstedt@usgs.gov

**In-Situ Determination of Depth and Temperature Selection by Great Lake Fishes.** Scientists at the USGS Great Lakes Science Center, Hammond Bay Biological Station, are conducting a study of the daily and seasonal temperature and depth preferences of various types of Great Lakes





fish. The data from these studies will greatly increase the understanding of seasonal species overlap and will benefit management and restoration programs in Tribal agencies, eight States, Canadian provinces, and other Federal agencies throughout the Great Lakes basin. USGS scientists obtained the fish for the study with assistance from the Chippewa Ottawa Resource Authority (CORA). The fish were tagged during 2003 with archival tags that record both depth and temperature, producing daily and seasonal records of the habitats occupied by each fish. During 2003, USGS staff tagged 226 lake trout and 100 lake trout obtained from Tribally-operated commercial trap nets set by the Sault Ste. Marie Tribe of Chippewa Indians and the Bay Mills Indian Community. The USGS and CORA scientists also worked with Tribal trap netters to tag 123 lake whitefish from trap nets set by Tribal fishermen under contract with CORA to provide fish for CORA research. Tribal fishermen have also been very responsive in returning fish tags to USGS scientists and in providing parasitic phase sea lampreys for research. Contact: Roger Bergstedt, 989-734-4768, roger\_bergstedt@usgs.gov

**Wildlife Health Alerts and Other Information on Wildlife Diseases.** The USGS National Wildlife Health Center (NWHC) in Madison, Wisconsin, distributes *Wildlife Health Alerts* to Federal and State natural resource and conservation agencies, including the Bureau of Indian Affairs. *Wildlife Health Alerts* provide and promote an exchange of information on important threats to wildlife health. They are issued for specific wildlife diseases, not for human health issues. No *Wildlife Health Alerts* were issued in 2003; however, NWHC will continue distribution of these notices as they are issued. Tribal governments are encouraged to contact the USGS to be added to the automated announcement list. Contact: Paul Slota, 608-270-2420, paul\_slota@usgs.gov

**Southwest Strategy.** The USGS is an active partner in the Southwest Strategy (SWS). SWS is an intergovernmental process that provides a forum for diverse entities to collaborate and resolve natural resource conservation, management, and community development issues affecting Arizona and New Mexico. Through cooperative planning and improved decision-making, SWS strives to maintain, restore, and enhance the cultural, economic, and environmental quality of life for the people of Arizona and New Mexico. SWS brings together Federal, Tribal, State, and local governments, as well as private landowners and other stakeholders, in a problem solving process. The USGS sponsors and chairs the SWS Scientific Information Support Team, which has developed a database containing

information acquired from research and natural resource, social, and economic data that is critical to natural resource management in Arizona and New Mexico. The database was made available on the Internet in 2003 (<http://swin.nbi.gov/sid/home.ac>). In November 2003, the SWS Tribal Relations Support Team (TRST), which is co-sponsored by the USGS, jointly sponsored the Annual Tribal Soil and Water Conservation District Conference in Laughlin, Nevada, with the Navajo Nation's Chinle Soil and Water Conservation District. The TRST also planned and conducted a three-day Tribal Relations Training workshop for mid-level managers in May 2003 at the Indian Pueblo Cultural Center in Albuquerque, New Mexico. More than 100 representatives from the Federal and State agencies attended. To address the serious issue of smuggling of antiquities along the U.S.–Mexico Border, the SWS U.S.–Mexico Border Task Team sponsored a Bi-National Cultural Resources Law Enforcement Training workshop in Nogales, Arizona, in August 2003. Contact: Elaine Padovani, 520-670-5506, epadovan@usgs.gov or Wes Ward, 520-670-5584, wward@usgs.gov

**Hydrogeologic Analysis of Ground-Water Availability in Chippewa Township, Michigan, Saginaw Chippewa Indian Tribe.** Chippewa Township encompasses Tribal lands and buildings belonging to the Saginaw Chippewa Indian Tribe of Michigan. The Tribe and neighboring communities have a significant need for drinking water obtained exclusively from ground-water wells. The hydrogeology in this area is complex and good quality water can be difficult to obtain. In FY 2002, the USGS began a two-year cooperative study with the Tribe and Chippewa Township to conduct a hydrogeologic analysis of the area. The goal of the study is to determine current and future ground-water availability so that the Tribe and the Township can use the information for the benefit of their communities. In FY 2002, water-quality samples were collected to determine the applicability of using a deep bedrock aquifer as a ground-water resource, and surface geophysical methods were used to image glacial sediments that overlie bedrock. In FY 2003, additional geophysical analyses were made and a ground-water flow model was constructed to aid in managing the area's ground-water resources. Also in FY 2003, two ground-water level recorders were established, and the water-level monitoring network for the Township was expanded. In FY 2004, model calibration will be completed and modeling scenarios will be run reflecting known or projected changes in hydraulic stress. The findings of the study will be presented to Tribal and Township audiences. Contact: Chris Hoard, 517-887-8949, ejhoard@usgs.gov



**Public Water Supply Wells, Sault Ste. Marie Tribe of Lake Superior Chippewa Indians.**

The Sault Ste. Marie Tribe of Lake Superior Indians and the Indian Health Service discovered the toxic contaminant, ethylene dibromide (EDB), in a recently-installed public water-supply well (PWS) at a Tribal housing development during routine testing. Quantities of EDB exceeded USEPA drinking water standards in the well water. In FY 2003, after a series of meetings among Tribal, USEPA, Indian Health Service, USGS, and other officials, USGS assisted USEPA in determining if EDB-contaminated agricultural materials were buried near the PWS wells using geophysical instruments and a Geoprobe. No buried contaminated materials were found. In FY 2004, work will consist of determining ground-water flow direction to the PWS wells by constructing several monitoring wells and investigating hydraulic and geologic characteristics from cores acquired during the drilling process. Contact: Dave Westjohn, 517-887-8921, westjohn@usgs.gov or Tom Weaver, 906-786-0714, tlweaver@usgs.gov



Artwork done by: Charlie Her Many Horses, Sicangu (Rosebud) Lakota







## **Educational Activities**





## Educational Activities

**National Indian Education Association.** The USGS expanded its involvement in the annual conference of the National Indian Education Association (NIEA) by providing a geographic information systems (GIS) workshop for participants. Participants in this hands-on, computer-based workshop, conducted by James Rattling Leaf and Jhon Goes In Center of the Sicangu Policy Institute of Rosebud Sioux Tribe's Sinte Gleska University, Esther Worker of ESRI, and Joseph Kerski of the USGS, explored Native American population distribution and natural hazards using ArcView GIS software and USGS spatial data. Emphasis was placed on how students can use GIS in history, geography, economics, and science classes to analyze patterns and links from a local to a global scale to encourage critical thinking. The group also discussed diverse opportunities to use GIS skills to enhance employment prospects. The USGS and Sinte Gleska University jointly sponsored an information exhibit at the NIEA conference in Albuquerque, New Mexico, which attracted over 3,500 attendees. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov or Joseph Kerski, 303-212-4315, jjkerski@usgs.gov

### **National Oceanic and Atmospheric Administration Coastal GIS and Metadata Training for American Indians.**

The National Oceanic and Atmospheric Administration (NOAA) and the USGS, through its support of the Federal Geographic Data Committee (FGDC), presented an annual training session on GIS/metadata and coastal issues for American Indians at the NOAA Coastal Services Center in Charleston, South Carolina and at the USGS Training Center in Denver, CO. Topics included the National Spatial Data Infrastructure, water quality, and flora and fauna monitoring. The training session helped assure Tribal investment in data collection and maintenance and provided Tribal access to public data catalogs and clearinghouses. The course accommodates 15 to 20 American Indian students at each annual session. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Water Technician Training Course.** The Bureau of Indian Affairs sponsored its annual Water Technician Training Course session at New Mexico State University in Las Cruces, New Mexico. Tribal representatives from throughout Indian Country participated in the course with 27 students participating in the New Mexico session. The four-week earth sciences course utilized instructors from several Federal agencies and academia. USGS personnel taught a three-day module titled, "Introduction

to Hydrologic Data Collection Techniques." The New Mexico Water Resources District provided USGS instructors. Instruction included classroom and field activities on ground-water concepts and data collection, and surface-water data collection techniques. The field-oriented training program uses hands-on-experience to develop basic data collection skills. The New Mexico session is coordinated by New Mexico State University. Contact: Edward (Nick) Nickerson, 505-646-7618, nickerso@usgs.gov

### **Introduction to Metadata and GIS Courses for American Indian Conservation Professionals.**

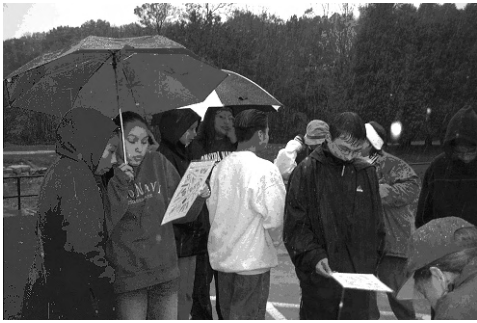
The USGS, through its support of the Federal Geographic Data Committee (FGDC) and the U.S. Fish and Wildlife Service (FWS) continues offering two training sessions that introduce American Indian students to the uses of GIS. The Native American students include Tribal, State, and Federal employees. Topics of the sessions include the National Spatial Data Infrastructure, 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

### **Oneida Nation and USGS Celebrate Science with Oneida Students.**

The USGS Wisconsin Office celebrated National Water Monitoring Day with the Oneida Nation at Duck Creek near Green Bay, Wisconsin. Forty-two students from the Oneida Nation High School and Middle School and their science teachers participated in events. The Oneida Nation Environmental Department, Water Resources Team, co-sponsored the celebration. The students expressed interest in the functions of both Tribal and Federal scientists and were eager to learn about how water quality affects them. Two USGS employees gave an opening talk about the missions of the Oneida Nation's Water Resources Team, the USGS, and how the two governments collaborate on water-quality issues. Another USGS employee gave a presentation on the different types of algae, how to collect algae samples, and how algae data are used in evaluating the water quality of a system. An Oneida Water Resources Team representative gave a presentation on invertebrate collection, indices scores, and how they are used in evaluating water quality. Another USGS employee talked about the Clean Water Act, and its significance and impact on the Nation's water resources, including an overview of water quality, how the USGS monitors water quality,







National Monitoring Day at the Oneida Nation with students from the Oneida Nation High School. Photo taken by Morgan Schneider (USGS Middleton, WI).

and how streamflow measurements are made and used. Due to the inclement weather conditions, field parameters were collected continuously using a multi-parameter meter and compared with the colormetrics kits provided by the American's Clean Water Foundation. Despite temperatures in the low 30's and a mix of rain and snow, the students actively participated in the Duck Creek activities. Contact: Kevin Richards, USGS, 608-821-3861, krichard@usgs.gov

**La Crosse, Wisconsin, Native American Students.**

Representatives of the USGS Upper Midwest Environmental Science Center (UMESC) met with the La Crosse (Wisconsin) School District's Native American student liaisons at the Study Center in La Crosse. The Study Center is sponsored by the Ho-Chunk Nation, to facilitate Native American educational success in the La Crosse public school system. Discussions were held about educational resources available at the Center to cultivate interactions among USGS, the Native American students, and the communities. In addition, during FY 2003, UMESC representatives gave a tour of the USGS Center's educational resources to three teachers from the Ho-Chunk Nation's Tomah Study Center in Tomah, Wisconsin. Discussions were held to plan educational opportunities for the students during the 2002-2003 school year and the summer of 2003. Kindergarten through 9<sup>th</sup> grade students from the Tomah Study Center of the Ho-Chunk Nation came to the UMESC for tours, demonstrations of scientific techniques, and to learn about career opportunities. USGS scientists explained the relevance of unbiased USGS science to the preservation of natural resources and Native American's cultural values. The Ahuco Headstart Center, sponsored by the Ho-Chunk Nation in Tomah, Wisconsin, also brought 20 Native American preschool children to tour the UMESC in May 2003. Contact: Randy Hines, 508-781-6398, Randy\_Hines@usgs.gov

**USGS EDC Staff Support Flandreau Indian School.**

Staff of the USGS EROS Data Center (EDC) visited Flandreau Indian School (FIS), a BIA boarding school 45 miles north of Sioux Falls in southeast South Dakota. They discussed possible USGS support for an on-line geographic information system (GIS) course at the school. In addition to possible GIS course support, EDC staff, the FIS Superintendent and FIS staff members discussed the potential for the USGS to provide excess equipment to the school. In March of 2003, the Gifted Student Program Coordinator at FIS brought 60 students to the EDC for a tour, which included a series of hands-on activities with earth science and remote sensing technology. EDC staff conducted presentations for the visiting students and educators. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov

**USGS Supports Tribal College Outreach.**

Outreach staff at the USGS EROS Data Center provided Cankdeska Cikana Community College, Fort Totten, North Dakota, with USGS bookmarks and Landsat trading cards for use at an elementary and middle school Earth Day event for Native American students. Cankdeska Cikana Community College serves the Spirit Lake Tribe. USGS staff also sent bookmarks, Landsat trading cards, and other materials to Oglala Lakota College (OLC), Kyle, South Dakota. The USGS handouts were used by OLC staff in a global positioning system (GPS) and Geo-cache scavenger hunt



Gail Schmidt, EDC staff person stationed at the South Dakota School of Mines & Technology worked with 15 Native American students in the Wind Cave National Park. Photo taken by Gail Schmidt (USGS).





for K–8 Native American students held in September 2003. Contact: Gene Napier, 605-594-6088, enapier@usgs.gov

### **USGS and South Dakota School of Mines and Technology Collaborate on Native American Student Summer Camp.**

The USGS, through an EDC staff person stationed at the South Dakota School of Mines & Technology (SDSM&T), Rapid City, South Dakota, worked with 15 Native American students in the Wind Cave National Park area during June 2003. The group used global positioning systems (GPS) units as a part of SDSM&T advanced placement program for gifted students. The USGS staffer showed the students how remote sensing technology can be used in many earth science applications, including fire science. Contact: Gail Schmidt, 605-394-2292, gschmidt@usgs.gov

**NASA REASoN CAN Awarded to SGU.** During 2003, Sinte Gleska University (Rosebud Reservation) was awarded a REASoN CAN grant by the National Aeronautics and Space Administration (NASA). REASoN CAN stands for “Earth Science Research, Education, and Applications Solutions Network Cooperative Agreement Notice.” Under the terms of the Memorandum of Understanding between the USGS and Sinte Gleska University (SGU), the EROS Data Center (EDC) staff worked with SGU staff to develop the project implementation plan for this grant. SGU staff, with support from EDC staff, revised the original proposal, as NASA requested, and established the implementation plan for the project entitled, “*Using Geospatial Information to Enhance Tribal Rangeland Management Through Education and Understanding.*” The project, to begin during FY 2004, focuses on education for the Rosebud Tribe— understanding the impact of rangeland management practices on vegetation resources. Using NASA and USGS science applications and information, SGU will characterize the problem, explore solutions, and educate the Rosebud Tribe’s communities about the impacts. A key aspect of this endeavor is to engage the minds of the young (elementary and secondary) students to cultivate a holistic understanding of the relationships between Tribal land resources and economic sustainability, community prosperity, and cultural preservation. In addition, many generations of Tribal leadership and land use/land management decision makers will also benefit from a better understanding of the impact of land management on Tribal resources. Contact: Eugene Napier, 605-594-6088, enapier@usgs.gov

**Sinte Gleska Intern Through CRISP.** An intern from Sinte Gleska University (Rosebud Sioux Tribe) was funded

through the Central Region Integrated Science Program. She spent two months at USGS EROS Data Center (Sioux Falls, South Dakota) learning geospatial analysis techniques and developing a database for water-quality studies on the Rosebud Sioux Reservation. Working with data collected by the USGS Water Resources group in Rapid City, S.D., the intern compiled well and lake water-quality assessments and identified possible sources of water-quality impacts, such as agricultural activity and its proximity to elevated nitrate levels in well assessments. She developed a presentation to explain her results to others, including Tribal officials. Contact: David Meyer, 605-594-6046, dmeyer@usgs.gov

### **Technical Assistance to Haskell Indian Nations**

**University.** The USGS serves on the Haskell Indian Nations University’s Natural Resources Advisory Board and advises Haskell on pertinent academic programs. In FY 2003, technical assistance was provided to Haskell with their development of a mobile water-quality lab (purchased with USEPA grant funds) intended for use with nearby Tribes. Contact: Walt Aucott, 785-832-3505, waucott@usgs.gov

### **Technical Support—Environmental Sampling Techniques.**

Oglala Lakota College (OLC) is an accredited institution offering baccalaureate and master’s degree programs on the Pine Ridge Reservation of the Oglala Sioux Tribe. The college is currently developing a water-quality laboratory and wanted an understanding of the techniques and methods used by the USGS for the collection of discharge measurements, water-quality samples, and macro-invertebrate sampling. An overview of current methods was presented to students and staff from the Oglala Lakota College over a 4-day period. Students and staff participated in hands-on collection of measurements and samples. Contact: Joyce Williamson 605-355-4560, jewillia@usgs.gov

**Southwestern Indian Polytechnic Institute.** Southwestern Indian Polytechnic Institute (SIPI) and the USGS, through its support of the Federal Geographic Data Committee (FGDC), are conducting quarterly satellite broadcasts from SIPI for participating Tribal colleges and universities. The broadcasts, entitled “GIS in Indian Country,” have been popular with students and faculty. They provide a good connection to the Indian community, a means of including field work in the curriculum, and an excellent school-to-career opportunity. These broadcasts are dedicated to promoting Tribal self-sufficiency by improving management of geographic information and building



intertribal communication networks while maintaining national standards of data quality through the National Spatial Data Infrastructure. Contact: Bonnie Gallahan, 703-648-6084, bgallahan@usgs.gov

**Explorer's Club—Outdoor Science Education Outreach on San Diego County Reservations.** A retired USGS scientist has channeled her enthusiasm for earth science education into an outreach project for Indian Tribes in southern California. Working in partnership with the Tribes, USGS, San Diego State University, Palomar College, and the San Diego Science Alliance, she has expanded a series of successful outdoor science activities originally developed under USGS auspices into a set of "Explorer's Club" programs for children age 6 to 12. The format of each program can be adapted to suit the needs of the Education Director or Recreation Director of each Tribe. Tribal elders participate as program instructors. The programs include activities such as panning for gold and magnetite, collecting rocks, coring soil, and learning outdoor photographic techniques. Water-related activities are particularly important to help the students understand water issues in their semi-arid area that has experienced four years of drought. For Earth Science/World Water Monitoring Week, a USGS scientist joined the team to teach Native American children how to measure water-quality parameters such as pH, temperature, water clarity, and oxygen content. Equipment from prior USGS funding was shared with children from the Pala Band of Mission Indians, La Jolla, Sycuan, Viejas, and Campo Band (Kumeyaay). Contact: Eleanora I. (Norrie) Robbins, 619-303-9095, norrieroobins@cox.net



Explorer's Club member Pierre Alexander, age 5, learns about rocks in a hands-on program. Photo by Norrie Robbins.

