The Oxbow

FROM THE NORTH DAKOTA STATE WATER COMMISSION

The "Mighty Mouse" Institute participants and instructors.

Duane Anderson, USFWS, explains Lake Darling Dam oper

"Mighty Mouse" Watershed is the Focus of 2007 WET Institute

By Bill Sharff

The Project WET watershed education program moved the 2007 Institute to the Minot area this past July to learn about the Mouse River watershed. The move gave 23 educators, from all grade levels and all parts of the state, an opportunity to learn about north central North Dakota's watershed issues and concerns.

By moving these types of programs around the state, and by providing more localized watershed information, educators are given greater opportunities to learn about watershed issues that are important in their own "backyard." In the past, Project WET has provided institutes that focused on the Missouri, James, and Sheyenne Rivers, and Devils Lake.

The 2007 Institute was based out of Minot State University, and it was credited though Minot State, North Dakota State University, and the University of North Dakota. Some of the timely topics covered during the program included:

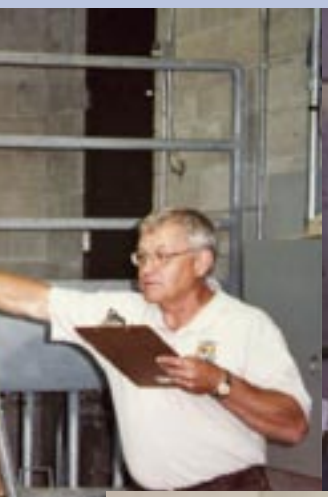
- Bank stabilization and erosion
- Northwest Area Water Supply
- International water issues
- Forestry and geology of the Turtle Mountains
- Flood control and management
- Irrigation
- Best management practices
- Water quality
- Regulatory issues
- Wildlife refuge system management
- Water use, supply, and distribution
- Wetlands management
- Water and wastewater treatment
- Biota transfer
- Watershed and stream investigations

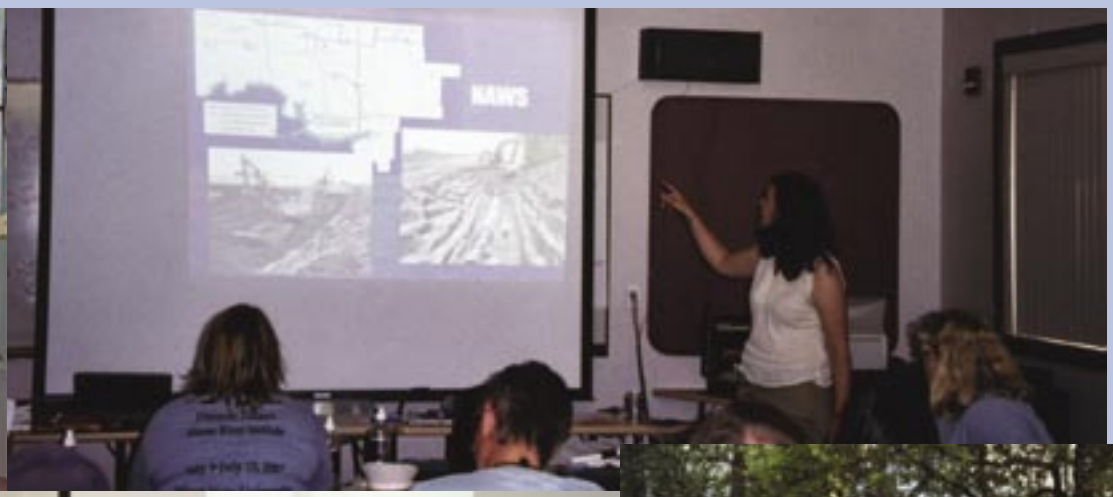
The institute also included a full-day environmental investigation segment where educators learned how to complete a watershed survey and visual stream habitat assessment. They looked at watershed conditions adjacent to and in the Des Lacs River; collected and analyzed macroinvertebrates to complete a bioassessment; analyzed chemical and physical parameters of the river; learned about stream dynamics and how to conduct a stream habitat assessment; measured stream flow; and estimated discharge.

In addition, the institute instructors went through 11 hands-on activities from four major Project WET curriculum guides that correlated to

2007 FIELD TOURS

Lake Darling Dam
Upper Souris National Wildlife Refuge
ADM (canola/biodiesel) Processing
Minot Wastewater Treatment System
J. Clark Salyer National Wildlife Refuge
International Peace Garden
Lake Metigoshe
Metigoshe State Park
Eaton Irrigation Project
Mouse River Restoration Project
Turtle Mountains
Minot Milling
Burlington Dam





Michelle Klose, NDSWC, talks about the Northwest Area Water Supply Project.

ations.

Allan Walter, Minot Public Works Dept. Director, addresses Minot water issues.

Completing a stream assessment on the Des Lacs River.

the field tours, environmental investigations, and presentations.

Attending educators had an opportunity to evaluate the institute in terms of course components and overall value of the course. Justin Rasch, a Minot elementary teacher, said, "This is my fifth (Project WET) institute. I would not keep coming back if they were not as fantastic and educational as they are."