**National Water Monitoring Day.** Children from the La Jolla Band of Mission Indians participated in National Water Monitoring Day, October 18, 2002. USGS personnel and other volunteer professionals guided the students through the collection and analysis of a core set of water-quality parameters. Water samples were collected from the San Luis Rey River on the La Jolla Indian Reservation and analyzed in the field for dissolved oxygen, pH, water clarity, and temperature. The USGS provided technical instruction along with field supplies and equipment. Contact: Julia Huff, 858- 637-6823, jahuff@usgs.gov

**Anchorage, Alaska, ESIC Explains USGS Mapping to Alaska Native Students.** The Alaska Earth Science Information Center (ESIC) provided an opportunity for Native children from the Lower Kuskokwim School District to learn about various aspects of the USGS Geography Discipline during their annual June and July "Road Science" field trips. Among the topics covered were aerial photography, stereo imaging, and understanding map contours. Experiential learning techniques and activities got the students actively involved in learning to use spatial data. Approximately 80 students were involved in the program. Contact: Greg Durocher, 907-786-7009, gfdurocher@usgs.gov

**Alaska Native Internship Program.** A USGS scientist continued a fisheries science internship program in the Bristol Bay region of Alaska during the summer of 2003. The focus of the program is to recruit Alaska Native students into the field of fisheries science. In 2003, five students from Nondalton, Igiugig, and Kokanok, Alaska, learned what it was like to be a fish biologist. All of the students assisted on the project the previous summer, while one of the young women has been with the program 5 years. This experienced student acts as field crew leader on the otolith-sampling project. The other interns learned new skills such as habitat mapping; otolith collection, preservation, and reading; diverse fish capture methods; environmental monitoring techniques and data entry and presentation techniques. The USGS coordinated this internship program in partnership with the National Park Service at Lake Clark National Park and Preserve. If funding becomes available, this program of encouraging Alaska Natives to pursue college degrees and to consider careers in science will continue in FY 2004. Contact: Carol Woody, 907-786-3512, carol\_woody@usgs.gov



### **Yupik Students Assist in Biological Research.**

USGS scientists in Alaska are continuing to enhance communication between government researchers and Alaska Natives as they present career opportunities to Native youths. To demonstrate the kind of research being conducted, the USGS recruited 24 Yupik Eskimo students in 2003 to assist in a waterfowl study on the Yukon-Kuskokwim Delta in 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. The year 2003 marks the 18th consecutive year of involvement by Alaska Native students from the Native Village of Chevak in this important project. More than 180 Yupik youth have participated in this program since 1986. This effort supports a regional need for information on the population biology of species of interest to indigenous people, wildlife enthusiasts, and sport hunters. Contact: Craig Ely, USGS Alaska Science Center, 907-786-3526, [craig\\_ely@usgs.gov](mailto:craig_ely@usgs.gov)



*Modern*—artwork done by Jamie Poorman, Sicangu (Rosebud) Lakota





# Resource and Environmental Activities







## Resource and Environmental Activities

### **Occurrence of Nutrients, Organic Compounds, and Mercury in the Meduxnekeag River Adjacent to Maliseet Tribal Lands.**

Although major point-sources of nutrients to the Meduxnekeag River have been reduced to levels permitted by the Maine Department of Environmental Protection, seasonal algal blooms in the river persist. One hypothesis is that seasonal algal blooms are driven by nutrients released from benthic sediments. Analyses of fish tissue samples in previous studies have indicated the presence of mercury, DDT and other recalcitrant organic compounds. It is unclear whether these compounds are associated with stream-bottom sediments in the Meduxnekeag River. A USGS project, begun in FY 2003, is designed to establish the range of in-stream nutrient concentrations during the spring and summer of 2003 at sites upstream and downstream of Tribal lands. The study will determine concentrations of nitrogen, phosphorous, mercury, and selected organic compounds in stream-bottom sediments at sites upstream and adjacent to the Maliseet Tribal lands. Additional project tasks include determining concentrations and ratios of carbon, nitrogen, and phosphorous in algal tissue collected from river samples at sites adjacent to tribal lands and assessing whether a relation exists between streamwater nutrients, sediments, and algal tissue. Contact: Charlie Culbertson, 207-622-8201, ext. 127, cculbert@usgs.gov

### **Finding the Source of Fecal Coliform Bacteria in Water Used by the Houlton Band of Maliseet Indians.**

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 impacts to communities through the loss of sustenance and recreational activities. In recent years, fecal contamination of surface waters by non-point 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. Because 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 study will incorporate a deoxyribonucleic acid (DNA) fingerprinting technique (genotyping) to differentiate between human and non-human sources of coliform bacteria in water samples collected from the Meduxnekeag River, flowing through Maliseet Tribal land, near Houlton, Maine. The objectives of the research are to determine the occurrence, density distribution, and human or animal origin of fecal coliform bacteria from non-point source pollution in a six-mile stretch of the Meduxnekeag River, adjacent to and including the Houlton Band of Maliseet Indians' Reservation. Contact: Charlie Culbertson, 207-622-8201 ext. 127, cculbert@usgs.gov

### **Support for Passamaquoddy Water Management Plan.**

The USGS Maine Water Resources District is continuing to work with the Passamaquoddy Indians to collect real-time streamflow information critical to the development of a water management plan for Tribal land in southeastern Maine. The watershed includes important blueberry barrens and Atlantic salmon habitat. Careful stewardship of the land requires accurate streamflow information. The USGS operated two streamflow gages in FY 2000–01 and is committed to long-term operation of one gage. Contact: Charlie Culbertson, 207-622-8201, ext. 127, cculbert@usgs.gov

### **Ecological Health and Contamination in the Penobscot River.**

The Bureau of Indian Affairs (BIA), the USGS, the U.S. Environmental Protection Agency (USEPA), the Agency for Toxic Substances and Disease Registry (ATSDR), and, initially, the University of Maine Analytical Environmental Chemistry Laboratory, partnered to gather information regarding the occurrence, distribution, and ecological and human health risks associated with dioxins, furans, and PCBs in fish and sediment in the Penobscot River. The USGS evaluated existing fish and sediment contaminant data from the Penobscot River's main channel from the Milford Dam impoundment in Old Town to Grindstone, Maine. A USGS administrative report summarizing the data quality was produced in 2003. Due to the unreliable nature of the data, the data could not be used to determine the occurrence and distribution of these contaminants in the River. The USGS is continuing to work with the BIA, the lead agency, along with USEPA



and ATSDR to propose a new study to assess human or ecological risks from potential contaminants in the river. A meeting was held at the Penobscot Indian Nation (Indian Island, Maine) in September 2003 to begin the proposal development process. Contact: Carl Orazio, 573-876-1823, corazio@usgs.gov or Susan Finger, 573-876-1850, sfinger@usgs.gov

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

**Tribal Fisheries Restoration and Enhancement.** The USGS Great Lakes Science Center's Tunison Laboratory of Aquatic Science continued assisting Tribes in restoring and enhancing their fisheries. Tunison staff stocked 220 catchable rainbow trout, reared at the Tunison facility, in waters of the Onondaga Nation. Tunison scientists continued assisting The St. Regis Mohawk Tribe by examining the feasibility of restoring Atlantic salmon in St. Lawrence River tributaries. Salmon restoration activities included stocking 21,500 salmon fry in tributaries of the St. Regis and Little Salmon Rivers and assessing survival through the fall. Survival of salmon fry was lower than in previous years, possibly due to drought conditions during summer. Over-winter survival of salmon was also lower than in previous years. The Environmental Division of The St. Regis Mohawk Tribe and Tunison Laboratory continue cooperating on a pilot project that focuses on the American eel population in the St. Lawrence River. The project involves field collecting American eels, ecological assessments, and laboratory analysis of eel health and life history of this population. Tunison staff are also working with Mohawk Tribal groups along the St. Lawrence in

New York, Ontario, and Quebec concerning river water level studies carried out under the International Joint Commission. Contact: James H. Johnson, 607-753-9391, ext. 30, james\_h\_johnson@usgs.gov

**Stemming Tropical-Fish Invasion of Restored Wetlands, Big Cypress Seminole Indian Reservation.** USGS biologists, the Seminole Tribe, and partners at Florida Atlantic University have completed a study of the invasion of restored wetlands on the Seminole Reservation by non-native fishes, which included an evaluation of methods to discourage the invasion of such wetlands. They compared the fish assemblages of natural wetlands to restored wetlands that had been drained for cattle pasture. They found that the natural wetlands had higher species richness of native fishes and, following a mild winter, also had higher numbers of introduced tropical fishes. A field experiment in the restored wetland showed that introduced fishes in shallow waters died during winter cold fronts, but survived in deeper habitats that offered thermal refuge. Manipulating water depths in the restored wetlands could offer a means of controlling introduced fishes. The scientists also found that the pump that provided water to restore the wetland caused high mortality of fishes passing through its impeller. Proper design of impellers and screens on pumps would be a way of reducing or eliminating the introduction of exotic fishes into wetlands if pumping was the major means of supplying water for restoration. Products obtained from this activity included two Masters of Science theses from Florida Atlantic University and final report to USGS and its partners. Contact: William (Bill) F. Loftus, 305-242-7835 Loftus@usgs.gov; Craig Tepper (Seminole Tribe of Florida), 954-966-6300, ext. 1120, water@gate.net

**South Florida Ecosystem Program, Internal Surface Water Flows.** As part of the Everglades Restoration Programs, the Army Corps of Engineers (ACE) and South Florida Water Management District (SFWMD) propose modified water deliveries to The Seminole Tribe of Florida, Big Cypress National Preserve, and other parts of Florida's interior. The proposed changes are intended to provide net flood protection and water delivery to agricultural lands as well as partial restoration of historic ecosystem conditions within the Seminole lands. A baseline of current data is needed to help determine the effects that proposed water delivery changes will have on Seminole lands. The USGS has installed and is obtaining data from strategically located streamflow-gaging sites to help define future surface-water flow requirements and decompartmentalization efforts through the Comprehensive Everglades Restoration





Sampling for fish using minnow traps and drift fence arrays in the Kissimmee Billie Slough on the Big Cypress Seminole Indian Reservation. Reference sites such as this cypress swamp were used to compare fish assemblages in these less disturbed, natural habitats with the fish assemblages in the restored wetland. Photo taken by Brad Dunker, USGS.

Program. Subsequent studies based on accurate flow calibrations generated by data from these sites may then be used by other agencies for computation of nutrient and other contaminant loadings in the canal system. Data from continuous flow gages, at selected impact points for interior basins, will also complement the existing eastern flow canal discharge network and allow more accurately timed surface-water releases. USGS biologists are using the hydrological restoration of a wetland that had been drained for cattle pasture to test several hypotheses about the invasion of wetlands by non-native species, including methods that may discourage their use of such wetlands. Contact: Mitch Murray, 305-717-5827, mmmurray@usgs.gov; Bill Loftus, 305-242-7835, Loftus@usgs.gov; Craig Tepper (Seminole Tribe of Florida), 954-966-6300, ext. 1120, water@gate.net

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

stocked and wild lake trout, specimens of stocked lake trout with imbedded coded wire tags, and comparisons of fish community composition in the Bay with that in nearby Lake Superior fishery management units. Contact: Owen Gorman, 715-682-163, owen\_gorman@usgs.gov; Mike Donofrio (KBIC) 906-524-5757, mdonofri@up.net

**Source-Water Assessments and Protection Plans, Keweenaw Bay Indian Community.** In 2001, the USGS completed an assessment for the L'Anse, Michigan, water supply as part of a 5-year cooperative agreement with the Michigan Department of Environmental Quality. The Keweenaw Bay Indian Community's (KBIC) Zeba Community lies immediately north of L'Anse and is in the same watershed. To fulfill trust obligations, in November 2001, the USGS completed a source-water assessment for the Zeba Community water supply. In 2002, based on the results of the Zeba source-water assessment, KBIC asked USGS to complete an assessment of the ground-water supply at the Kawbawgam Road Community near Marquette, and to prepare source-water protection plans for both the Zeba and Kawbawgam Road Community water supplies. A cooperative agreement was implemented in FY 2002 to conduct this work, and an assessment of the Kawbawgam Road supply was completed in September 2002. In FY 2003, USGS and KBIC environmental staff completed source-water protection plans for both supplies. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Mapping Bottom Substrates in the Lower Bad River and Adjacent Areas of Lake Superior.** The USGS Great Lakes Science Center's Lake Superior Biological Station developed an agreement with the Bad River Band of Lake Superior Tribe of Chippewa Indians to conduct a benthic mapping survey of the lower two miles of the Bad River and adjacent four miles of lakeshore habitat in Lake Superior. Detailed data on the distribution of depths and bottom substrate composition will be collected in GIS (geographic information system) mapping format and will be used by the Bad River Band to determine the distribution and abundance of suitable spawning and rearing habitat for an indigenous population of lake sturgeon. In Wisconsin, lake sturgeon have been designated as a species of special concern and the U.S. Fish and Wildlife Service treats lake sturgeon as a Species of Management Concern. Understanding the relation between habitat and the success of lake sturgeon spawning and recruitment will provide Tribal natural resource managers with information needed to protect these areas to enhance recovery of Lake Superior lake sturgeon populations. The U.S. Fish and Wildlife Service is partnering with USGS to carry out this project





for the Bad River Band. Contact: Owen Gorman, 715-682-6163, owen\_gorman@usgs.gov; Mark Dryer, 715-682-6185, mark\_dryer@fws.gov; Tom Doolittle 715-682-7111 (Bad River Band), wildlife@badriver.com

**Lake Sturgeon Enhancement in Menominee Waters.** The Menominee Reservation Lake Sturgeon Enhancement Committee, composed of personnel from the Menominee Indian Tribe of Wisconsin, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, and the USGS, is coordinating ongoing efforts to re-establish lake sturgeon in waters on the Menominee Reservation. These efforts involve evaluating the successes of stocking juvenile and fingerling lake sturgeon in Reservation impoundments and transplanting adult lake sturgeon from the lower Wolf River to the portion of the Wolf River on the Menominee Reservation. USGS fishery biologists at the Upper Midwest Environmental Sciences Center provided training and assistance to Menominee employees in the implantation of transmitters into juvenile and adult lake sturgeon near Keshna, Wisconsin. These efforts will help resource managers determine habitat requirements and spawning potential of stocked or transplanted lake sturgeon in Reservation waters. Contact: Brent Knights, 608-781-6332, brent\_knights@usgs.gov

**Development of an Upstream Fish Ladder for Lake Sturgeon.** The USGS in Turners Falls, Massachusetts has been working for several years to develop an effective inexpensive fish ladder for passing lake sturgeon and riverine fishes at low dams on streams in the Great Lakes area. The Menominee Indian Tribe of Wisconsin has provided support for this effort. The research has resulted in the construction of a prototype fish ladder. Extensive testing shows lake sturgeon and many species of riverine fishes pass the ladder successfully, including small mouth bass, large mouth bass, white suckers, channel catfish, walleye, and several species of sunfish. Contact: Leetown Science Center, Boyd Kynard, 413-863-3807, Boyd\_Kynard@usgs.gov

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

**Moose Population Dynamics, Northeastern Minnesota.** The USGS is conducting moose research with the Minnesota Department of Natural Resources, the Fond du Lac Band of Lake Superior Chippewa, and the 1854 Authority (Grand Portage Band of Lake Superior Chippewa and Bois Forte Band of Chippewa). The objectives of the study are to determine survival rates of adult moose, causes of mortality, and to improve aerial surveying of the moose population. In March 2003 (year two of the five-year study), 42 moose (21 females, 21 males) were captured and radio-collared, increasing the total number of radioed moose to 60 animals. They were radio-tracked aerially once per week accumulating approximately 1,200 locations. From March through December, 17 of 60 (28%) have died, 13 from natural causes and 4 from human causes. Causes of mortality included truck, train, or natural accidents, hunting, unknown (not predation), and unexamined (natural mortality). Unknown mortalities occurred in April, May, June, August, and December. This information will help the Tribes and the State improve moose management by providing information critical to the long-term welfare of moose in Minnesota. Seventeen additional moose will be captured in FY 2004 to add to and replace the study animals that have died. Contact: Michael Nelson, 218-365-4505, michael\_nelson@usgs.gov



Moose with collar (tagged). Photo courtesy of Minnesota Department of Natural Resources.

**Hydrologic and Lake Level Changes, Long Lost Lake, White Earth Band of the Minnesota Chippewa Tribe.** Long Lost Lake is a 480-acre land-locked lake, within the boundaries of the White Earth Indian Reservation. The lake is approximately 6 miles west of Lake Itasca, the source of the Mississippi River, in northwestern Minnesota. The water level (stage) of Long Lost Lake has risen approximately 20 feet since about 1990. Twelve Tribal



residences, several roads, and 50 acres of Tribal lands are submerged, and 30 Tribal members have been displaced from their homes. The USGS is working with the Tribe to document historical changes in the stage of Long Lost Lake to determine the cause-and-effect relations that have resulted in increased lake stage, and to develop a general understanding of the hydrology of lakes that experience rapid and dramatic changes in lake stage. Climatological changes and human modifications within the watershed will be considered as potential contributing factors. This study also will develop the monitoring network needed to understand the hydrologic setting and hydrologic budget of the Long Lost Lake and information about the lake's setting relative to other lakes in the area. The study began in FY 2002 and is expected to conclude in FY 2005. Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov



**Water-Resources Investigation for the Prairie Island Indian Community.** The Prairie Island Indian Community and the USGS conducted a bathymetric survey of Sturgeon Lake and collected bottom sediment samples from the lake. The Community is concerned about potential water-quality effects of dredging of the lake for pleasure boat traffic. Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov

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

Top: Brian Engle (Hydrologic Technician, USGS, left), Cliff Johnson (Water Quality Coordinator, Yankton Sioux, center), Milton Mallory (Environmental technician Yankton Sioux Tribe, right) on a sampling boat on the Missouri River. Bottom: Brian Engle prepares to decant sample water into a churn splitter while Cliff Johnson secures a second sample bottle into the eater-quality-suspended-sediments sampler. Photos by Dave Hernandez, USGS.

**Hydrogeology of the Ogallala and Arikaree Aquifers for the Rosebud Sioux Tribe.** The Ogallala and Arikaree aquifers are important water resources for the Rosebud Sioux Tribe and are used extensively for agricultural, municipal, and domestic water supplies. Water-resource tools are needed to evaluate management and environmental issues such as planning for source-water protection, describing potential impacts of contamination, and estimating sustainable aquifer withdrawals. A numerical ground-water flow model of the Ogallala and Arikaree aquifers underlying the Rosebud Reservation has been developed, calibrated, and documented by USGS hydrologists in cooperation with the Rosebud Sioux Tribe. The model was completed in FY 2003. A GIS interface for the model is currently being developed to aid the Tribe in using the model to test the effects of various hydrologic conditions such as drought or increased water use. Contact: Andy Long, 605-355-4560, ext. 237, ajlong@usgs.gov



**Rosebud Total Maximum Daily Load.** The USGS and the Rosebud Sioux Tribe are continuing to conduct a water quality assessment in support of Total Maximum Daily Load (TMDL) development for the Little White River in Todd County, South Dakota. Historical data have been reviewed and compiled. Project personnel will now concentrate on sampling water-quality to further define conditions of the Little White River and its tributaries and analyzing and modeling selected data. The Rosebud Sioux Tribe will use the data and analysis to write a TMDL for the Little White River. Technology transfer, a major part of this project, will aid the Tribe with TMDL development for other streams within its lands. Contact: Joyce Williamson, 605-355-4560, ext. 219, jewillia@usgs.gov

**Well Inventory for Abandoned Wells on Rosebud Lands.** Abandoned wells are possible avenues for various surface contaminants to be introduced directly into ground-water systems. Petroleum products and other hazardous wastes have been detected by the Rosebud Sioux Tribe in several abandoned wells in Todd County. The Tribe is interested in plugging abandoned wells within the county. A previous well inventory to locate abandoned wells in the vicinity of community supply wells was conducted in Todd County; however, areas surrounding these community supply wells were not visited during that previous study. The current study 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 (GWSI) database relative to abandoned wells. The Tribe will use the results of this study to assist them in providing safe water to their Tribal members and residents. Contact: Kathy Neitzert 605-352-4241, kmneitze@usgs.gov

**Potentiometric Map for the Arikaree Aquifer, Pine Ridge Reservation.** The USGS in cooperation with the Oglala Sioux Tribe, continues conducting a study to map the potentiometric surface of the Arikaree aquifer. The potentiometric surface is the hydraulic head, or upper surface, of an unconfined aquifer (in other words, the water table) or, on a confined aquifer it is the upper water surface in a well. The aquifer is present near the surface in approximately 80 percent of the Oglala Reservation and is the single largest source of ground water for the Tribe. The objectives of this study are to provide the Oglala Sioux Tribe with a map depicting the potentiometric surface of the Arikaree aquifer and a compilation of well locations and construction information. The map will be used by

several Tribal departments and could help identify the best locations for new wells, predict ground-water movement, and assess aquifer vulnerability to contamination. Contact: Allen Heakin, 605-355-4560, ext. 216, ajheakin@usgs.gov

**Water Quality on the Lands of the Prairie Band Potawatomi Nation.** Water quality is a major concern for the Prairie Band of Potawatomi Nation because creeks on their lands provide sources of subsistence hunting and fishing for Tribal members. Ground water is used in domestic wells on the reservation and is being considered as a source for water supply as the Tribe develops its economic base. Surface water on Tribal lands has been sampled on a quarterly basis since June 1996, and two reports have been published as a result of this monitoring. In 2002, a ground-water component was added to the study and 11 wells completed on the reservation will be sampled on a yearly basis to assess ground-water quality. Tribal personnel assist USGS scientists in collecting and preparing samples for analysis in conjunction with the water-quality aspects of this study. As part of the capacity building, Tribal personnel have also attended training courses at the USGS National Training Center in Denver as well as training with USGS personnel on other water-quality studies in the Kansas District. The study is scheduled to continue through 2004, with a cumulative interpretative report on the water quality of the Potawatomi lands to be released at the conclusion of the study. Contact: Heather Ross Schmidt, 785-832-3575, hross@usgs.gov

**Osage-Skiatook Petroleum Environmental Research Project.** USGS scientists are leading the Osage-Skiatook Petroleum Environmental Research (OSPER) Project in which research is being conducted to investigate the transport, fate, and biologic effects of saline produced water and hydrocarbon releases from oil production at two sites on Skiatook Lake, on the Osage Nation. Environmental research began in FY 2001 and continued in FY 2003 with geologic mapping, drilling of observation wells, geophysical surveys, microbial studies, geochemical sampling of soils, bedrock, and ground and surface waters, plant surveys, and tree-ring dating of trees. This work focuses on the impacts 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 (DOE), U.S. Environmental Protection Agency (USEPA), Bureau of Indian Affairs, U.S. Army Corps of Engineers (ACE), University of Tulsa, Oklahoma State University, and USGS research scientists from Oklahoma, Virginia, Colorado, and California. Initial results from these investigations can be found at

<http://water.usgs.gov/pubs/wri/wri03-4260/>.

Contact: Jim Otton, 303-236-8020, jkotton@usgs.gov

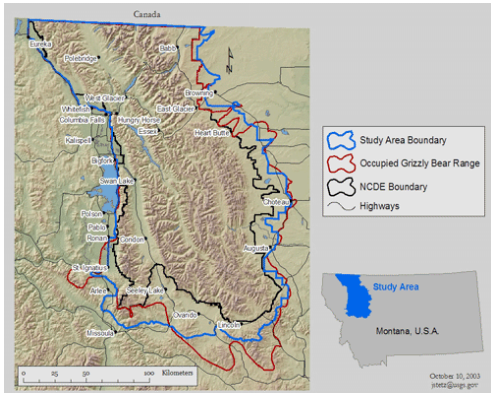
**Availability of Water in Arkansas River Alluvial Aquifer, Osage Nation.** The USGS conducted a cooperative project with the Osage Nation that included using direct-push drilling, lithostratigraphic and hydrologic analysis, and water-quality sampling to evaluate the quantity and quality of water in alluvial and terrace aquifers along the Arkansas River in Osage County. Two Native American student hydrologists conducted the sampling for the project under USGS supervision as part of their Master's of Science program requirements for Oklahoma State University in FY 2002. They assisted in writing the project report in FY 2003. Contact: Marvin M. Abbott, 405-810-4411, mmabbott@usgs.gov

**Surface-Water Quality and Total Petroleum Hydrocarbon Loading into Skiatook Lake.** This USGS project, began in FY 2003, is investigating the impact 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 is also used as a water supply for the cities of Sand Springs and Sapulpa. Past water-quality data collected on Hominy Creek have indicated the presence of variable but commonly high concentrations of major ions associated with surface- and ground-water discharges of produced waters. The project's objectives are to determine the general quality of water entering Skiatook Lake and the loads of constituents discharged by Hominy Creek and Wildhorse Creek into Skiatook Lake. As part of this project, the USGS helped the Osage Nation build their Tribal capabilities by installing a surface-water and water-quality monitoring station and by training Osage Nation staff to make discharge measurements and conduct water-quality sampling. Contact: Kelli DeHay, 918-254-6651, kdehy@usgs.gov

**Ground-Water-Quality Monitoring for the Fort Peck Assiniboine and Sioux Tribes.** Brine is a byproduct of crude oil production. Handling and disposal of brine during the last 50 years in the East Poplar oil field has resulted in contamination of not only the shallow Quaternary aquifers, but also the Poplar River. Previous investigations have documented and delineated part of the extent of brine contamination in the East Poplar oil field during the early 1990's. Several studies identified more than 12 square miles of saline-water (brine) contamination in the East Poplar oil field. In the 10 years since the last study, the entire extent of contamination may have increased. The brine plume is migrating toward the nearby city of Poplar, Montana, which relies on the shallow Quaternary aquifers as its sole source of water. The objective of the project is to delineate brine contamination in the Quaternary aquifers in and near the East Poplar oil field. The project area includes the entire East Poplar oil field and extends south to include the city of Poplar. This project will provide the Fort Peck Assiniboine and Sioux Tribes with an updated delineation of brine contamination in the shallow Quaternary aquifers in and near the East Poplar oil field. The project will also enable the Tribes to determine more effective remediation of brine contamination within the oil field and provide the information that the Tribes need to evaluate the threat to the city of Poplar's water supply. Contact: Joanna Thamke, 406-457-5900, jothamke@usgs.gov

**Northern Divide Grizzly Bear Project.** The USGS in cooperation with the Confederated Salish and Kootenai Tribes, the Blackfeet Nation, and Federal and State agencies, is continuing a multi-year research project to determine the number of grizzly bears in the Northern Continental Divide Ecosystem of the United States through non-invasive measures. This project, requested by the Governor of Montana and supported by Senator Burns (MT), is designed to produce a scientifically valid estimate of the size of the grizzly bear population for the entire ecosystem. The immense study area encompasses 7.9 million acres, which extends from the Salish-Kootenai lands in the west to the Blackfeet Reservation lands in the east and from the Canadian border in the north to Montana Highway 200 in the south. Much of the project is on Tribal lands, and tribal participation contributed to a successful and productive preliminary 2003 field season. Representatives from both Tribal governments have been actively involved in all stages of the planning process and will serve as project sub-area leaders.





Map: Jeffrey Stetz, USGS



Photo courtesy of the National Park Service.

Contact: Kate Kendall, 406-888-7994, [kkendall@usgs.gov](mailto:kkendall@usgs.gov); Dale Becker (Salish-Kootenai), 406-675-2700, ext. 1278, [daleb@cskt.org](mailto:daleb@cskt.org); Dan Carney (Blackfeet), 406-338-2430, [dcarney@3rivers.net](mailto:dcarney@3rivers.net).

### Flood Frequency at Gaged and Ungaged Sites in Montana.

Reliable flood-frequency information for streams is essential for design and operation of various water-control structures such as dams, levees, and water-supply systems. In addition, reliable flood-frequency data are required for proper design of stream-crossing transportation structures, such as bridges and culverts, and for identification of flood-prone areas for land-use management and flood-insurance purposes. The USGS conducted a study in cooperation with the Confederated Salish and Kootenai Tribes, BIA, and State and Federal agencies. Its purpose was to update flood-frequency information for all gaged sites in Montana that have at least a 10-year record of unregulated flow record. Project personnel used the updated flood-frequency information, together with geomorphic and climatic data compiled at each gaged sites, to develop regional regression equations and a region-of-influence computer model for the estimation of flood-frequency at ungaged sites, as well as a Web-based program to help users apply the estimation

methods at ungaged sites. This project was completed in FY 2003 with publication of a Water Resources Investigations report (WRIR 03-4308) entitled, "Methods for Estimating Flood Frequency in Montana Based on data Through Water Year 1998." Contact: Charles Parrett, 406-457-5900, [cparrett@usgs.gov](mailto:cparrett@usgs.gov)

### Hydraulic Characteristics and Flood-Limit Delineation of the Jocko River on Part of the Flathead Reservation.

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

### Cooperative Field Work with the Chippewa Cree Tribe.

Members of the Chippewa Cree Tribe of the Rocky Boy's Reservation participated in a USGS workshop on water-sampling techniques in FY 2002. In FY 2003, personnel from the Tribe's Water Resources Department increased their proficiency and developed additional expertise as they accompanied USGS staff in the field on a regular basis. The teams made routine measurements of stage and discharge at several streamflow-monitoring stations located on the Rocky Boy's Reservation. Contact: Norman Midtlyng, 406-457-5900, [nmidtlyn@usgs.gov](mailto:nmidtlyn@usgs.gov)





Tribal members measuring streamflow on Beaver Creek at reservation boundary near Rocky Boy, Montana. (Photo credit: Norm Midtlyng, USGS)

**Monitoring Ground Water in Potential Coal-Bed Methane Zones, Northern Cheyenne Tribe.**

Coal-bed methane (CBM) has a large potential for development in southeastern Montana and on Native lands. In order to release methane from the coal beds, large amounts of ground water must be withdrawn from the coal beds. On the Northern Cheyenne Reservation, many of the coal beds are important sources of water for stock watering and domestic supply. The same ground-water sources could be developed for CBM in areas near the Reservation. In FY 2002, the USGS, in cooperation with the Northern Cheyenne Tribe, installed six observation wells in the coal beds. The wells will be used to monitor changes in water quality and water levels as CBM development proceeds near the Reservation boundary. In a related effort, the USGS, in cooperation with the Bureau of Indian Affairs, analyzed cores collected during the observation well drilling for gas content. In FY 2003, the USGS worked with the Tribe to monitor water levels monthly in the four of the observation wells and operated water-level recorders in the remaining two wells. As a result of these efforts, the Northern Cheyenne Tribe will have additional data to manage and protect their natural resources. Contact: Mike Cannon, 406-457-5900, mcannon@usgs.gov; Jason Whiteman (Northern Cheyenne Tribe) 406-477-6503

**USGS Assists BIA and Native American Tribes with Endangered Species Training.** In May 2003, a research ecologist at the USGS assisted the Bureau of Indian Affairs (BIA) with a training session in Albuquerque, New Mexico, on techniques for surveying endangered southwestern willow flycatchers. Biologists from more than a dozen southwestern Tribes and Pueblos participated in the training. The USGS scientist presented information on the status, distribution, ecology, and habitat use of the bird, and led a morning field trip to known southwestern willow flycatcher breeding sites along the Rio Grande. Contact: Mark Sogge, 928-556-7194, mark\_sogge@usgs.gov

**Mapping Exotic Plants in the Southwest.** In conjunction with land managers, biologists at the USGS are developing a database on exotic plants in the Southwest. The database is an important regional tool for inventorying, monitoring, and sharing data on exotic (non-native) plant species that are invading the area. USGS scientists are gathering data on the plants and compiling it according to Federal standards. The database can also be used to generate maps of locations of the plants. The goals of this effort include developing and maintaining the Southwest Exotic Plant Database, maintaining a distribution system that integrates educational, management, and scientific information to aid in control of the exotic plant species, and facilitating a collaborative partnership among Tribal, Federal, State, and private land managers. The database is available on the Southwest Exotic Plant Information Clearinghouse (SWEPIC) web site (<http://usgssrv1.usgs.nau.edu/swepic>) and, as such, the data and the SWEPIC information are freely available to Tribal members. Contact: Kathryn Thomas, 520-556-7327, ext. 235, kathryn\_a\_thomas@usgs.gov

**Geologic Framework of Rio Grande Basins, New Mexico.** The USGS is conducting geologic and geophysical studies to provide a framework for understanding aquifers in several critical ground-water basins along the Rio Grande, which extends from Colorado to Mexico. The current focus of this project is the Española ground-water basin in the greater Santa Fe, New Mexico, region, which includes lands belonging to the Pueblos of Cochiti, Nambe, Pojoaque, Tesuque, San Ildefonso, San Juan, and Santa Clara. The project is developing a better understanding of the three-dimensional form of the ground-water basin to improve the understanding of ground-water flow and resources. The project includes geologic mapping in cooperation with the New Mexico Bureau of Geology and Mineral Resources and the University of New Mexico; geophysical mapping of the subsurface in cooperation





with Los Alamos National Laboratory and the Summer of Applied Geophysics Experience educational program; investigations into how faults affect the aquifer system; and studies of geologic history to predict the distribution of underground aquifers. Geologic and geophysical maps in the basin provide the Pueblos with information that aids in ground-water protection and assessment of water and other natural resources. Contact: Mark Hudson, 303-236-7446, mhudson@usgs.gov; Tien Grauch, 303-236-1393, tien@usgs.gov

### **Seismological Laboratory Facility Serving the World**

**from the Pueblo of Isleta.** The USGS recently signed a 5-year lease with the Pueblo of Isleta. The lease is for use of all buildings and facilities of the original USGS Albuquerque Seismological Laboratory (ASL), including seismometer test tunnels and boreholes, on Isleta lands, south of Albuquerque, New Mexico. The ASL has used these facilities, known as the ASL–Isleta site, since 1961 as a global network maintenance center, data-collection center, and for low-noise testing of modern seismic instruments in support of global seismograph networks used for monitoring seismic activity worldwide. USGS will continue to use the site for all of these purposes during the term of this lease. ASL’s mission includes operation and maintenance of 91 seismic stations of the Global Seismograph Network (GSN) in 60 countries and the installation, operation, and maintenance of 35 Advanced National Seismic System/USArray seismic stations in the U.S. that are part of the National Science Foundation-funded Earthscope Project. The site on the Pueblo of Isleta is notable for its low seismic noise characteristics. Seismic equipment manufacturers want their instruments to be tested here as a key step in qualifying the instruments for use in seismic networks. The USGS/ASL also operates a standard GSN station at this location; one of 128 such stations operating worldwide in more than 80 countries and islands. Data received in real time and on tapes mailed from the GSN stations support earthquake monitoring and research at the USGS National Earthquake Information Center and the Incorporated Research Institutions for Seismology (IRIS), tsunami warning efforts by the National Oceanic and Atmospheric Administration, and monitoring efforts for the Comprehensive Test Ban Treaty. The Pueblo of Isleta and the general public receive occasional educational talks and presentations on how the seismic equipment functions for monitoring earthquakes. The USGS is grateful to the Pueblo of Isleta for permitting this globally significant scientific endeavor on their lands. Contact: Charles R. (Bob) Hutt, 505-846-5649,

bhutt@usgs.gov. Additional information:  
<http://aslwww.cr.usgs.gov>  
Live Seismograms: <http://www.liss.org/>

**Inventory of Vascular Plants and Vertebrate Animals.** In collaboration with the biologists from the Navajo Nation and other Tribes and partner agencies, USGS scientists are conducting a comprehensive inventory of vascular plants and vertebrate animals in 10 National Parks and National Monuments within and adjacent to Tribal lands. Inventory objectives are to document overall species diversity, collect data on distribution and abundance of rare species, and identify non-native, weedy species. Canyon de Chelly National Monument (NM), Hubbell Trading Post National Historic Site, and Navajo National Monument include lands of the Navajo Nation. Grand Canyon National Park (NP) shares boundaries with Havasupai and Hualapai Tribal lands, and Glen Canyon National Recreation Area, Rainbow Bridge NM, and Wupatki NM are all adjacent to Navajo Nation lands. Mesa Verde NP abuts the Ute Mountain Ute Reservation, and Bandelier NM is adjacent to the San Ildefonso Reservation. The USGS, National Park Service, and Tribal cooperators have completed vegetation surveys at Canyon de Chelly and Navajo NMs. Amphibian, reptile, and mammal surveys are currently being conducted at Mesa Verde and Yucca House NM. Bird and mammal surveys are currently underway at Canyon de Chelly, Hubbell Trading Post, and Navajo NMs. The southwest has been experiencing severe drought, and effects of this drought are evident in all aspects of the inventory. However, these studies still provide insights into the range of conditions seen in this part of the west, and distribution and population levels of a wide range of species under drought conditions. Haskell Indian Nations University students have assisted with various aspects of the work, including mapping and vegetation description. The studies provide students with hands-on experience in field research and technologies such as geographic information systems. Contact: Charles Drost, 928-556-7187, charles\_drost@usgs.gov

### **Geo-Ecological Studies of Land Use, Climate Change, and Landscape Vulnerability on the Navajo Nation.**

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, such as stream erosion, sedimentation, flooding, the distribution of native and invasive plants, and the availability and quality of water. This information will be provided to Navajo communities



and schools, so that land-use planning and water resources can be developed based on the knowledge of land-use impacts. Evaluating the present mobility of sand dunes is important for determining potential impacts of climatic variation on grazing and farming resources, native plants, air quality, damage to infrastructure, and health-related impacts from dust storms. USGS has completed a map of sand dune deposits, covering one-third of the Navajo Nation, combined with climate information in a geographic information system (GIS), has been completed as part of ongoing USGS work. When used with equations for climatic factors, the map may be used to predict the potential for sand dune mobilization. Although the Navajo Nation has an overall moisture deficit, there has been enough moisture to support stabilizing vegetation, though only marginally in some areas. Given current severe drought conditions, the soil moisture balance is diminishing. In another part of this project, USGS researchers developed a list of prospective plant species occurring in the Tsezhin bii' area of the Navajo Nation, using literature and herbarium samples. Field sampling was conducted to obtain plant community occurrence data to assist with developing a vegetation map for the Tsezhin bii' area. Also, digital maps of physical parameters for the area, including elevation and elevation derived slope and aspect, geology, and dune location, were processed to develop a biophysical framework for more detailed field sampling to be conducted in the spring of FY 2004. Sampling protocols for detailed measurement of vegetation on sand dunes and sand sheets were developed in the fall of FY 2003 and will be implemented using the biophysical framework in the spring of FY 2004. See <http://climchange.cr.usgs.gov/info/sw/> and <http://climchange.cr.usgs.gov/hopibuttes/>. Contact: Margaret Hiza, 928-556-7366, mhiza@usgs.gov; Kathryn Thomas (vegetation studies), 928-556-7327, Kathryn\_a\_thomas@usgs.gov

**Native Concerns About Ground-Water in the Black Mesa Area.** The N aquifer is the most heavily used aquifer for water supplying people of both the Hopi Tribe and the Navajo Nation in the Black Mesa area. Both Tribal governments are concerned that increasing withdrawals of water from the N aquifer to slurry Black Mesa coal will cause excessive declines in water levels and/or will cause poor-quality water from the overlying D aquifer to infiltrate into the N aquifer. (The D aquifer overlies the N aquifer in the Black Mesa area.) The USGS completed a study that characterizes the ground-water geochemistry of the D aquifer through the use of naturally occurring inorganic constituents and stable and radio isotopes. Results indicate that the ground water is 4,000 to 40,000 years old, evolving

from a calcium-magnesium to a sodium-potassium carbonate type water. Infiltration between the D and N aquifers has been occurring for thousands of years. The area of highest infiltration is in the southeastern part of the study area where the N aquifer is thin, the hydraulic gradient is small, and the vertical head difference (water pressure differential) between the D and the N aquifers is small. Strontium ratios for <sup>87</sup>Sr were used to identify areas where infiltration is occurring. Beginning in FY 2004, the Carmel Formation, which forms the geological layer separating the N and D aquifers, will be studied to develop a better understanding of its regional extent and composition. This information will help identify how and where leakage of ground water can occur between the D and N aquifers. Water users in the Black Mesa area, including the Hopi and Navajo, will use the results of these studies to make informed decisions on how best to manage available water resources. Contact: Margot Truini, 520-556-7352, mtruini@usgs.gov

**Navajo Nation and USGS Sign Official Approval for Human Health/Coal Research.** The Navajo Nation gave their official approval to the USGS to conduct a research project "Relationship of Indoor and Ambient Air Quality to Respiratory Diseases in the Navajo Nation." Groups participating in negotiating the agreement and expected to participate in the future research include the USGS, the Navajo Nation Environmental Protection Agency, the Navajo Nation Department of Health, Diné College, the Indian Health Service, the Shiprock Chapter of the Navajo Nation, the Navajo Nation Historic Preservation Department, and the Navajo Tribal Utility Authority. Funding to support Navajo collaborators on the project has been secured from the U.S. Department of Energy and the Agency for Toxic Substances and Disease Control (U.S. Department of Health and Human Services). This research project is particularly critical because it will examine connections between residential and industrial coal usage by Navajo people and health issues. Results of the study will provide information that will assist the Navajo Nation in developing their policies and practices to improve healthful use of this energy source. Contact: Joe Bunnell, 703-648-6497, jbunnell@usgs.gov

**Parasites of Native and Non-Native Fishes in the Lower Little Colorado River.** Scientists from the USGS studied parasites in fishes in the lower 21 kilometers of the Little Colorado River, Grand Canyon, Arizona, an area administered by the Navajo Natural Heritage Program (Navajo Nation) and the National Park Service (Grand Canyon National Park). Fish populations were sampled by





the USGS in FY 2000 and FY 2001. In FY 2001, a total of 1,235 fish representing 11 species (all 4 native species and 7 non-native species) were captured and examined for internal parasites. Results from both years indicate that between 50–60 percent of the endangered humpback chub (*Gila cypha*) were infected with the Asian tapeworm (*Bothriocephalus acheilognathi*). Such infections can cause disease and retard growth. The disease could be severe enough to cause mortality. A reduced growth rate could increase the time that fish are susceptible to predation and also cause the fish to be small when they enter the main stem of the Colorado River during monsoon season. Smaller fish do not survive as well as larger fish in the cold waters of the main stem. In addition, zooplankton (critical to tapeworm transmission) were collected, identified, and counted. Temperature was monitored in various tributaries of the Little Colorado River to evaluate environmental conditions involved in the transmission of the tapeworm. Laboratory infections of bony-tailed chub, a surrogate for the endangered humpback chub, were initiated in FY 2001 and in December 2003. These experiments were designed to assess the impact of the Asian fish tapeworm on fish growth, body condition, and ability to withstand thermal stress. The results indicate that the tapeworm did affect growth, causing infected fish to grow more slowly. In some experiments with fish that were fed a ration of 0.5 percent body weight, 24 percent of exposed fish died as compared to 5 percent unexposed fish. Other parameters such as body condition and affects of thermal stress were not significantly different in the laboratory-infected fish than in the control fish. Contact: Rebecca Cole, 608-270-2468, rebecca\_cole@usgs.gov

**Vegetation Surveys on Native Lands.** USGS scientists conducted vegetation surveys on the Navajo Nation, the Hopi Tribal lands, and the Gila River Indian Community in FY 2003. As part of the Southwest Regional Gap Analysis regional conservation assessment of biota, a land cover map of the southwest is being developed. The USGS vegetation team is developing the land cover map products for most of Arizona and some surrounding areas. Results and products of the studies will be shared with Tribal governments. The draft land-cover maps will be completed in the spring of 2004, and the gap analysis reporting of conservation protection in the southwest, including on Tribal lands, should be completed late spring 2005. Contact: Kathryn Thomas, 928-556-7327, kathryn\_a\_thomas@usgs.gov

**Vegetation Mapping at Canyon de Chelly National Park.** In late FY 2003, the USGS initiated vegetation mapping at Canyon De Chelly National Park within the Navajo Nation.