Metta Pfliger, a secondary teacher from Hazen, commented, "There were many experiences that I had at this institute that I will remember for a lifetime. I would have never learned this much or visited such a diversity of places. [Now] I want to visit more of North Dakota's water-related sites."

April Kritzberger, a Fargo kindergarten teacher said, "I will definitely attend more workshops like this again. [It was] much better then actually going on campus for a whole semester. I would highly recommend this course."

As in previous years, the institute put great emphasis on journaling. Participants constructed and decorated their journals with materials that reflected Mouse River watershed issues. And each day, participants were required to journal different concepts and reflect on what they had learned during the daily activities, including how they could integrate their newly learned knowledge into their classroom.

Instructors at this year's Mouse River Institute were Project WET Director Bill Sharff; Kim Belgarde, an elementary teacher from Fargo; Angie Bartholomay, a science teacher from Bottineau; and Ila LaChapelle, a science teacher from Walhalla.

The institute was funded in part by an EPA Section 319 Non-point Source Pollution grant, the State Water Commission, local county resource districts, soil conservation districts, and local school districts.

2007 GUEST PRESENTERS

U.S. Fish and Wildlife Service
Natural Resource Conservation Service
ND State Water Commission
ND Parks and Recreation
Renville County Water Resource District
Bottineau County Commission
Oak Creek Water Resource District
Bottineau Co. Emergency Management
Minot State University – Bottineau
Minot Public Works
Minot Milling
ADM Processing
International Peace Garden
Eaton Irrigation Project

Water in Demand for the Oil Industry in Western North Dakota

By Alan Wanek

The recent increase in oil development in western North Dakota brings with it a demand for more water use. Oil production in western and north-central North Dakota requires water during the development of new oil wells, occasionally as oil is produced, and as part of secondary recovery operations in older oil fields.

Fresh water is used in making up the circulating fluid used when drilling the hole for an oil well's surface casing and when mixing cement slurry to seal the casing in place. Oil well surface casing is set through the fresh-water zone, which extends to more than 2,000 feet in the central part of the Williston Basin in western North Dakota. Some tens of thousands of gallons of water are used when installing an oil well's surface casing.

The completion and development of some oil wells involves formation fracturing. Oil can be recovered from low-permeability or 'tight' rocks, such as the mostly shale and siltstone Bakken Formation, by drilling and casing a hole down to the formation of interest, then drilling one or two miles laterally (approximately horizontally) following a more permeable, sandy interval within the formation.

Water is then pumped into the horizontally drilled hole (lateral) under enough pressure to fracture the oil-bearing formation. Grains of sand, included with the pressurized water, move out into the fractures, holding them open after the water pressure is released. The open fractures allow oil to move to the lateral as the well is pumped.

A second type of oil-industry water use occurs during the ongoing operation of some oil wells. Water is normally entrained with produced oil. Once produced, the water and oil are separated and the water is either injected into the Dakota aquifer using saltwater disposal wells, or is injected back into the oil-producing zone. Water produced with oil is highly concentrated in dissolved ions, primarily sodium and chloride. Occasionally, in areas where oil occurs near bedded rock salt, the water produced with oil is salt-saturated.

At two miles depth, plus or minus, the water entrained with produced oil in western North Dakota is hot. As the salt-saturated water travels up the well and cools, it loses energy and is unable to hold the salt in solution, forming a scale and eventually plugging the production tubing inside the well casing. To prevent this, a small amount of fresh water is pumped to the bottom of the oil well, diluting the incoming saltwater enough to prevent scale from forming on the tubing. Oil wells that use fresh water for dilution of saltwater will normally require the water for as long as oil is being produced from the saltwater-saturated zone.

The third type of water use in North Dakota's oil fields is waterflooding to maintaining fluid pressure in oil-bearing zones. In a waterflood, an oil field is operated as a unit, with some of the oil wells in the unit being converted to water injection wells. The injected water causes oil to move to the remaining oil wells where it is pumped to the surface.

Formation fracturing may require about one million gallons of water per well. Operation of an oil well requiring fresh water for dilution may require about half a million gallons of water per year. As a comparison, about 12 inches of water are typically applied yearly over irrigated land in western North Dakota; therefore, about 130 acre-feet of water will be used to irrigate a 130-acre pivot circle. That compares to the amount of water that would be required for about 42 formation-fracturing jobs, each using one million gallons of water, or for 80 oil wells using a water dilution process.

Waterflood operations typically require tens or hundreds of gallons of water per minute, and may last for years. Because of the large quantity of water used in waterflooding, the source of water is restricted to the Dakota aquifer or underlying zones. The Dakota aquifer occurs between about 4,000 and 6,000 feet below land surface in western North Dakota, and between about 2,000 and 3,000 feet below land surface in north-central North Dakota. Water from the Dakota aquifer and from underlying zones is unsuitable for human or livestock consumption or for irrigation because of the high concentration of dissolved solids, particularly sodium and chloride.

North Dakota State Water Commission
Dale L. Frink, State Engineer
900 East Boulevard Ave. • Bismarck, ND 58505
(701)328-2750 • http: //swc.nd.gov