The project will describe, classify, and map vegetation within the park, using the U.S. National Vegetation Classification. Current aerial photography will be photo-interpreted and field plots will be sampled to inform the development of the vegetation classification and map. An initial meeting was held at the park to discuss the scope of the project, work schedules, and issues involved with this particular landscape. Contact: Kathryn Thomas, 928-556-7327, Kathryn\_a\_thomas@usgs.gov

**Land Cover Change and Drought Effects on Tribal Lands in Northern Arizona.** The evaluation of changes in land cover resources on Tribal lands in Northern Arizona over an extended study period is imperative to developing ecosystem management plans that use historic and current data to support wise use of the resources. The effects of human impacts, grazing density, drought conditions, and range recoverability are critical to the analysis of these data. During FY 2003, USGS geographers acquired Landsat thematic mapper (TM) imagery of Navajo and Hopi lands. The images were taken, by satellite, from 1984 (earliest valid TM data), 1993 (a very wet year), and 2002 (a drought year). From these data, various digital products were produced to give visual indication of land cover changes during the last 18 years. In FY 2004, 2003 TM data and pre-1977 satellite data will be acquired to create additional digital products to add to the previously collected data. Precipitation received through May of 2003 indicated that already the State of Arizona had received as much precipitation as during the entire year of 2002, so 2003 imagery will likely give additional information on range recoverability. Removal of cattle began on these Hopi and Navajo lands during 1977, so having satellite imagery prior to this occurrence will provide a benchmark of part of the landscape where grazing used to occur. A complete analysis of all products will document changes to the Native lands due to human impact, prolonged grazing, fluctuating precipitation levels, and their effects on range recoverability. Contact: Jana Ruhlman, 928-556-7111, jruhlman@usgs.gov

**Terrestrial Monitoring.** The USGS is leading a project in Grand Canyon National Park to monitor and evaluate the effects of water releases from Glen Canyon Dam on terrestrial resources. The Hopi Tribe, Hualapai Tribe, and the Southern Paiute Consortium have been participating in this project since FY 2002, by providing input to USGS biologists about resources of traditional concern to the Tribes and by participating in field monitoring activities. FY 2003 was the third and final year of the field component of the project; in FY 2004, the Tribes will assist



in evaluating the information from their respective cultural perspectives. Navajo Nation and the Pueblo of Zuni have been invited to participate in the data analysis phase of the project in FY 2004. Contact: Helen Fairley, 928-556-7285, hfairley@usgs.gov

**Geoenvironmental Effects of Glen Canyon Dam.** Glen Canyon Dam has affected the environment in Grand Canyon. The USGS is collaborating with other researchers to provide information for policy decisions concerning the management of water flow from Glen Canyon Dam. Under the post-dam flow regime, which limits floods and impounds sediment, sandbars have degraded, campsites and riparian habitat have been lost, and species have become endangered. Congress passed the Grand Canyon Protection Act, requiring the Bureau of Reclamation to alter discharge from the dam to enhance the environment downstream in Grand Canyon National Park. Representatives of seven Tribes and Pueblos (Havasupai, Hopi, Hualapai, Navajo, San Juan Southern Paiute, Southern Paiute Consortium, and Zuni) are among more than two dozen stakeholders who participate in the Adaptive Management Program or who regularly receive reports on the progress of this project. USGS scientists are interpreting sedimentary structures to provide explanations for sediment transport, particularly for use in determining sediment transport prior to the dam, and developing new approaches to sediment-transport modeling. Contact: David Rubin, 831-459-3156, drubin@usgs.gov

**Hydrogeologic Studies Near Pipe Spring National Monument and Lands of the Kaibab Band of Paiute Indians.** Water resources are very limited near Pipe Spring National Monument and the Kaibab Band of Paiute Indians Reservation. Residents in the vicinity of the monument, Tribal members, and the local Arizona communities of Fredonia and Moccasin must share the limited water supply. A three-year project began in FY 2002, with USGS scientists conducting geologic mapping and seismic imaging of the subsurface near and on Pipe Spring National Monument west of Fredonia, Arizona, and the surrounding lands belonging to the Kaibab Band of Paiute Indians. The mapping includes four USGS 7.5' quadrangles and encompasses the western two-thirds of the Kaibab Paiute Indian Reservation. This USGS project is being conducted in association with the National Park Service and in cooperation with the Kaibab Band of Paiute Indians. The geologic map will be published in FY 2004. The results of USGS geologic and hydrogeologic interpretations of the geologic mapping and seismic profiles will be used as the basis for possible additional studies. The purpose of

this research is to provide the diverse land managers with information on the implications of ground-water use and availability in this area. Contact: George Billingsley, 928-556-7198, gbillingsley@usgs.gov or Robert Hart, 928-556-7137, bhart@usgs.gov; Margot Truini, 928-556-7352, mtruini@usgs.gov

**Geologic Mapping of the Eastern Grand Canyon.** The USGS and the National Park Service began a study in 2003 to improve understanding of the surficial and underground water resources of the eastern part of Grand Canyon National Park and adjacent Navajo lands. This project encompasses an area of about 2,000 square miles. The three-year project is being conducted with cooperation of the Cameron Chapter House in the southwestern part of the Navajo Nation. Contact: George Billingsley, 928-556-7198, gbillingsley@usgs.gov, or Sue Priest, 928-556-7148, spriest@usgs.gov

**Hydrogeologic Study of the upper and middle Verde River Watershed, Arizona.** The population of Yavapai County, Arizona, is growing rapidly, resulting in an increased demand on water resources in the upper and middle Verde River watershed. The watershed contains a thriving riparian zone and is the primary water supply for the county, as well as for large populations further downstream, including the Yavapai-Prescott Indian Tribe and the Fort McDowell Yavapai Nation. The hydrogeologic system in the watershed has not been comprehensively studied, and the effects of historic and present development on regional water resources are poorly understood. Beginning in 2001, this study was funded by the Yavapai County Water Advisory Committee to improve hydrologic and geologic information upon which water resource decisions will be based. This effort used geophysical and geologic methods to better define the geometry of and internal structures in the basins and the composition and architecture of the basin fill. This study is augmenting a larger investigation supported by the State of Arizona. As part of both investigations, USGS personnel operate a microgravity network to measure changes in ground-water storage. Precipitation and streamflow data are being collected from new rain gages and a new stream gage on a tributary to Big Chino Wash. USGS scientists are collecting and analyzing ground-water samples to help delineate ground-water flow paths, and are conducting surface resistivity surveys to delineate the thickness and extent of alluvial sediments in selected reaches of the Verde River. All of these investigations will produce data that can be directly used in a numerical hydrogeologic model of the system, providing critical information to water managers and



users. Contact: Victoria Langenheim, 650-329-5313, zulanger@usgs.gov, or John Hoffman, 520-670-6671, ext. 265, jphoffma@usgs.gov

**Ground Water and Surface Water, Colony Wash Watershed, Ft. McDowell Yavapai Nation, Maricopa County, Arizona.**

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

**Copper Mines and Ground Water.** Ground-water withdrawals associated with two new copper mines proposed for southern Arizona have the potential to affect existing water rights and water supplies of the area. 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 impacts to the ground-water system caused by mine-related pumping. The proposed project could affect the claims to water of the Gila River Indian Community and the San Carlos Apache Tribe, for whom the Federal government has trust responsibilities. In 2003, USGS scientists reviewed selected sections of the Environmental Impact Statement (EIS). The Final EIS was

published in December 2003 and the BLM is expected to issue a Record of Decision in early 2004. The final EIS calls for the USGS to play a long-term role in the project by providing quality control on the hydrologic data collected as part of the ground-water monitoring plan. The USGS scientists will collect a limited amount of data and will also provide a web page for the project to facilitate public access to the data. Contact: James G. Brown, 520-670-6671, ext. 280, jgbrown@usgs.gov, or Bruce Gungle, 520-670-6671 ext. 233, bgungle@usgs.gov

**Coeur d'Alene Tribe National Map Implementation and Wildfire Mitigation Application.** Coeur d'Alene employees are cooperating with USGS staff to improve the Tribe's wildfire management capabilities and to enhance the data available to all people involved in wildfire mitigation. USGS specialists in *The National Map* data integration and viewer implementation will work with GIS experts at the Coeur d'Alene Tribe to implement *The National Map* over Tribal lands using data created by the Coeur d'Alene Tribe, in combination with additional Federal, State, and County data. The Tribe supported the FY 2002 Washington/Idaho National Map pilot by providing their own regional hydrography data set. Remote sensing experts from EROS Data Center will introduce Tribal personnel to the Landfire methodology for fire fuels modeling. A plan will be developed to secure and/or create layers, principally a forest fuels layer, required of various wildfire behavior modeling software packages. Ultimately, Tribal personnel will be fully trained to develop the required data and apply the wildfire behavior models to predict and mitigate wildfire hazards. The resultant fire behavior model data will be served from the Tribe's website and from *The National Map* for use by other fire protection organizations in the area. The techniques can be transferred to other Tribes in the region in the future. Contact: Tracy Fuller, 208-387-1351, tfuller@usgs.gov, Eric Wood, 605-594-6068, woodec@usgs.gov, or Frank Roberts, 208-686-5307, fmroberts@cdatribe.org.

**White Sturgeon Habitat Simulations to Assess the Feasibility of Enhancing Spawning Substrate in the Kootenai River.** In 1999, the USGS in cooperation with the Kootenai Tribe of Idaho, began examining Kootenai River white sturgeon spawning habitat. Ultimately, the results of this project will be used by the Kootenai Tribe and others to evaluate the feasibility of various recovery actions on improving substrate conditions in Kootenai River white sturgeon spawning areas. The Kootenai River Sub-Basin is an international watershed that encompasses parts of British Columbia (Canada), Montana, and Idaho, making





the river the second largest tributary to the Columbia River. During the last 80 years, the hydraulic, sediment transport, and substrate characteristics of the Kootenai River have been altered as a result of the construction of Libby Dam, dike construction, and wetlands drainage. The operation of Libby Dam has altered the river ecosystem, resulting in the decline of resident fish populations including the Kootenai River white sturgeon (listed as an endangered species in 1994) and burbot. One limitation to white sturgeon spawning success may be the change from the natural fluctuations in flow and sedimentation in sturgeon spawning areas resulting from the operation of the dam. During FY 2003, USGS scientists completed surveying the bathymetry and levees of the Kootenai River from Libby Dam, Montana, to Kootenay Lake in British Columbia, including the white sturgeon spawning reach along the Kootenai Tribal Lands in Idaho. In the summer of 2003, the USGS staff finished collecting suspended-sediment samples from the river's water column at the upstream and downstream extents of the spawning reach. Sediment samples from the riverbed also were collected from the upstream end of the spawning reach. Acoustic doppler current profiling equipment was used to characterize the river's streamflow velocity structure throughout the spawning reach. These data are being used in calibrating one-dimensional and multidimensional digital models that simulate streamflow and sediment transport. These models, now being constructed, will be used to simulate streamflow velocity structure and sedimentation under various flow regimes. The results will be used in evaluating the feasibility of various recovery actions to improve substrate conditions in sturgeon spawning areas. The USGS has written a report for the Kootenai Tribe of Idaho entitled, "Characterization of channel substrate, and changes in suspended sediment transport and channel geometry that may have affected white sturgeon spawning habitat in the Kootenai River near Bonner's Ferry, Idaho, flowing the closure of Libby Dam." This report is based, in part, on 30 kilometers of seismic sub-bottom profiles (including the spawning reach); 3.5 meter-long cores of riverbed sediments at 30 locations in the spawning reach, and; suspended-sediment samples from the river. Contact: Gary Barton, 253-428-3600, ext. 2613, gbarton@usgs.gov

#### **White Sturgeon Restoration in the Middle Snake River.**

The USGS provided technical expertise to the Nez Perce Tribe during the development of a management plan for white sturgeon in the lower middle Snake River. The Nez Perce fishery biologists requested USGS participation in several meetings where discussions centered on whether an Ecosystem Diagnosis and Template analysis or simpler

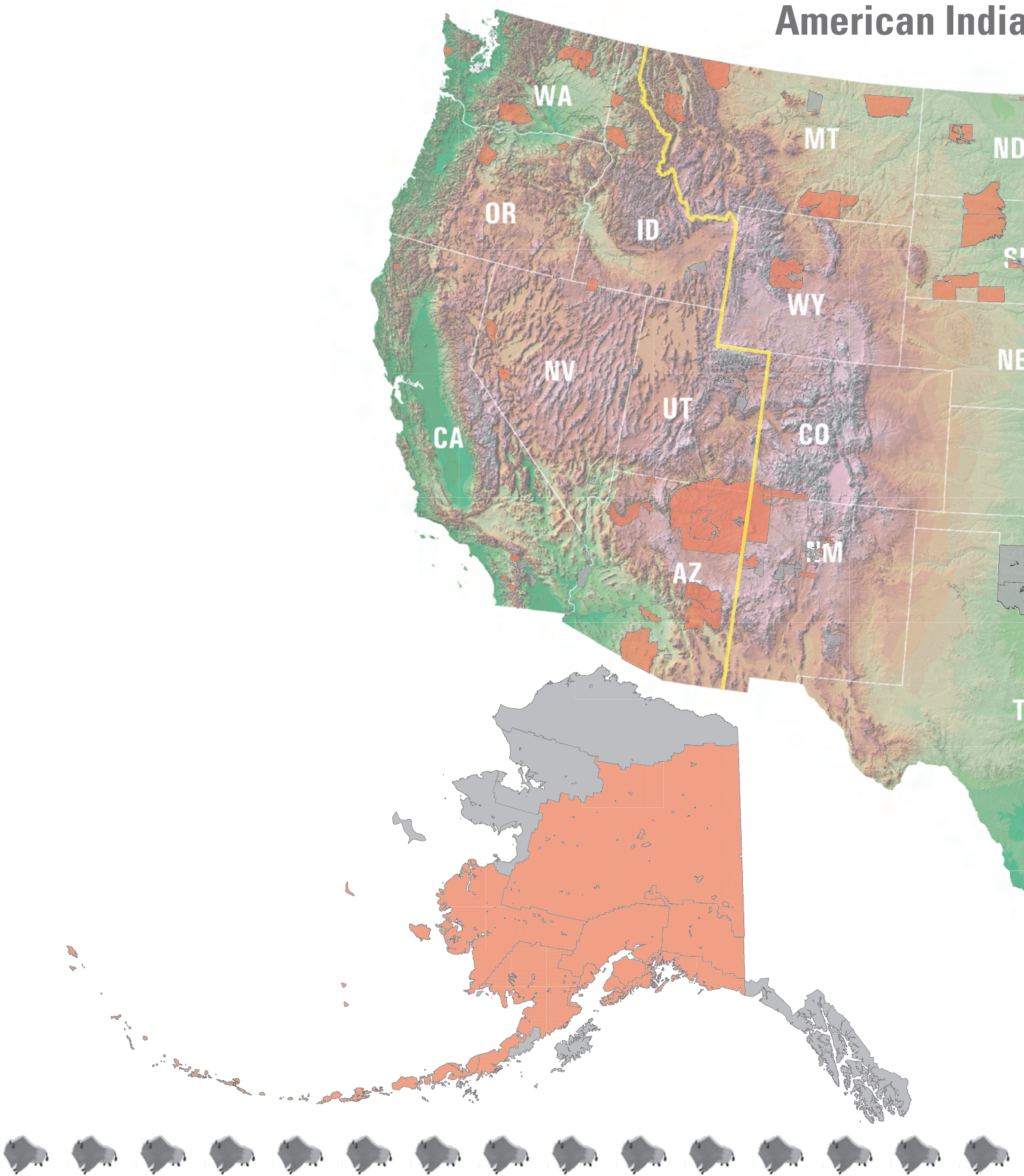
Biological Risk Assessment was warranted for fishery management actions proposed for this reach of the river. USGS expertise in sturgeon biology and familiarity with published sturgeon research assisted the Nez Perce in formulating a request for proposals to conduct a Biological Risk Assessment. Contact: James H. Petersen, 509-538-2299, jim\_petersen@usgs.gov

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

**Fallon Basalt Aquifer.** The Fallon Paiute Shoshone Tribe, the U.S. Navy, the Bureau of Reclamation, and the Nevada Division of Water Resources are cooperating with the USGS on a study to better define sources of water, controls on its use, and the water quality in the Fallon Basalt Aquifer. This aquifer is the sole source of drinking water for the Fallon Paiute Shoshone Tribe, the City of Fallon, and the Fallon Naval Air Station. All parties are concerned about the quality and availability of the water resource. The Fallon Tribe is contributing data and funding to the project and is providing access to Tribal lands for this study. Work on the Fallon Basalt Aquifer study is progressing, with a report on in-situ arsenic treatment recently published as a book chapter, "In Situ Arsenic Remediation in a Fractured, Alkaline Aquifer," by Alan H. Welch, Kenneth G Stollenwerk, Douglas K. Maurer, and Lawrence S. Feinson, in a book titled "Arsenic in Ground Water, Geochemistry and Occurrence," Alan H. Welch and Kenneth G. Stollenwerk, eds., Kluwer Academic Publishers, Boston, 2003. A report summarizing work on the potential for conjunctive use in the basalt aquifer should be published in FY 2004. That report discusses potential geochemical reactions from injection of surface water into the basalt aquifer. A new study has begun to determine the potential for formation of chlorination by products from

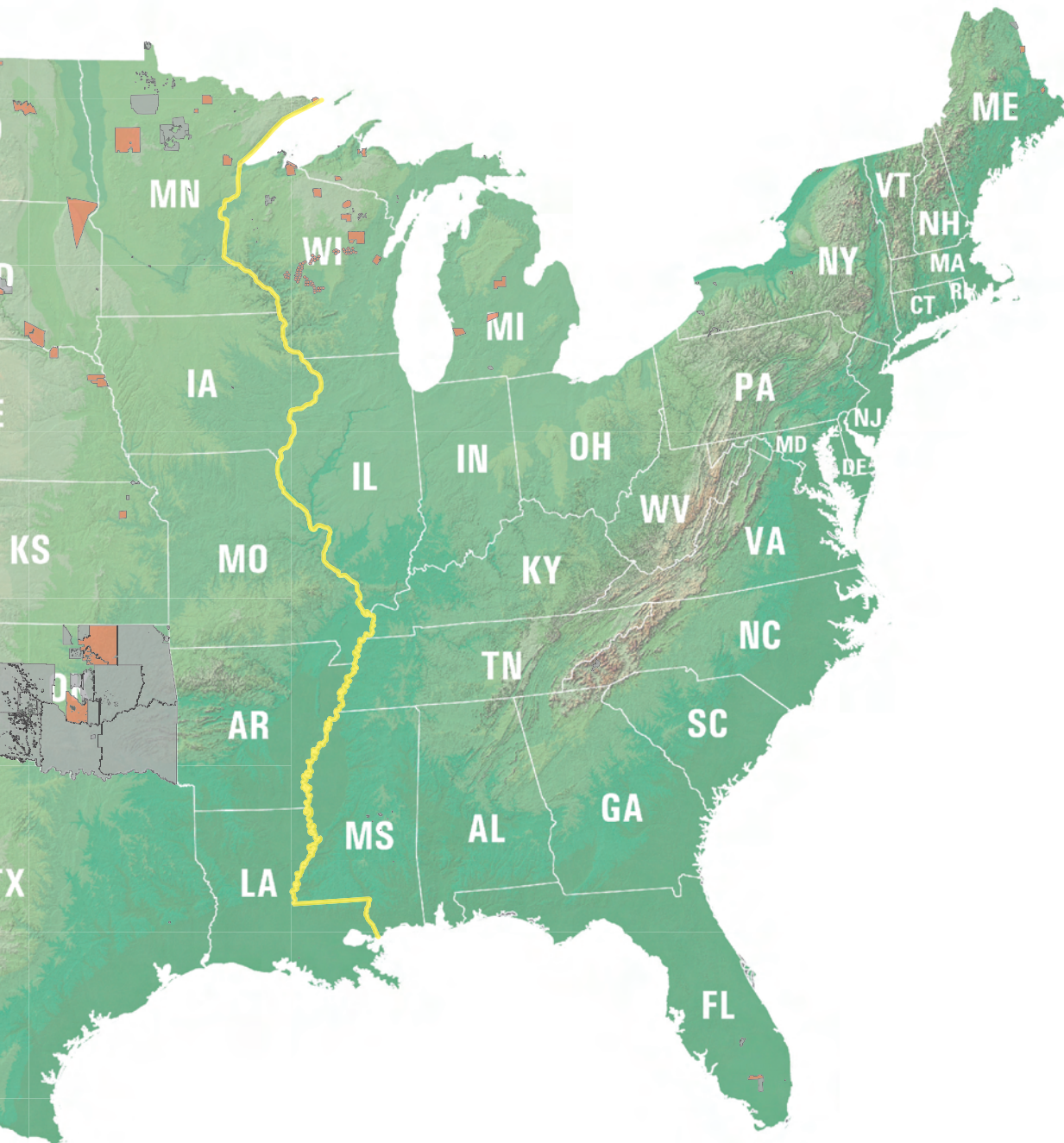





# U.S. Geological Survey American Indian





# Fiscal Year 2003 Activities on Indian/Alaska Native Lands



-  Lands With USGS Projects
-  Lands Without USGS Projects
-  Regional Boundaries



injection of treated surface water into the basalt aquifer. A summary of the results of USGS chlorination by products work is expected to be published as a USGS Fact Sheet in 2004. In addition, work to characterize the basalt aquifer by drilling deep test holes is continuing. Four holes have been drilled, with the final, fifth hole to be completed at a later time. Available data will be compiled in a report summarizing the deep test drilling. Remaining work includes developing a numerical ground-water flow model and a final report. Contact: Douglas Maurer, 775-887-7631, dkmaurer@usgs.gov

#### **Fighting Northwest Fish Disease is a Cooperative Effort.**

The USGS is assisting the Northwest Indian Fisheries Commission as well as State and Federal fisheries managers with efforts to reduce the effects of bacterial coldwater disease, a major disease affecting juvenile salmon and trout in Tribal as well as State, Federal and private sector facilities. The USGS hosted two workshops and began a small research project to improve the diagnostic methods for the disease. With the leadership of the Northwest Indian Fisheries Commission, USGS scientists are hoping to collaborate on a project involving fish health researchers at Tribal, State, Federal, private sector and university facilities, if funding support can be found. Contact: James Winton, 206-526-6587, jim\_winton@usgs.gov

#### **Transport and Fate of Bacteria and Nitrate in Ground Water, Lower Nooksack River Basin.**

The Nooksack Indian Nation wants to improve their understanding of the fate and transport of fecal coliform and nitrate contaminants as the contaminants move from agricultural fields to the ground-water system and eventually to surface-water systems in the lower Nooksack River Basin. Additional information about the extent of denitrification is also needed to provide realistic constraints on water-quality models that are used to make water-resource management decisions. In FY 2002, USGS scientists began studying the interaction between surface water and ground water in the shallow aquifer of the lower Nooksack River Basin. Stream locations where ground- and surface-water exchanges occur have been identified. A network of stations was used intermittently during FY 2003 to monitor the hydraulic gradient between ground water and surface water. Ground water and surface water have been sampled and analyzed for concentrations of *E.coli* bacteria, a suite of nutrients, and other constituents related to ground-water denitrification. A laboratory microcosm experiment was conducted to evaluate the attenuation rate of *E.coli* in stream sediments from Fishtrap Creek. Ground- and

surface-water samples will be collected over the course of a storm during FY 2004. Contact: Steve Cox, 253-428-3600 ext. 2623, secoc@usgs.gov

#### **Shallow and Airborne Trace Metal Concentrations from Lake Roosevelt.**

Lake Roosevelt is a cultural and economic resource for the Confederated Tribes of the Colville Reservation. Mining waste and other upstream activities have contaminated the lake, leading to concerns about the contamination affects on human health. The Colville Tribes want to know more about the potential threat to human health of trace metals in exposed bottom sediment from Lake Roosevelt. Lake Roosevelt is a 125-mile-long reservoir in eastern Washington State that extends from Grand Coulee Dam to near the Canadian border where the Columbia River is free flowing. During periods when the water level of the reservoir is lowered, large areas of contaminated sediment are exposed. Upon drying, the fine-grained portion of these sediments, including trace metals, becomes airborne due to high winds and can be inhaled by area residents and visitors. USGS scientists have studied two different, though related, aspects of the potential human health issues involving trace metals in fine-grained sediments: the sediment itself, prior to disturbance, and the airborne characteristics of these sediments. Sediment samples were collected to determine the concentrations of trace metals in the fine-grained sediment exposed during the spring 2001 drawdown. The results of the sediment study were published in USGS Water-Resources Investigations Report 03-4170 entitled, "Concentrations and Distribution of Slag-Related Trace Elements and Mercury in Fine-Grained Beach and Bed Sediments of Lake Roosevelt, Washington, April-May, 2001" (Majewski and others, 2003). Once airborne, the dust particles can be carried downwind various distances depending on their size and the magnitude and duration of the prevailing winds throughout the Lake Roosevelt airshed. During FY 2003, USGS scientists continued monitoring air quality at several locations along Lake Roosevelt to determine the occurrence, concentrations, distribution, and seasonal variability of selected trace elements on airborne dust particles, and, to the extent possible, the fraction of airborne trace elements originating from exposed lakebed sediments. This work will continue through FY 2004. Contact: Sue Kahle, 253-428-3600, ext. 2616, sckahle@usgs.gov

#### **Trace-Element Concentrations in Sediment Cores and Rates of Sediment Accumulation in Lake Roosevelt.**

Lake Roosevelt is a cultural and economic resource for the Confederated Tribes of the Colville Reservation. Mining waste and other upstream activities have contaminated the



lake, leading to concerns about the contamination effects on human health. Other aspects of the contamination have been studied, but very little is known about trace-element concentrations below the sediment surface. Information is also lacking about the presence and distribution of smelter-produced slag particles in the middle and lower reaches of Lake Roosevelt. In FY 2002, USGS scientists began a study in cooperation with the Colville Tribes to gather and analyze data to better understand the three-dimensional extent of trace-element contamination of the bed sediments of Lake Roosevelt. Six sediment cores were collected in slack-water sections of the reservoir. During FY 2003, selected intervals from the cores were analyzed for concentrations of selected trace elements, including arsenic, cadmium, copper, lead, mercury, and zinc. The samples were also age-dated. Slag particles identified in some of the core samples have been examined with a scanning electron microscope and a dispersive X-ray spectrometer. Sampling results were analyzed in FY 2003 and will be published during FY 2004. Contact: Steve Cox, 253-428-3600 ext. 2623, secocx@usgs.gov

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

**Water Resources of the Tulalip Tribes.** Future increases in population and development of lands of the Tulalip Tribes and neighboring areas would lead to increased pumping of ground water both on and off the Native lands. Increased pumpage may decrease baseflows of streams and could affect fish-rearing operations in the Tulalip Creek watershed. In cooperation with the Tulalip Tribes, USGS scientists are conducting a study to evaluate Tribal ground-water and surface-water resources. To date, 252 wells have been inventoried and 15 wells have been sampled. Selected streams and wells were monitored in FY 2003 for flows and water levels, respectively. The geohydrologic system has been mapped. A water budget and future ground-water

use are being evaluated. The results of this study will be published in FY 2004. Contact: Lonna Frans, 253-428-3600 ext. 2694, lmfrans@usgs.gov

**Salmon Life History.** USGS fishery biologists are continuing to assist the Skagit System Tribal Cooperative in studying the life history of chinook salmon in the Skagit River, Washington. The study is being done by Seattle City Light, Skagit System Cooperative, and the USGS, and investigates the importance of intertidal estuarine habitats in the life cycle of chinook salmon. The length of time spent in this ecosystem is determined, and the daily growth of juvenile chinook salmon measured, by studying the changes in “ear stone” (otolith) microstructure. The USGS provides staff, specialized equipment, supervision, technical assistance, and expertise in conducting the study. Contact: Lyman K. Thorsteinson, 206-526-6282, lyman\_thorsteinson@usgs.gov

**Salmon River Watershed Analysis, Quinault Indian Nation.** The Quinault Indian Nation collaborated with USGS and several other agencies to conduct an analysis of the Salmon River watershed. The Salmon River watershed covers 3 square miles of forested land, much of which has been affected by timber harvesting. The river has native runs of chinook and coho salmon, as well as steelhead trout. The Quinault Nation also operates a salmon hatchery on the river. The watershed analysis will be used to support Tribal decision-making processes in managing the river system and restoring salmon runs. Under two separate projects, the USGS led efforts for two modules—hydrology and geomorphology—of the watershed analysis. As part of the hydrology module, USGS staff measured and described low-flow discharge at selected sites on the Salmon River and correlated low-flow discharges with nearby continuous-discharge records to estimate low-flow magnitudes and recurrence intervals on the Salmon River. As part of the geomorphology module, USGS scientists investigated channel-migration processes, including interactions among channel migration, large woody debris, floodplains, and the surrounding forest. Historic channels and logjams were also mapped. The results of these studies were written as chapters of a watershed analysis that was published by the Quinault Nation in FY 2003. The USGS also published the results of the hydrology module as a separate USGS report (Watershed analysis of the Salmon River Watershed, Washington-Hydrology, USGS Water-Resources Investigations Report 03-4204, Bidlake, 2003). Contact: Bill Bidlake 253-428-3600 ext. 2641, wbidlake@usgs.gov; Jim O’Connor, 503-251-3222, oconnor@usgs.gov





**Concentrations of Dissolved Oxygen in the lower Puyallup and White Rivers.**

The Puyallup Tribe of Indians is concerned that wasteload allocations for biochemical oxygen demand and ammonia based on a modeling study conducted in the early 1990's will not protect the quality of water in the lower Puyallup and White Rivers. The USGS, in cooperation with the Tribe and the Washington State Department of Ecology, monitored concentrations of dissolved oxygen, specific conductance, temperature, and pH in the rivers during August and September 2001 and 2002. In FY 2003, the USGS published a report analyzing the 2002 data for factors that affect concentrations of dissolved oxygen in the lower Puyallup and White Rivers (Ebbert 2003). A similar report analyzing the 2001 data for the Lower Puyallup and White Rivers was published in FY 2002. The Washington State Department of Ecology will use the data to evaluate present wasteload allocations. Contact: Gary Turney, 253-428-3600 ext. 2626, [glturney@usgs.gov](mailto:glturney@usgs.gov)

**Trends in Streamflow in the lower Puyallup River Basin.**

The lower part of the Puyallup River traverses the Puyallup Indian Reservation and is an important resource to the Puyallup Tribe of Indians for direct water uses and for fish that help sustain the Tribe. To improve understanding of the river's resources, the USGS and the Tribe are conducting a cooperative study of flow trends of the Puyallup River, and are comparing those flows to regulatory in-stream flows for the river. During FY 2003, various streamflow statistics were analyzed, including annual mean discharge, monthly mean discharge for summer months, and annual minimum 7-day mean flows. Streamflow records were also evaluated to determine the fraction of time that minimum instream flows were not met. The impacts of water use were evaluated using data from USGS 5-year compilations and water rights permits. A report was drafted and will be published. Contact: Steve Sumioka, 253-428-3600, ext. 2645, [ssumioka@usgs.gov](mailto:ssumioka@usgs.gov)

**Coastal Erosion in Willapa Bay, Washington.** The USGS, the Bureau of Indian Affairs, and the Army Corps of Engineers are cooperating in a study of coastal erosion on lands of the Shoalwater Bay Indian Tribe, located in Willapa Bay, Washington. Tribal lands are rapidly eroding, increasing the frequency of flooding and the loss of valuable intertidal habitat. The joint study will allow the Tribe to make informed decisions to remedy this coastal problem. This study is benefiting from the recently completed "Southwest Washington Coastal Erosion Study" carried out by the USGS and the Washington State Department of Ecology. This cooperative project used

fundamental and applied studies to develop a regional perspective and understanding of coastal processes, sediment transport, and associated shoreline changes. The study examined the effects of man-made influences (enhanced runoff, dredging operations, Columbia River dams) and natural processes (climate variability, subsidence caused by earthquakes, coastal dune development) on sediment budgets and on the long-term shoreline change trends of the southwest Washington coast. During FY 2003, USGS scientists collected wave, current, and sediment transport data during several winter storms. The field data are being used to calibrate and test a 2-D numerical model of circulation, sediment transport, and morphological change in the estuary. The modeling is being used to help determine the spatial patterns and causes of erosion and deposition in the estuary, and will eventually be used to evaluate alternative solutions to erosion problems. Contact: Guy Gelfenbaum, 650-329-5483, [ggelfenbaum@usgs.gov](mailto:ggelfenbaum@usgs.gov)

**Ground-Water Resources of the Yakima River Basin, Confederated Tribes and Bands of the Yakama Nation.**

Surface water in the Yakima River Basin is being adjudicated. The amount of surface water available for appropriation is not known, but there are increasing demands for water for municipal, fisheries, agricultural, industrial, and recreational uses. These demands must be met by either ground-water withdrawals and/or by changes in the way water resources are allocated and used. Ongoing management of water in the basin also may be affected by rules that protect salmonid fish under the Endangered Species Act. In FY 2000, the USGS began a study of the ground-water system in the basin, in cooperation with the U.S. Bureau of Reclamation and the Washington State Department of Ecology, and working with the Confederated Tribes and Bands of the Yakama Nation. Results of the study will describe the geologic framework and ground-water flow system in the Yakima River Basin, as well as the interaction between ground water and surface water. A ground-water model will be constructed 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. As part of this project, about 2,000 wells were visited to verify locations and measure water levels. Water levels were measured five times at about 800 of these wells. Information about all inventoried wells was added to the USGS National Water Information System. Lithologic information from each inventoried well was digitally stored and is being used to construct maps of the hydrogeologic units. The interaction



of ground water and surface water along selected reaches was monitored by collecting continuous water-level and temperature data. Analysis of these data is ongoing. Historical municipal ground-water withdrawal data have been collected and compiled, and agricultural withdrawal data were collected in FY 2002 and FY 2003. Another part of the ground-water withdrawal study involves relating water rights to specific wells. Ground-water recharge was estimated for the upland, forested areas in the basin using four previously constructed watershed models, and datasets are being compiled to estimate recharge in the low-lying agricultural areas. 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. As of FY 2003, about 120 miles of river have been profiled. Contact: John Vaccaro, 253-428-3600 ext. 2620, [jvaccaro@usgs.gov](mailto:jvaccaro@usgs.gov)

**Restoration Monitoring of Satus Creek and the Satus Wildlife Area, Yakama Nation Reservation.** Agricultural return flows are known to contribute suspended sediment, nutrients, bacteria, metals, and pesticide loads to creeks and rivers in the Yakima River Basin. In particular, Satus Creek, located on lands of the Confederated Tribes and Bands of the Yakama Nation, receives loads from the North Drain return flow, resulting in increases of sediment, nutrients, bacteria, and pesticides, both in the water column and in streambed sediments. In addition, the deposition of sediment from the North Drain return flow has created barriers to the migration of fish protected under the Endangered Species Act (ESA). A large-scale restoration effort by the Yakama Nation and the Army Corps of Engineers (ACE) is being conducted to improve the aquatic ecosystem associated with Satus Creek and the Satus Wildlife Area. Several salmonids that are listed under the ESA have historically used Satus Creek for parts of their lives. In the Yakima River Basin, a large part of the production of one of these species (anadromous steelhead trout) is in Satus Creek. The Satus Wildlife Area also is an important component in the restoration of habitat for wildlife and fish in the lower Yakima River Basin. The USGS, in cooperation with the ACE, is monitoring the hydrologic, water-quality, and possibly the biologic effects of the North Satus Drain Ecosystem Restoration to identify temporal and spatial changes in the system. The USGS is also compiling selected historical data for Satus Creek, North Drain, and the local shallow ground-water system. The USGS began monitoring the current baseline conditions in FY 2002 and will continue monitoring conditions after the restoration work is completed. As of FY 2003, data have been collected at various surface-



Doug Call (USGS) conducting a mini-piezometer measurement on the Yakima River. (Photo by W. Simonds, USGS)

water and ground-water sites to identify pre-restoration concentrations of nutrients, metals, and organochlorine compounds. Fish samples from carp in the Satus Wildlife Area and bed-sediment samples at two sites were also collected and analyzed for metals and organochlorine compounds. Contact: John Vaccaro, 253-428-3600 ext. 2620, [jvaccaro@usgs.gov](mailto:jvaccaro@usgs.gov)

**Yakima River Basin Stream Quality and Biological Communities.** The lands of the Confederated Tribes and Bands of the Yakama Nation encompass more than 100,000 acres of intensively irrigated land within the Yakima River Basin. Agricultural runoff throughout the Yakima Basin, including the Yakama Nation, continues to be assessed as part of the USGS National Water Quality Assessment Program (NAWQA). Trends are being assessed by comparing water-quality data (legacy pesticides, trace elements, fecal indicator bacteria, aquatic communities of insects and algae) to similar data collected more than a decade ago in an earlier NAWQA study. The study of agricultural runoff from small watersheds includes several drainages within the Yakama Nation. NAWQA program personnel worked cooperatively with personnel from the Yakama Nation's Department of Natural Resources. Agricultural runoff was collected from a network of biological sampling sites on several small watersheds to assess the effect of different irrigation methods and agricultural practices on surface-water quality including algae and aquatic insects and their habitats. The intent of the biological assessment is to determine a threshold of agricultural activity capable of sustaining healthy aquatic communities. In addition, a ground-water sample and a surface-water sample were collected within





the basin to measure emerging contaminants, including antibiotics, other prescription and non-prescription drugs, organic-waste-water contaminants, and steroids. These chemicals may be leaching to shallow ground water from combined animal feeding operations or may be entering surface water from point and non-point sources. During FY 2003 and FY 2004, weekly water samples were and will be taken and analyzed from a series of wells and surface-water sites to provide data upon which to base a 3-D understanding of the transport of anthropogenic compounds through an agricultural system. This is one part of a national study by NAWQA (<http://wa.water.usgs.gov/projects/ccyk/>). Additional reports from studies of agricultural contaminants in the Yakima Basin as well as chemical data can be obtained at [http://oregon.usgs.gov/projs\\_dir/yakima/yakima/index.htm](http://oregon.usgs.gov/projs_dir/yakima/yakima/index.htm). Contact: Robert W. Black, 253-428-3699, [rwblack@usgs.gov](mailto:rwblack@usgs.gov); Greg Fuhrer, 503-251-3231, [gifuhrer@usgs.gov](mailto:gifuhrer@usgs.gov)

**Steelhead Restoration.** USGS fishery biologists continue cooperating with the Confederated Tribes and Bands of the Yakama Indian Nation in an effort to restore steelhead trout in the Wind River Basin in southwestern Washington State. Federal scientists and Tribal representatives worked together on a Technical Advisory Committee to the Wind River Watershed Council. For more information about this project, see the following website: <http://biology.usgs.gov/wfrc/crrlhome/windriver.html>. Contact: Jim Petersen, 509-538-2299, ext. 236, [jim\\_petersen@usgs.gov](mailto:jim_petersen@usgs.gov)

**Watershed Restoration for Reintroduction of Salmon and Steelhead.** 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 on the White Salmon River. 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 is: <http://wfrc.usgs.gov/research/fish%20populations/STPetersen2.htm>. Contact: Jim Petersen, 509-538-2299, ext. 236, [jim\\_petersen@usgs.gov](mailto:jim_petersen@usgs.gov)

**Water Management and Steelhead on National Wildlife Refuges.** USGS fishery biologists continue 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 is: <http://wfrc.usgs.gov/research/aquatic%20ecology/STPetersen13.htm>. Contact: Jim Petersen, 509-538-2299, ext. 236, [jim\\_petersen@usgs.gov](mailto:jim_petersen@usgs.gov)

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

**Pacific Lampreys.** The USGS is assisting Columbia River Treaty Tribes in their effort to study the status and needs of Pacific lamprey in the Columbia River Basin. The USGS is continuing to assist the Confederated Tribes of the Umatilla Reservation (CTUIR) in their endeavor to reestablish Pacific lampreys in the Umatilla River. USGS biologists are cooperating with the CTUIR to conduct research on several aspects of the life history and habitat needs of lampreys in the Columbia River Basin. The USGS, in cooperation with is CTUIR, investigating the olfactory sensitivity of Pacific lampreys to pheromones released by other lampreys and lampreys' use of these pheromones as a migratory cue. The USGS is cooperating



with the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) in research to examine the distribution and abundance of all lamprey species found in the Deschutes River Basin. Additional USGS research to assist these Tribes includes a study to define critical habitat needs of lamprey eggs and early larvae by conducting experiments to measure effects of temperature on these early life history stages and refining identification and aging techniques for larval lamprey. All of these projects are intended to provide information that will help the CTUIR implement their Umatilla River restoration plan. Biologists from the USGS and CTUIR have often combined resources in activities such as field collections of larval lampreys and laboratory dissections of larval lampreys for identification and aging studies. Additionally, USGS, CTUIR, and CTWSRO biologists have routinely shared information from cooperative studies. Contact: Jennifer Bayer, 509-538-2299, ext. 299, [jennifer\\_bayer@usgs.gov](mailto:jennifer_bayer@usgs.gov)

**Umatilla Basin Ground-Water Study Planning.** The Confederated Tribes of the Umatilla Indian Reservation, Oregon Water Resources Department (OWRD), and USGS continued to plan an investigation of the ground-water resources in the Umatilla Basin with special focus on ground-water/surface-water interaction. Basic data collection of continuous water levels in selected wells was initiated by the three cooperating agencies in FY 2003. The Columbia River Basalt Aquifer can produce large quantities of water and underlies the Umatilla Basin; however, the storage capacity of the basalts is limited. As a result, water levels in the aquifer are declining in many parts of the basin and there is concern about the impact of these changes to the hydrologic system on discharge to streams. Recent meetings between the Tribes, OWRD, and USGS have started the process of developing a detailed scope of work for the comprehensive ground-water investigation in the basin. Contact: Bill McFarland, 503-251-3204, [billmcf@usgs.gov](mailto:billmcf@usgs.gov)

**Spring Chinook Salmon on the Deschutes River, Oregon.** USGS fishery biologists continue cooperating with the Confederated Tribes of the Warm Springs Reservation in the third year of a study on the Deschutes River in Oregon. The study will help to determine the distribution, migration behavior, habitat use, and species interactions of juvenile spring Chinook salmon raised in hatcheries and released in the fall on the Deschutes River. Juvenile spring Chinook salmon are tagged with radio transmitters and then tracked throughout the lower Deschutes River as they migrate downstream from the Warm Springs National Fish

Hatchery. Information from the tracking devices will help determine the winter locations of juvenile salmon released during fall and how they might impact wild salmon in the Deschutes River. Working together, scientists from the Confederated Tribes of the Warm Springs Reservation and the USGS are sharing the responsibilities for trapping, tagging, tracking, and instream sampling during this study. Contact: Jim Petersen, 509-538-2299, ext. 236, [jim\\_petersen@usgs.gov](mailto:jim_petersen@usgs.gov)

**Geomorphology of the Deschutes River, Oregon.** The results of this project, which was completed in FY 2003, describe the geologic and geomorphic context of the Deschutes River system in a way that helps evaluate the effects of the Pelton–Round Butte hydroelectric complex on downstream channel morphology. Portland General Electric and the Confederated Tribes of the Warm Springs Reservation are currently applying jointly to the Federal Energy Regulatory Commission for relicensing of the hydroelectric complex. Results of the USGS study were published in 2003: O’Connor, J.E., and Grant, G.E., eds., 2003, A peculiar river: Geology, geomorphology, and hydrology of the Deschutes River, Oregon: American Geophysical Union Water Science and Application Series, no. 7, 220 p. Contact: Jim O’Connor, 503-251-3222, [occonnor@usgs.gov](mailto:occonnor@usgs.gov)

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

**Quantifying the Ground-Water Resources of the Upper Klamath Basin, Oregon and California.** Ground water has long been considered a possible source to meet the increasing demands for water in the upper Klamath Basin. A quantitative understanding of the regional ground-



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

**Anadromous Fishery Restoration.** In 2003, USGS ecologists participated in the Trinity River Restoration Program (cooperating with the Yurok and Hoopa Valley Tribes) and the Klamath River Basin Anadromous Fishery Restoration Program (cooperating with the Yurok and Karuk Tribes). The U.S. Department of the Interior's lead bureau for coordinating on-the-water sampling of adult and young-of-year salmon and their habitat was the U.S. Fish and Wildlife Service's Arcata (California) office. The USGS collaborated with design and implementation of the sampling. The sampling data from the past 7 years are being analyzed to improve the Klamath River System Impact Assessment Model (SIAM). This was the first year of renewed data collection to improve the Trinity River young-of-year salmon production model (SALMOD) since the Trinity River Flow Evaluation Study was completed. The goal for both models is to provide a better understanding of water quantity and habitat problems that limit salmonid production. SIAM is available at <http://www.fort.usgs.gov/products/software/siam/siam.asp> as is the user's guide. Contact: Dave Hamilton, 970-226-9383, dave\_hamilton@usgs.gov

**Amphibian Surveys on Tribal Lands in California.** USGS scientists from the Western Ecological Research Center worked with the Morongo Band of Mission Indians and the Agua Caliente Band of Cahuilla Indians in summer 2003. The biologists conducted surveys for mountain yellow-legged frogs and red-legged frogs and assessed

habitat suitability for these species on Tribal lands in the San Bernardino and San Jacinto Mountains. Neither of the target species was found on Tribal lands, however, during one part of the study a new cultural site was identified and recorded. Contact: Robert N. Fisher, 858-637-6882, rfisher@usgs.gov

**Water-Quality Sampling of the Taku River.** The Douglas Indian Association (DIA), the Alaska Department of Environmental Conservation, and the USGS completed the final year of data collection as part of a 5-year cooperative water-quality project to establish baseline water-quality data for the Taku River, an important salmon fishery. Although the watershed is undeveloped, a new mine is proposed in the watershed on the Canadian side of the border. The Taku River also is subject to glacial outburst floods that affect the River's water quality. The USGS is conducting the field sampling and the U.S. Environmental Protection Agency is analyzing the samples. The DIA has provided an intern to assist USGS researchers with the sampling for part of the project. During FY 2003, USGS scientists continued working with the Water Survey of Canada and the Canadian part of the DIA by providing logistical support and discharge measurements for the collection of water-quality samples on the Taku River and several of its tributaries on the Canadian side of the border. Contact: Bruce Bigelow, 907-586-7287, bbigelow@usgs.gov

**Stream Gaging of Sinona Creek.** The USGS operates a streamflow-monitoring station on Sinona Creek near Chistochina for the Cheesh'Na Tribal Council. Sinona Creek is an important subsistence fishery. Tribal members have noticed a marked decrease in streamflow the past few years. USGS hydrologists provided training to tribal members in measurement of streamflow. Contact: Steven Frenzel, 907-786-7100, sfrenzel@usgs.gov

**Geologic Mapping near Tanacross, AK.** Surficial geologic mapping by the USGS is underway along a section of the Alaska Highway near Tanacross, Alaska. A high-pressure natural gas pipeline route is proposed to run parallel to the highway from Fairbanks to the Yukon. The map will provide information for land-use decisions along the proposed route. The Tanacross Corporation owns about 25 percent of the land being mapped by this project. Results of the mapping will be shared with the Tanacross Tribal Council and the map can be used by the Tribe to identify economic gravel resources and permafrost areas. Contact: Paul Carrara, 303-236-1287, pcarrara@usgs.gov





**Aniak Mining District Geologic Map Compilation.** The USGS is cooperating with the Bureau of Land Management (BLM) on a five-year regional study in southwest Alaska that will benefit two Alaska Native Regional Corporations—Calista and Doyon. BLM's Aniak Mining District study encompasses 360,000 km<sup>2</sup> of Federal, State, and Native Corporation land in an area of past gold and mercury production that may contain additional undiscovered gold and other resources. The USGS brings local expertise to the cooperative project, having previously performed 1:250,000-scale geologic mapping and assessment of undiscovered resources for about one-half of the area. The USGS has compiled a geologic map of the mining district as an underlay for the BLM studies. In FY 2003, BLM released the results from a 1000-mi<sup>2</sup> geophysical survey in the center of the mining district. The geophysical survey was published by the State of Alaska Department of Natural Resources. The USGS will assist in interpreting these data and will incorporate new information into the geologic compilation. Contact: Marti L. Miller, 907-786-7437, mlmiller@usgs.gov

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

**Geochemical Landscape of Alaska Native Corporation Lands.** Geologists from the USGS have developed collaborative plans with Alaska Native Corporations to conduct projects with the goal of understanding the geochemical landscape (that is, the spatial variations in the distribution of chemical elements within media such as stream sediment and soil) of Native and adjacent lands. The study areas comprise the southwestern quadrant of Alaska, including the Aleutian Islands. Part of the project includes collecting one sample per 289 km<sup>2</sup> (10 km by 10 km grid cell) and analyzing each sample for 43 chemical elements of both geological and environmental significance (such as mercury, arsenic, and selenium). Geologists from the Calista Corporation and the Bristol Bay Native

Corporation participated in acquiring samples for analysis. Sampling was completed in the Bristol Bay, Calista, and adjacent areas in 2003. The samples collected in FY 2003 will be chemically analyzed. Data will become part of the National Geochemical Survey and will be available on the web at: <http://tin.er.usgs.gov/geochem/doc/home.htm>. The geochemical data will be used to create interpretive derivative maps involving watersheds, lithologies, geology, mineral deposits, and political boundaries. The products of the project are designed to assist the Native Corporations in managing their lands. Contact: Andrew E. Grosz, 703-648-6314, agrosz@usgs.gov

### **Sulfide Oxidation, Metal Fluxes, and Biological Impacts in Coastal Environments of Prince William Sound, Alaska.**

A reconnaissance investigation was initiated to better understand the fate of sulfide-rich debris distributed along shorelines in Prince William Sound, Alaska. This material is related to mining activities conducted close to shorelines in the region during the early twentieth century. Specifically, the extent of metal-sulfide oxidation, acid generation, and metal fluxes within the transitional zone needed to be delineated to identify potential human and environmental impacts including nearshore areas below the mine sites and extending across the intertidal zone into shallow subtidal areas offshore. Samples of sulfide-bearing ore and waste, surface water, and sediment were collected from mine workings, drainages below mines and mine dumps, the mixing zone between ground water and seawater in subsurface beach gravels, and offshore. The resulting observations and analytical data provide



The intertidal zone at the Ellamar mine site, Prince William Sound. The oxidation of sulfide debris in beach gravels (foreground) results in acidic subsurface water containing metals such as iron, copper, zinc, lead, and cadmium in solution. (Photo by R. Koski)

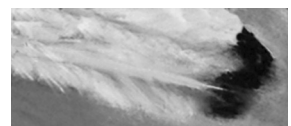
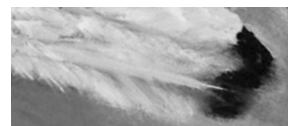


evidence that plumes of acidic, metal-rich water resulting from sulfide oxidation are entering the intertidal zone at two sites (Ellamar and Threeman). Additional studies, in collaboration with USGS biologists and the University of Alaska-Anchorage, are planned for these two sites and a much larger mine site on Latouche Island. These studies will focus on the extent of these plumes and the impact of metal fluxes on aquatic organisms and habitat in the intertidal and offshore marine environments. The USGS contacted Alaska Native corporations to obtain permission for access to mine areas and also provided briefings on the research results. 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 has 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. The USGS will continue to work closely with the Native corporations as additional work is planned. Contact: Randy Koski, 650-329-5499, rkoski@usgs.gov

**Mapping Sensitive Islands in the Bering Sea.** The USGS and the National Oceanic and Atmospheric Administration's (NOAA) Office of Response and Restoration have completed a mapping project for the Pribilof Islands of Alaska. Saint George and Saint Paul are the only two inhabited islands in the volcanic Pribilof archipelago. The Pribilofs are located in the Bering Sea approximately 770 air miles southwest of Anchorage, Alaska, and 250 miles north of the Aleutian Islands. These two tiny islands are home to the world's largest community of Aleut people. The maps and digital data from this project will be used for restoring the environmental integrity of the islands along with identifying and protecting sensitive habitat areas of migratory birds and marine mammals. The data are also being shared with the Native communities on the islands for land use, economic development analysis, and natural resource management. A concerted effort was undertaken by the local residents to identify the original Aleut names for various geographic features on both islands. Organizations contacted by USGS personnel included: Aleut Community of Saint Paul Island, Tribal Government Ecosystem Conservation Office (St. Paul); the Tribal Government of Saint Paul Island; Tanadgusix Corporation (Saint Paul); the Saint George Traditional Council, and the Saint George Tanaq Corporation. This effort will help to acknowledge and preserve the historical and linguistic importance of the Aleut language. The

Alaska Historical Commission along with the U.S. Board of Geographic Names concurred on the significance of this innovative approach. The local names were provided to the USGS for incorporation into the final four 1:25,000-scale map products with many of the geographic features on both islands are labeled in English and Aleut. Contact: A.C. Brown, 907-786-7002, acbrown2@usgs.gov

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





# Technical Assistance





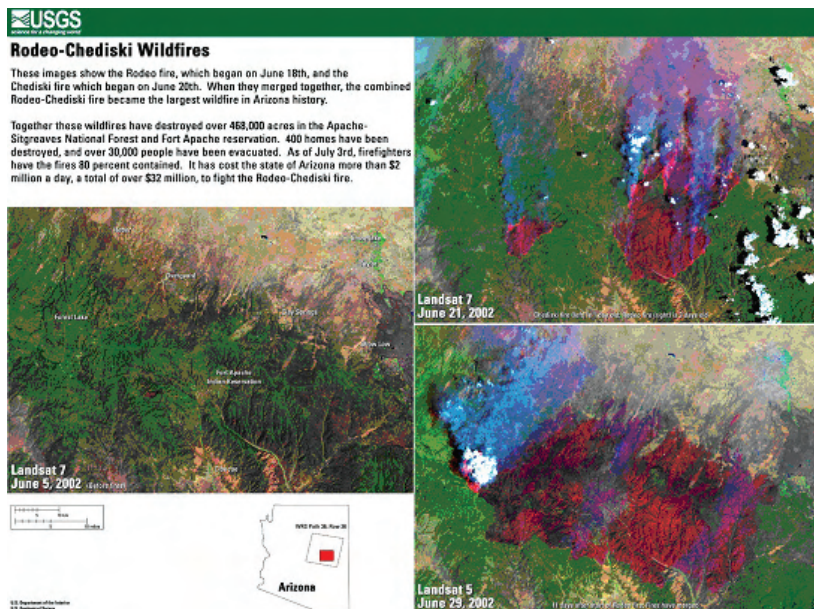
# Technical Assistance

**Diagnostic Services.** The USGS National Wildlife Health Center (NWHC) provided diagnostic services to several Tribal organizations in 2003. Tissues from white-tailed deer, collected by the Lower Brule Sioux Tribal biologists, were specifically collected and submitted to the USGS Center as part of a chronic wasting disease (CWD) surveillance effort by the tribal wildlife managers. There has been no documented occurrence of CWD on or near the Lower Brule Reservation. However, the Tribe was being proactive in beginning to monitor their big game populations for this high profile disease that has been documented in free-ranging and captive wild cervids in other areas of South Dakota. Bald eagles were submitted to the NWHC by the Confederated Tribes of the Warm Springs Reservation and from Tribal lands in Fluvanna County area of Virginia via the Wildlife Center (wildlife rehabilitators) in Virginia. The bald eagle from the Warm Springs Reservation was found dead whereas the bald eagle from Virginia was found alive on Tribal lands and died later at the Wildlife Center of Virginia. Both of these birds were submitted for diagnostic investigation in order to determine the cause of death. The Maniilaq Association of Alaska submitted a snow goose through the USFWS Selawik National Wildlife Refuge. The snow goose was collected by a Native subsistence hunter in Alaska and judged to be in abnormally poor body condition. The

Tribal biologists submitted the bird the USGS Center to determine if there was a disease agent responsible for the poor body condition. Contact: Scott Wright, 608-270-2460, swright@usgs.gov

## USGS Information Helps Fire Management on Tribal Lands.

The USGS EROS Data Center (EDC) provided imagery and analyses to assist Federal and non-federal resource managers who form Burned Area Emergency Response (BAER) teams in response to wildfires. In FY 2003, the EDC responded to requests for these services due to fires on seven Native American reservations. The EDC staff obtained satellite images of the area before, during, and after the fire. The staff then generated an estimate of burn severity by comparing the pre- and post-fire images. The resulting EDC preliminary burn severity map and associated pre- and post-fire satellite images are provided to the BAER team for immediate use in generating their official and final soils burn severity map. The BAER team verified the USGS data in the field and added local expert knowledge when available. The BAER team then revised the maps based on the local data. This final soils burn severity map was used to develop many of the subsequent BAER team's 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, 605-594-2745, rmckinley@usgs.gov



Satellite images of the Rodeo-Chediski wildfires in Arizona, the lands of the White Mountain Apache Tribe. USGS provided imagery to help firefighters control wildfires. (Imagery by the USGS EROS Data Center).



## FY 2003 DOI BAER Team Support for Wildland Fire Burn Mapping

Fire Name	Reservation	Tribe	Date	Approx. Acres
Rattlesnake Canyon	Colville (WA)	Colville Tribe	7/9/2003	10,600
Encebado	Taos (NM)	Pueblo of Taos	7/11/2003	5,400
Kinishba	Fort Apache (AZ)	White Mtn. Apache Tribe	7/18/2003	24,500
Molina*	Nambe (NM)	Pueblo of Nambe	7/20/2003	7,240
McGinnis Flats	Colville (WA)	Confederated Tribes of the Colville Reservation	7/25/2003	2,245
Balcony House	Ute Mountain (CO)	Ute Mountain Tribe	7/29/2003	2,750
Windmill Complex, Craig II, others	Crow & Northern Cheyenne (MT)	Crow & Northern Cheyenne Tribes of MT	8/25/2003	40,000
			<b>Total</b>	<b>92,735</b>

\*Note that no suitable imagery was acquired for the Molina fire although several Landsat and ASTER attempts were analyzed.

**Stream Gaging on the Meduxnekeag River.** The Houlton Band of Maliseet Indians and the USGS began a cooperative stream-gaging project on the Meduxnekeag River in Maine. Two continuous, real-time river-flow gages were installed on the Meduxnekeag River to complement ongoing collaborative water-quality projects. Contact: Greg Stewart, 207-622-8205, Ext. 118, gstewart@usgs.gov

**Surface-Water Gaging Station and Temperature Probe, Keweenaw Bay Indian Community.** In September 2001, the USGS installed a continuous-data stream-gaging station on the Silver River, which is tributary to Lake Superior, in a cooperative project with the Keweenaw Bay Indian Community Environmental Department. Data from the stream gage are available on a real-time basis. A real-time water temperature gage was added to the site in May 2002. The Keweenaw Bay Indian Community and other interested parties are currently investigating installation and operation of another continuous data stream-gaging station on the Falls River, which drains about 45 mi<sup>2</sup> adjacent to the Silver River Basin and also flows into L'Anse Bay on Lake Superior. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Water-Resources Investigation for the Lac Vieux Desert Band of Lake Superior Chippewa Indians.** In FY 2002, the USGS and the Lac Vieux Desert Band of Lake Superior Chippewa Indians began a cooperative four-year study of surface-water quality and basin characteristics of Lac Vieux Desert. The 6.6 mi<sup>2</sup> lake straddles the Michigan–Wisconsin

border and is the headwaters of the Wisconsin River. In May and September 2002 and 2003, seven sites on the lake were sampled for a suite of physical parameters and chemical constituents to help USGS and Tribal scientists determine the general water quality and health of the 34 mi<sup>2</sup> lake basin. Streamflow measurements were made of all tributaries to the lake as well as outflow into the Wisconsin River. Activities for FY 2004 will include continued operation of the gaging station on Lac Vieux Desert and the Wisconsin River at the lake outlet, collection and analysis of spring or summer water-quality samples of the lake, analysis of ground-water/surface-water interaction within the lake basin, and determination of a water budget for the lake basin. A report summarizing data collection and other hydrologic information that will assist Tribal and non-Tribal planning will be produced in FY 2004. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Nottawaseppi Huron Band of Potawatomi Water Issues.** Little is known about surface- and ground-water resources beneath the lands of the Nottawaseppi Huron Band of Potawatomi. Tribal members living on the Reservation depend upon domestic water from fairly shallow wells completed in unconsolidated glacial and lacustrine deposits. Three small tributaries of the St. Joseph River system pass through agricultural land prior to crossing the Reservation. In FY 2000, a four-year cooperative agreement was implemented between the Tribe and the USGS. The study investigated water quantity and quality of streams near the Reservation and agricultural pesticides



in ground-water wells. USGS and Tribal environmental staff worked cooperatively on several aspects of the data collection effort. During FY 2004, a report will be completed, summarizing data collection activities and other hydrologic information that will assist Tribal planning efforts. Tribal planners and environmental staff will continue to be challenged by water management options concerning housing development and widespread agricultural activities. The USGS report recommended future hydrologic studies to inform Tribal decisions affecting water quality and availability. Contact: Tom Weaver, 906-786-0714, [tlweaver@usgs.gov](mailto:tlweaver@usgs.gov)

### **Bad River Streamflow, Sedimentation, and Erosion Study.**

The major objective of this study is to understand how streamflow, erosion, and sedimentation rates have changed in the Bad River and some of its key tributaries over time due to changes in land cover. It is not known if erosion and sedimentation are exceeding natural rates. The study began in FY 2002 in cooperation with the Bad River Band of Lake Superior Chippewa Indians. Streamflow data from a long-term gaging station in the reservation was statistically analyzed for trends in peak and mean monthly flows. These data indicated that snowmelt runoff events are occurring earlier in the spring. Several large floods have occurred over the last 10 years. Erosion and sedimentation hot spots were identified by analysis of a series of historical aerial photographs. In FY 2003, valley transects were constructed in key reaches with dominant processes of erosion, lateral migration, and sedimentation. Cores were collected along the valley transects and analyzed for sedimentation rates. Contact: Faith Fitzpatrick, 608-821-3818, [fafitzpa@usgs.gov](mailto:fafitzpa@usgs.gov); Bad River Contact: Kirsten Cahow, 715-682-7123, [brwater@badriver.com](mailto:brwater@badriver.com)



Coring site along the Bad River near its mouth. Sediment core is held by Kirsten Cahow, Bad River Band. (Photo by Faith Fitzpatrick, USGS)

**Ho-Chunk Water Quality.** The USGS is assisting the Ho-Chunk Nation by assessing the hydrology and water quality of the streams on, and in close proximity to, Ho-Chunk lands. A USGS report entitled, “Surface-Water-Resource Information for the Ho-Chunk Nation Lands and Vicinity, Wisconsin,” by M.W. Diebel and D.J. Sullivan, was published in FY 2003 (USGS Water-Resources Investigation Report 02-4307). The report included an analysis of existing information on chemical, physical, and biological investigations. Water-quality and biologic data collection was completed in FY 2003 at the Ho-Chunk Nation sites. Fish and benthic invertebrate samples were collected at sites that had not been sampled in FY 2002. Contact: Judith Coffman Thomas, 608-821-3814, [juthomas@usgs.gov](mailto:juthomas@usgs.gov); Randy Poelma (Ho-Chunk Nation), 800-944-1652, [Rpoelma@ho-chunk.com](mailto:Rpoelma@ho-chunk.com)

### **Neopit Mill Pond Sedimentation And Sediment Chemistry Study.**

The Menominee Indian Tribe of Wisconsin cooperated with the USGS on a study of sedimentation characteristics in Neopit Mill Pond, which was formed by damming the West Branch of the Wolf River. The USGS 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. An Open-File Report 03-23 was prepared and printed in 2003. Additional sediment chemistry sampling is scheduled for 2004. Contacts: Faith Fitzpatrick, 608-821-3818, [fafitzpa@usgs.gov](mailto:fafitzpa@usgs.gov); Doug Cox (Menominee Indian Tribe of Wisconsin), 715-799-4937, [dcox@itol.com](mailto:dcox@itol.com)

### **Historical Trends in Streamflow, Sedimentation Rates, and Sediment Trace Element Concentrations Associated with the Wolf River, Keshena Falls to Balsam Row Dam.**

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





**Simulation of Shallow Ground-Water Flow for the Menominee Indian Tribe of Wisconsin, Using Analytic Element Modeling.**

The Menominee Indian Tribe of Wisconsin is interested in furthering their understanding of the regional hydrogeology on their lands, including hydrogeologic controls on regional and local ground-water flow. The Tribe also has specific interest in determining the areas of recharge that contribute water to municipal wells in five small communities on the Reservation. To assist the Menominee Indian Tribe, the USGS constructed a single-layer analytic-element (AE) ground-water-flow model covering all of the Menominee Reservation. The calibrated AE ground-water model was used to characterize regional ground-water flow across the Reservation and to delineate the area of recharge to community wells for 5-, 10-, and 100-year times of travel. The results of this study will provide the Tribe with the necessary information to prepare a well-head protection strategy for community wells that will help ensure safe drinking water for its citizens. The AE ground-water-flow model was also used in FY 2003 to assist the Tribe in choosing the site of a new municipal well for the town of Keshena. Model simulations were used to identify locations that would provide sufficient water supply and have recharge areas within undeveloped Tribal lands. Publication of a USGS Water-Resources Investigation Report entitled, "Simulation of Shallow Ground-Water Flow on the Menominee Indian Reservation, Wisconsin, Using Analytic Element Modeling" is expected in FY 2004. Contact: Charles Dunning, 608-821-3827, cdunning@usgs.gov; Gary Schuettelz (Menominee Indian Tribe of Wisconsin), 715-799-4937, gschuett@mail.wiscnet.net

**Simulation of Shallow Ground-Water Flow for the Stockbridge-Munsee Indian Band of Mohican Indians, Using Analytic Element Modeling.**

The Stockbridge-Munsee Band of Mohican Indians is interested in furthering their understanding of the regional hydrogeology on their lands, and how that controls shallow ground-water flow. The Tribe is specifically interested in shallow ground-water flow in the Red Springs area, where farm land will be developed for residential neighborhoods over the next several years. The Tribe has concerns that past farming practices may adversely affect water quality in private wells. To assist the Stockbridge-Munsee Tribe, the USGS constructed a single-layer analytic element (AE) groundwater model, the near-field of which covers all of the Stockbridge-Munsee Reservation. The calibrated AE groundwater model was used to characterize regional groundwater flow across the Reservation, and to simulate groundwater flow paths at specific locations of interest

in the Red Springs area. The results of this study are directly relevant to the Tribe as they formulate their well-head protection strategy, providing safe drinking water in community wells, and manage residential development. The AE ground-water-flow model has also been used during FY 2003 to assist the Tribe in choosing a site for a new municipal well for Tribal properties along County Road A, including their Health Center and the Casino. Model simulations were used to identify locations that would provide sufficient water supply and whose recharge areas were within undeveloped Tribal lands. Publication of a USGS Water-Resources Investigation Report entitled, "Simulation of Shallow Ground-Water Flow on the Stockbridge-Munsee Indian Reservation, Wisconsin, Using Analytic Element Modeling" is expected in FY 2004. Contact: Charles Dunning, 608-821-3827, cdunning@usgs.gov; Greg Bunker (Stockbridge-Munsee Indian Tribe of Wisconsin), 715-793-5118, gbunker@frontiernet.net

**Oneida Hydrologic Investigations.** The objectives of this cooperative project with the Oneida Tribe of Wisconsin are to collect long-term water-quality 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 Richard, 608-821-3861, krichard@usgs.gov; 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.**

The Ho-Chunk Nation expects considerable growth in the Indian Mission and Sand Pillow communities, Jackson County, Wisconsin. As a result of new housing and community construction, and planned expansion of the Ho Chunk casino and hotel, projected demand for water in 5 years is 114,000 gallons per day (gal/d). In 20 years, projected demand is 216,000 gal/d. 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. Wells in this area have been completed in three different aquifers: crystalline bedrock, sandstone bedrock, and unconsolidated sands and clays. A field geologic investigation and evaluation of existing well and geological data were used to provide input 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. Monitoring wells have been



installed at selected locations and water-quality evaluation is underway. Contact: Charles Dunning, 608-821-3827, [cdunning@usgs.gov](mailto:cdunning@usgs.gov); James Dunning (Ho-Chunk Nation Office of Environmental Health), 715-284-7548, [jdunning@ho-chunk.com](mailto:jdunning@ho-chunk.com)

**Real-Time Lake Stage Monitoring for the Prairie Island Indian Community.** The Prairie Island Indian Community and the USGS have installed two real-time lake stage monitors. The Community is concerned about stage fluctuations and flooding in Sturgeon Lake that may affect the tribal residences and pleasure boat traffic adjacent to the Community. Contact: Don Hansen, 763-783-3250, [dshansen@usgs.gov](mailto:dshansen@usgs.gov)

**Spirit Lake Nation Wetlands Ecology.** USGS biologists are assisting staff of the Spirit Lake Nation's Tribal EPA Office in developing and implementing a biological assessment system to monitor the condition of wetlands on Tribal lands. This effort includes classroom and field workshops on biological monitoring techniques for Tribal staff. Additionally, USGS biologists are providing onsite assistance needed to select wetlands to monitor and implement the biological assessments of plant, invertebrate, and amphibian communities of Tribal wetlands. Contact: Ned H. Euliss, Jr., 701-253-5564, [ned\\_Euliss@usgs.gov](mailto:ned_Euliss@usgs.gov)

**Spirit Lake Tribe Capacity Building.** The USGS provides Spirit Lake Tribal staff technical assistance and quality assurance regarding the collection, processing, and shipping of water-quality samples. The Tribe has their water-quality samples processed by the USGS National Water Quality Laboratory. Contact: Douglas G. Emerson, 701-250-7402, [demerson@usgs.gov](mailto:demerson@usgs.gov)

**Online Geographic Information Systems Course at Sinte Gleska University.** Sinte Gleska University (SGU) and the USGS signed a Memorandum of Understanding in 2000 to cooperatively improve science education for Native American students. During 2003, the partnership resulted in the creation and maintenance of an online course, Lakota Studies 400, Introduction to Geographic Systems, (GIS). SGU endorsed this online course as part of its long-term goal of establishing the University as a center of excellence for spatial analysis. The course includes spatial data, readings, and laboratory exercises in population, land use, natural hazards, business climate, site selection, and other topics, using the power of spatial analysis. The online course is available at <http://rockyweb.cr.usgs.gov/public/outreach/sgu/sugis.html>. Contact: Joseph Kerski, 303-202-4315, [jjkerski@usgs.gov](mailto:jjkerski@usgs.gov); James Rattling Leaf, (SGU), 605-856-4262, [jamesrl@sinte.edu](mailto:jamesrl@sinte.edu)

**Capacity Building With the Osage Nation.** The USGS conducted a three-day introductory course on field water-quality methods for surface water for the Osage Nation Environmental Staff in September 2003. The course included discussions on site selection, proper sampling equipment, equipment cleaning, field forms and checklists, surface-water sampling theory, field parameters, and microbiology. The final day of the course included a field trip to a surface-water site where the Osage members practiced collecting field parameters, collected water-quality samples and a stream discharge measurement, and processed the samples. Contact: Kelli DeHay, 918-254-6651, [kdehay@usgs.gov](mailto:kdehay@usgs.gov)

**Navajo Surface Water Project.** 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 streamflow-gaging stations. The USGS is providing technical assistance to Navajo hydrologists and technicians by populating databases with hydrologic data to compute and store streamflow data. USGS scientists also are training Navajo personnel to compute records and develop rating curves. Additionally, USGS personnel are providing quality assurance for the project. The USGS currently operates two streamflow gages in cooperation with the Navajo Nation to provide near-real-time hydrologic data and to provide training opportunities to Tribal personnel. Contact: Gregory G. Fisk, 520-556-7225, [gdfisk@usgs.gov](mailto:gdfisk@usgs.gov)

**Navajo Wetlands.** USGS scientists continue studying the effectiveness of a constructed wetland built to improve the quality of the wastewater from the community of Piñon, Navajo Nation, for reuse and/or discharge. In addition to improving water quality, this wetland was designed to provide wildlife habitat that is scarce in the area. This is a cooperative effort among the Navajo Nation, the Indian Health Service, the Bureau of Reclamation, and the USGS. Besides collecting water-quality data at this site annually since 1999, the group has been collecting sediments, vegetation, and macroinvertebrates annually for bioaccumulation studies of certain chemical elements. Results from this research will provide information on how and when to build additional treatment wetland cells for further development in the Piñon area and in other remote locations within the arid Southwest. Sampling was done during July 2003, but due to a local construction project requiring the use of the wetland water, the fall 2003 sampling was postponed. Assuming the wetland will be in full operation throughout 2004, summer and fall sampling



are planned. Contact: Joan Thullen, 303-445-2212, joan\_thullen@usgs.gov; James Sartoris, 303-445-2230, james\_j\_sartoris@usgs.gov

**Hualapai Water Monitoring Program.** The USGS is cooperating with the Hualapai Tribe by providing technical assistance and on-site training to Hualapai personnel with their water-resources monitoring program. USGS personnel trained the Tribal hydrologic technician to collect sediment data and measure streamflow. The Tribal technician also was trained to properly and safely use a cableway, located at the Colorado River above the Diamond Creek gage. Contact: Robert J. Hart, 928-556-7137, bhart@usgs.gov; Gregory G. Fisk, 928-556-7225, ggfisk@usgs.gov

**Hopi Water Monitoring Program.** The USGS 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; Gregory G. Fisk, 928-556-7225, ggfisk@usgs.gov

**White Mountain Apache Stream-Gaging Cooperation.** The White Mountain Apache Tribe permitted USGS staff to access stream gages on Tribal lands under the terms of an Intergovernmental Agreement. USGS staff provided training to White Mountain Apache Tribal staff in water-quality and surface-water data collection techniques. The USGS staff are also providing technical assistance and training on the USGS Automated Data Processing System (ADAPS), used to manage hydrologic data. Contact: Christopher Smith, 520-670-6671 ext. 251, cfsmith@usgs.gov

**Yavapai-Prescott Water Monitoring Program.** The USGS continues to cooperate with the Yavapai-Prescott Indian Tribe by providing technical assistance and training to Yavapai-Prescott personnel with their water-resources monitoring program. During FY 2003, the Tribe began operating and maintaining a crest-stage gage network following training with the USGS staff. This activity demonstrates successful collaboration that enhances Tribal capabilities. The USGS also provided technical assistance with well-log interpretations for ground-water wells and measuring ground-water levels on Yavapai-Prescott lands. 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 USEPA water-quality standards. Contact: Robert J. Hart, 928-556-7137, bhart@usgs.gov; Gregory G. Fisk, 928-556-7225, ggfisk@usgs.gov

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

**Restoration of the Elwha River Ecosystem.** Scientists from the USGS are providing technical advice to the National Park Service (NPS) and the Lower Elwha Tribal Community of the Lower Elwha Reservation on restoration of the Elwha River ecosystem. As part of this project, the USGS conducted a workshop in March 2003 for NPS and Tribal employees to provide a synthesis of research in progress associated with dam removal. Restoration of anadromous fisheries is a priority for Tribes on the Olympic Peninsula. Contact: Edward Schreiner, 360-565-3044, ed\_schreiner@usgs.gov

**Peer Review of Hydrologic Investigations and a Ground-Water Model of the Lummi Indian Reservation.** The Bureau of Indian Affairs (BIA) is assisting the Lummi Tribe in investigations to determine the ground-water resources on the reservation available for Tribal use. At BIA's request, USGS hydrologists are providing technical review of the hydrologic data collected and technical oversight/review of a ground-water model of the Lummi Peninsula that is being constructed by a private contractor. Contact: Brian Drost, 253-428-3600, ext. 2642, bwdrost@usgs.gov

**Streamgaging by the Hoopa Valley Tribe.** Hoopa Valley Tribal employees are operating four gaging stations in the Trinity River watershed under the general direction of and quality assurance review by USGS scientists. Tribal employees have attended USGS classes on sediment measurement, in addition to on-the-job training during USGS field work. As part of the Trinity River Restoration Program, the Hoopa Valley Tribe is planning to expand its role in taking stream-discharge measurements and sediment sampling. Contact: Jim Bowers, 760-247-1401, jcbowers@usgs.gov



**Technical Support to Habematolel Pomo of Upper Lake.**

USGS hydrologists provided USGS reports and literature citations for non-USGS reports in response to requests from the Habematolel Pomo of Upper Lake for information related to mercury in Clear Lake and adjacent areas. An Indian-led Clear Lake watershed initiative resulted in a grant proposal to the USEPA for support. The proposal was highly rated but was not funded by USEPA. A refined and updated proposal will be submitted by the Tribe in FY 2004. A USGS representative will continue in an active advisory role. Contact: Walter Swain, 916-278-3024, wswain@usgs.gov

**Owens Valley Indian Water Commission Technical**

**Discussions.** USGS hydrologists continued providing information to the Owens Valley Indian Water Commission on ground water and its use by American Indians and the Los Angeles Department of Water and Power. This included USGS review of a third party ground-water model for the Water Commission. The project has been completed, but the USGS anticipates additional requests for assistance in FY 2004. Contact: Wes Danskin, 858-637-6832, wdanskin@usgs.gov

**USGS Technical Assistance to Bureau of Indian Affairs.**

The USGS continues to provide networking support to the Bureau of Indian Affairs (BIA). USGS employees provided technical expertise and designs to assist BIA with internal communications after BIA computers were taken off-line. Part of the design was implemented in Alaska in FY 2002. Some additional routing issues were resolved throughout BIA during FY 2003. Contact: Pat Murphy, 650-329-4044, pmurphy@noc.usgs.net





**Surface-Water Monitoring Stations.** The USGS Water Resources District operated the following surface-water monitoring stations in FY 2003, usually with cooperative funding from the Tribe, the Bureau of Indian Affairs (BIA), or a third party:

No. of Stations	Cooperator	Contact
2	Houlton Band of Maliseet Indians	Contact: Greg Stewart (Maine), 207-622-8205, ext. 118, gstewart@usgs.gov
2	Seminole Tribe of Florida & South Florida Water Management District (includes two continuous recorders with Tribal nutrient autosamplers)	Contact: Mitch Murray (Florida), 305-717-5827, mmurray@usgs.gov
1	Keweenaw Bay Indian Community	Contact: Tom Weaver (Michigan), 906-786-0714, tlweaver@usgs.gov
2 1 1 1 1 2	Sokaogon Chippewa, Mole Lake Band Bad River Band of Lake Superior Chippewa Indians Menominee Indian Tribe of Wisconsin Oneida Tribe of Wisconsin Stockbridge-Munsee Band of Mohican Indians Lac du Flambeau Band of Lake Superior Chippewa Indians	Contact: Rob Waschbusch (Wisconsin), 608-821-3868, rjwaschb@usgs.gov
1 1	Grand Portage Band of Lake Superior Chippewa Bois Forte Band, Nett Lake Community	Contact: Kevin Guttormson (Minnesota), 218-326-1297, kgguttor@usgs.gov
2	Three Affiliated Tribes	Contact: Douglas Emerson (North Dakota), 701-250-7402, demerson@usgs.gov
1 1 1 1 1 3 3 1 1 2	Bureau of Indian Affairs and Crow Creek Tribe Bureau of Indian Affairs and Oglala Sioux Tribe Bureau of Indian Affairs and Oglala Sioux Tribe (crest-stage only) Bureau of Indian Affairs and Rosebud Sioux Tribe Bureau of Indian Affairs and Yankton Sioux Tribe Lower Brule Sioux Tribe (crest-stage only) Oglala Sioux Tribe Rosebud Sioux Tribe Sisseton-Wahpeton Sioux Tribe Standing Rock Sioux Tribe	Contact: Ralph Teller (South Dakota), 605-355-4560 ext. 222, rwteller@usgs.gov



No. of Stations	Cooperator	Contact
2 2 1	Omaha Tribe of Nebraska and Iowa Santee Sioux Tribe of Nebraska Winnebago Tribe of Nebraska	Contact: Phil Soenksen (Nebraska), 402 437-5156, pjsoenks@usgs.gov
1	Citizen Potawatomi Nation	Contact: Robert Blazs (Oklahoma), 405-810-4419, rblazs@usgs.gov
7 1 9 2 4 11	Blackfeet Nation Chippewa Cree Tribes of the Rocky Boy's Reservation Confederated Salish and Kootenai Tribes Fort Peck Assiniboine and Sioux Tribes Northern Cheyenne Tribe Bureau of Indian Affairs	Contact: Wayne Berkas (Montana), 406-457-5900, wrberkas@usgs.gov
20 4	Tribal Water Engineer through the Joint Business Council of the Northern Arapaho and Eastern Shoshone Tribes (Wind River Reservation) Tribal Water Engineer through the Joint Business Council of the Northern Arapaho and Eastern Shoshone Tribes (Wind River Reservation) (canal rating maintenance)	Contact: Bob Swanson (Wyoming), 307-778-2931, rswanson@usgs.gov
2 1	Southern Ute Indian Tribe Ute Mountain Ute Tribe	Contact: Bob Boulger (Colorado), 970-245-5257, ext. 21, rboulger@usgs.gov
7 2 1	Bureau of Indian Affairs Pueblo of Zuni Isleta Pueblo, flood stage gage	Contact: Rene Garcia (New Mexico), 505-830-7903, rggarcia@usgs.gov
1 4	Nez Perce Tribe Bureau of Indian Affairs (BIA)	Contact: Thomas S. Brennan (Idaho), 208-387-1366, tbrennan@usgs.gov
3 1 1 10	Pyramid Lake Paiute Tribe Summit Lake Paiute Tribe Shoshone-Paiute Tribes Walker River Paiute Tribe	Contact: Kerry Garcia (Nevada), 775-887-7659, ktgarcia@usgs.gov



No. of Stations	Cooperator	Contact
1	Bureau of Indian Affairs & Peabody Coal Co. (Navajo Reservation)	Contact: Christopher Smith (Arizona), 520-670-6671, ext. 251, cfsmith@usgs.gov
1	Arizona Department of Water Resources (Navajo Reservation)	
2	Bureau of Indian Affairs (Navajo Reservation)	
2	Hopi Tribe	
2	Havasupai Tribe	
3	Bureau of Indian Affairs (Hualapai Tribe)	
6	Yavapai-Prescott Indian Tribe (2 continuous records and 4 crest-stage gages)	
1	Tohono O'odham Nation	
3	Pueblo of Zuni	
3	Bureau of Indian Affairs (White Mountain Apache Tribe)	
1	Coeur d'Alene Tribe	Robert Kimbrough (Washington), 253-428-3600, ext. 2608, rakimbro@usgs.gov
7	Confederated Tribes of the Umatilla Indian Reservation	
4	Confederated Tribes and Bands of the Yakama Nation	
2	Jamestown S'Klallam Tribe	
26	Lummi Nation	
1	uni	
2	Nisqually Indian Tribe	
1	Nooksack Indian Tribe	
1	Quileute Tribe	
1	Quileute Indian Nation	
1	Skokomish Tribe of Indians	
3	Spokane Tribe of Indians	
7	The Tulalip Tribes	
2	Bureau of Indian Affairs	
11	Confederated Tribes of the Warm Springs Reservation	Contact: Thomas A. Herrett (Oregon), 503-251-3239, herrett@usgs.gov
1	Nez Perce Tribe	
7	Hoopla Valley Tribe	Contact: James Bowers (California), 760-247-1401, jcbowers@usgs.gov
1	Karuk Tribe of California	
2	Tule River Tribe	
1	Alaska Native Tribal Health Consortium	Contact: David Meyer (Alaska), 907-786-7141, dfmeyer@usgs.gov
1	Central Council of the Tlingit and Haida Indian Tribes of Alaska	
1	Cheesh'Na Tribal Council	
1	Eklutna, Native Village	
1	Haida Corporation	



**Water-Quality Monitoring Stations.** The USGS Water Resources District collected water-quality data at the following sites in FY 2003, usually with cooperative funding from the Tribe:

No. of Stations	Cooperator	Contact
4	Turtle Mountain Band of Chippewa Indians (lake sites)	Contact: Douglas Emerson (North Dakota), 701-250-7402, demerson@usgs.gov
12	Northern Cheyenne Tribe; Crow Tribe of Indians (Tongue River)	Contact: John Lambing (Montana), 406-457-5900, jlambing@usgs.gov
6	Fort Peck Assiniboine and Sioux Tribes	
1	Pyramid Lake Paiute Tribe	Contact: Kerry Garcia (Nevada), 775-887-7659, ktgarcia@usgs.gov
4	Walker River Paiute Tribe	
2	Karuk Tribe of California	Contact: James Bowers (California), 760-247-1401, jcbowers@usgs.gov

**Ground-Water Monitoring Stations.** The USGS Water Resources District operated the following ground-water monitoring stations in FY 2003, usually with cooperative funding from the Tribe:

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





**Lake-Stage Monitoring Stations.** The USGS Water Resources District operated the following lake-stage monitoring stations, to determine lake levels, in FY 2003, usually with cooperative funding from the Tribe:

No. of Stations	Cooperator	Contact
2	Prairie Island Indian Community	Contact: Don Hansen, 763-783-3250, dshansen@usgs.gov
3	Hopi Tribe	Contact: Christopher Smith (Arizona), 520-670-6671, ext. 251,
1	Pueblo of Zuni	cfsmith@usgs.gov



# General Coordination and Policy Activities



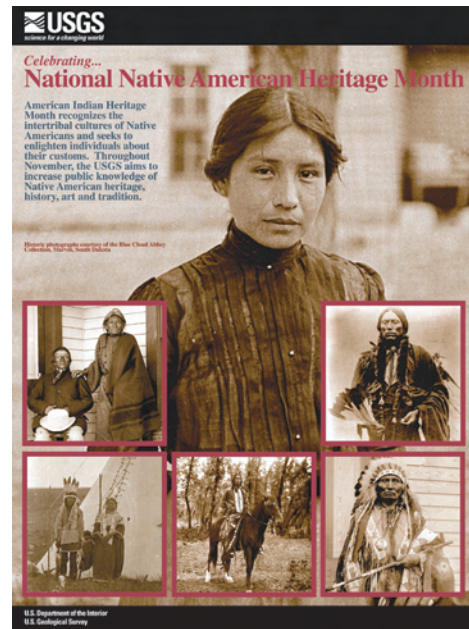


## General Coordination and Policy Activities

**Fast Response Team Forms for Emergency Management Imagery.** The Rodeo-Chediski fires that burned the White Mountain Apache lands and parts of Arizona, and the St. Francis Fire on the Rosebud Reservation and parts of South Dakota led USGS to begin to identify and assemble a response team that will be able to produce imagery for fire emergency responses. The fires, in 2002, prompted the initiation of this informal USGS group in 2003. Portable image acquisition, processing, and analysis equipment will make this team ready to respond to the needs of Tribes, BIA, State, and Federal agencies no matter where the fire emergency. Contact: Ed Pfeifer, 520-670-5019, [epfeifer@usgs.gov](mailto:epfeifer@usgs.gov)

**International Forum on Indigenous Education in the Geosciences.** The 2003 International Geoscience Education conference, in Calgary, Alberta, Canada, featured a forum on indigenous geoscience education. Presenters included educators from all continents except Antarctica speaking about communicating earth science concepts. The USGS presented a paper titled, "Working with Native Americans: Examples from the U.S. Geological Survey," that related collaborations with Tribal colleges and universities, and USGS experiences in encouraging Native students to pursue careers in science. Other papers on diverse educational topics also revealed similarities among Native peoples throughout the world, including cultural and family strengths, remote locations, and economic issues affecting these students. Blending Traditional science with Western science was another theme throughout this forum. Contact: Sue Marcus, 703-648-4437, [smarcus@usgs.gov](mailto:smarcus@usgs.gov)

**Geographic Information Systems Training Coordination.** In cooperation with the USGS (EROS Data Center), the Federal Geographic Data Committee and National States GIS Council plan and develop Tribal, Federal, State and local workshops, including the annual Tribal College Forum. The workshops and the Forum offer the Tribes an overview of the National Spatial Data Infrastructure overview and information to assist with them with their planning processes, development of data sets, and data sharing. Contact: Bonnie Gallahan, 703-648-6084, [bgallahan@usgs.gov](mailto:bgallahan@usgs.gov)



EDC staff designed a poster for National Native American Heritage Month. The images are courtesy of the Blue Cloud Abbey at Marvin, South Dakota

**Cooperative Training with Department of Homeland Security/Federal Emergency Management Agency.** The Federal Geographic Data Committee (FGDC) through its Memorandum of Understanding (MOU) with Department of Homeland Security/Federal Emergency Management Agency offer several classes for Tribal entities on topics such as: 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, CAP, Geospatial One Stop, and The National Map. Contact: Bonnie Gallahan, 703-648-6084, [bgallahan@usgs.gov](mailto:bgallahan@usgs.gov)

**EDC Provides Images for Events.** The USGS EROS Data Center (EDC) analyzes and archives satellite and geographic imagery from other sources. The imagery is used by USGS, Native American, and other scientists for a wide variety of studies including, for example, wildfires, land use, and changes in the landscape over time. EDC staff also produces images that help explain geography and USGS science at events and exhibits. The Black Hills of South Dakota are sacred to many Tribes. Images of the Black Hills, showing fires or unique, remote (satellite)





perspectives have been produced by EDC and used by USGS and others at numerous events because they are illustrative of USGS work and may be particularly meaningful to Native Americans. Contact: Mark Barber, 605-594-6176, mbarber@usgs.gov

**Rural Geospatial Innovations in America (RGIS).** The Federal Geographic Data Committee (FGDC), through its memorandum of Understanding (MOU) with Rural Geospatial Innovations in America (RGIS), will assist Federal, State, Tribal and local entities in implementing advanced geospatial information technologies to improve the quality of life, environmental health, and economics of rural communities. Implementing activities covered by the MOU include technical assistance to Tribal Colleges and Universities in developing and managing geographic information systems, implementing training programs on the National Spatial Data Infrastructure, Geospatial One Stop, The National Map, short courses and university curricula on advanced spatial analysis for decision-making processes. Contact Bonnie Gallahan at 703-648-6084, bgallahan@usgs.gov

**Biological Information for Committees of the Great Lakes Fishery Commission.** The Great Lakes Fishery Commission has established inter-agency committees to coordinate fishery resource management in individual lakes. The USGS and American Indian groups, such as the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish & Wildlife Commission, are represented on the committees for lakes Superior, Michigan, and Huron. To assist Tribal and State fishery management agencies in assessing the success of fish restoration efforts, USGS and Tribal scientists report annually on the status of lake trout rehabilitation and important prey fishes in lakes Superior, Michigan, and Huron. In addition, for the Lake Superior Committee, the USGS provided data and technical assistance. Contact: Sandra Morrison, 734-214-9391, smorrison@usgs.gov

**Coordination with Tribal Organizations in Michigan.** USGS staff attended quarterly Michigan Tribal Environmental Group (MTEG) meetings. The Michigan Tribes, the Inter-Tribal Council of Michigan, the U.S. Environmental Protection Agency (USEPA) Region 5, the USGS, the U.S. Department of Agriculture, the State of Michigan, and other groups and agencies are represented in MTEG. MTEG meetings provide a forum for environmental issues pertinent to Michigan Tribes. The USGS also participates in quarterly Multi-Federal Agency Memorandum of Understanding (MOU) meetings sponsored by the Midwest

Region of the Bureau of Indian Affairs (BIA). Federal agencies participating in the MOU workgroup include the BIA, the USGS, the Indian Health Service, the Army Corps of Engineers, and the USEPA, which meet to cooperatively plan and coordinate Federal-Tribal activities in USEPA's Region 5. Contact: Tom Weaver, 906-786-0714, tlweaver@usgs.gov

**Wildlife Mortality: Chronic Wasting Disease (CWD), West Nile Virus (WNV), and Other Diseases.** The USGS 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 at the USGS. Avian, mammalian, and amphibian wildlife carcasses from all over the country are submitted to the National Wildlife Health Center (NWHC) in Madison, Wisconsin, for diagnostic evaluation. Potential responses to wildlife mortality events include on-site assistance to contain the outbreak, diagnostic services to determine the cause, and research to improve understanding of the ecology of the disease. Services are available to bureaus within the Department of the Interior and to Tribal organizations. During 2003, Center staff conducted three wildlife disease workshops with several Tribes.

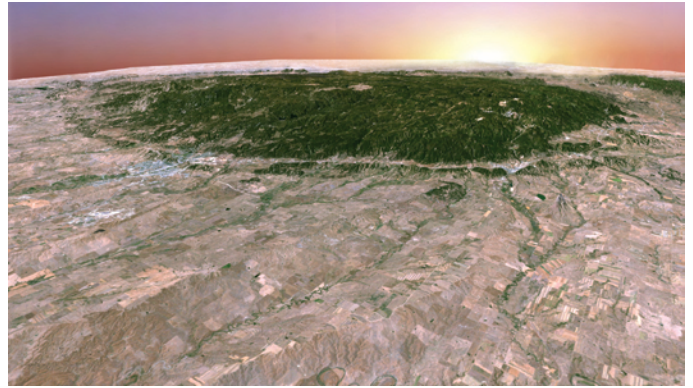
In October 2002, Center staff gave several presentations on emerging diseases including Chronic Wasting Disease (CWD), West Nile Virus, and Newcastle disease at the 20<sup>th</sup> Annual Pacific Regional Conference of the Native American Fish and Wildlife Society (NAFWS) in Worley, Idaho. The Coeur d'Alene Tribe hosted the meeting. The Tribes participating in the session included Yakama, Umatilla, Nez Perce, Warm Springs (Wascot and Paiute), Spokane, Coeur d'Alene, Kalispel and Colville.

In December 2002, the Center hosted a workshop on surveillance strategies to detect CWD in wild elk and deer. A representative of the Bureau of Indian Affairs (BIA) Great Plains Regional Office was invited and participated in this workshop. As a result of this meeting, the BIA official organized a CWD workshop in September 2003.

In February 2003, NWHC staff were invited to participate in a two-day workshop hosted by the Yakama Nation and held in Toppenish, Washington. CWD was the focus of the workshop, which included descriptions of the biology and ecology of the disease, discussions of surveillance methods, and demonstrations on collecting tissue samples for testing wild deer for CWD.



In May 2003, a USGS biologist provided an introduction to the NWHC's programs and services, along with additional information on a number of wildlife diseases, including West Nile virus infection, during a presentation at the 2003 NAFWS National Conference in Traverse City, Michigan. The presentation was part of the conference's symposium on wildlife diseases. The conference was organized by the Great Lakes Region NAFWS and hosted by the Grand Traverse Band. Attendees included members of more than 45 Tribes from all NAWFS regions, including Alaska, as well as Tribal Liaisons from U.S. Fish and Wildlife Service, U.S. Department of Agriculture, and employees of the Bureau of Indian Affairs. Since the symposium, the NWHC has received requests for information on ungulate diseases and submissions for diagnostic services from several Tribal participants.



Black Hills oblique Landsat image. (Image from USGS EROS Data Center)

In September 2003, a two-day workshop on CWD was organized by the Bureau of Indian Affairs and hosted by the Three Affiliated Tribes at Fort Berthold. Information was presented on the history, disease process, and detection of CWD. All transmissible spongiform encephalopathy diseases that affect wildlife were summarized and detailed information was provided on how to develop a CWD surveillance plan. A half-day was devoted to assisting individual Tribes with development of a CWD surveillance plan for their Tribal Nation. A temporary wet laboratory was established, two deer and an elk were necropsied, and samples were collected for CWD testing. The 29 workshop attendees represented 11 Tribal Nations: Crow Creek (Sioux), Standing Rock, Pine Ridge (Oglala), Santee, Yankton, Lower Brule, Cheyenne River, Rosebud, Crow, Chippewa-Cree Tribes of the Rocky Boy's Reservation, and Mandan, Hidasta, and Arikara Tribes. Contact: Scott Wright, 608-270-2460, [swright@usgs.gov](mailto:swright@usgs.gov); Kathryn Converse, 608-270-2445, [Kathy\\_converse@usgs.gov](mailto:Kathy_converse@usgs.gov); Grace McLaughlin, 608-270-2446, [gmclaughlin@usgs.gov](mailto:gmclaughlin@usgs.gov)

**EDC Staff Provided Imagery for Events.** EDC staff provided a digital copy of a satellite imagery fly-through of the Lewis and Clark route to the Crownpoint Institute of Technology, Crownpoint, New Mexico. Contact: Mark Barber, 605-594-6176, [mbarber@usgs.gov](mailto:mbarber@usgs.gov)

**Donation of Excess Computers to Omaha Tribe.** In January 2003, USGS EROS Data Center (EDC) donated 30 excess computers, monitors, and printers to the Omaha Tribe of Nebraska. Members of the Tribe traveled to Sioux Falls to accept the donation. The computers were examined by the Tribe and then distributed to students and other needed places on the Reservation. Donation of EDC excess computers and equipment to local Native American Tribes will continue in the future. Contact: Terry Pfannenstien, 605-594-6146, [pfann@usgs.gov](mailto:pfann@usgs.gov)

**Sinte Gleska University Second Annual Leadership Forum.** The Memorandum of Understanding (MOU) between Sinte Gleska University (SGU) and the USGS mandates an annual meeting of the parties leaders. In 2003, that meeting occurred during the University's Founders Week celebrations on the Rosebud Reservation. University President Lionel Bordeaux and USGS Central Region Director Tom Casadevall guided discussions on accomplishments and goals related to the MOU. The USGS-SGU partnership has produced the University's new Tribal Geospatial Applications Center, which is dedicated to training Native American students in developing GIS, GPS, and remote sensing technologies. Contact: Gene Napier, 605-594-6088, [enapier@usgs.gov](mailto:enapier@usgs.gov)



**Ground water in the Española basin.** The Espanola Basin is the primary source of water for several Pueblos and for the cities of Santa Fe and Los Alamos, New Mexico. Water management decisions, especially during drought conditions, must be based on scientific knowledge of the geologic controls on ground-water flow, storage, and contamination. The USGS hosted a workshop in March 2003 in Santa Fe, New Mexico, for geophysicists, geologists, hydrologists, and water resource managers from various Federal, Pueblo, State, and local government agencies and academia. The workshop provided a forum for the scientists to exchange information, develop mutual goals, report progress to technical communities, and establish a working relationship with decision-makers. Annual workshops hosted in 2002, 2003, and 2004 in Santa Fe, New Mexico, have fostered communication among scientists working in the Española Basin and communicated the results of the studies to 85–100 attendees, several of whom were members of Pueblo Nations. Workshop information can be found at <http://climchange.cr.usgs.gov/ehtag>. Contact: Tien Grauch, 303-236-1393, [tien@usgs.gov](mailto:tien@usgs.gov); Mark Hudson, 303-236-7446, [mhudson@usgs.gov](mailto:mhudson@usgs.gov)

**New USGS Map of New Mexico.** A new USGS map, “Geologic Map of the Rio Puerco Quadrangle, Bernalillo and Valencia Counties, New Mexico,” provides geologic information that can be used by the public and the people of the Pueblo of Isleta. This map includes lands belonging to the Pueblo of Isleta located just south of Albuquerque, New Mexico. It can be used to aid in site-selection for new water wells on the Pueblo. Contact: Florian Maldonado, 303-236-1281, [fmaldona@usgs.gov](mailto:fmaldona@usgs.gov)

**Risk Assessment of Contamination in the Hanford Reach of the Columbia River.** The Yakama Indian Nation was briefed on USGS scientific investigations concerning potential aquatic contamination associated with the Hanford Reach of the Columbia River during a workshop held in Toppenish, Washington, in April 2003. Subsequent to that meeting, at the request of the Yakama Indian Nation, a multidisciplinary (biology and hydrology) USGS proposal for research on the environmental quality of the Columbia River was developed. Information from these studies will be necessary should future ecological and human health risk assessments be conducted on the potential impact of contamination from the Hanford Nuclear Reservation. A summary of this proposal was presented to the Yakama Nation in October 2003. Contact: Ed Little, 573-875-5399, [elittle@usgs.gov](mailto:elittle@usgs.gov)



*Lakota Dancer*—Artwork done by Regina One Star, Sicangu (Rosebud) Lakota



# Future Opportunities







## Future Opportunities

**Seneca Nation of Indians Water Supply Aquifer.** In FY 2004, the USGS signed a Cooperative Water Agreement with the Seneca Nation of Indians located in Cattaraugus and Erie counties in western New York. USGS will assess the hydrogeology of an aquifer system that the Seneca Nation hopes to use as a new water supply. Contact: Edward Bugliosi, 607-266-0217, ebuglios@usgs.gov

### **Geographic Information in the Four Corners Region.**

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

**Bureau of Indian Affairs Requests Additional Endangered Species Training.** USGS scientists, at the request of the Bureau of Indian Affairs (BIA), continue providing training on endangered species monitoring to Tribal biologists. Similar training for Tribal personnel has previously been conducted, with BIA assistance, by a USGS research ecologist. The training includes techniques for surveying the endangered southwestern willow flycatcher. Lectures were presented on the status, distribution, ecology, and habitat use of the flycatcher, and included a field trip to known flycatcher breeding sites along the Rio Grande. Similar training in New Mexico, with tribal participants and USGS presentations, is sponsored by the US Fish and Wildlife Service. Contact: Mark Sogge, 928-556-7466, ext. 232, mark\_k\_sogge@usgs.gov

**Mineral Resources Studies in Southwestern Alaska.** The USGS will begin a new mineral resource focused study in southwestern Alaska in 2004. This region holds promise for undiscovered metallic resources, but is a geologic frontier because what is known comes largely from expeditions carried out sixty years ago or more. Collection of basic geologic, geochemical, and geophysical data is expected to facilitate mineral exploration, assist in land-use planning, and may encourage economic development. The study area lies within the Bristol Bay Native Corporation (BBNC) region and the USGS anticipates cooperating on this study with BBNC under a Cooperative Research and Development Agreement (CRADA). Contact: Marti L. Miller, 907-786-7437, mlmiller@usgs.gov



## USGS Contacts

The U.S. Geological Survey (USGS) 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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Indian pictograph on Dakota sandstone cliff in Apishapa Canyon made by chipping the "desert varnish" from the weathered surface of the rock. U.S. Geological Survey Folio 186, 1912.





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