Ripples in the Grande Ronde

Winter 2006

RIVERS UNITING NEIGHBORS · QUARTERLY NEWS FROM THE GRANDE RONDE MODEL WATERSHED

Poley Allen's last ditch effort

by Coby Menton, GRMW

The Poley Allen ditch, one of 11 active irrigation diversion ditches on the Lostine River, supplies water to 600 acres of cropland where small grains, alfalfa, grass hay, and livestock forage are produced. Those 600 acres are located on the west side of the river immediately above and below the town of Lostine.

Prior to 1997, water was diverted from the Lostine River using a gravel push-up dam resulting in poorly regulated diversion of water, reduced water quality (turbidity and sedimentation) and reduced fish passage. With design assistance from the Bureau of Reclamation (BOR) and Natural Resources Conservation Service, funding assistance from the Bonneville Power Administration and BOR, and administrative services provided by the Wallowa Soil and Water Conservation District, the Poley Allen Ditch Company installed a new permanent concrete diversion structure.

At completion, the 12-foot wide, 30-foot long, and 3-foot deep diversion accommodated fish passage, removed the necessity to annually rebuild the gravel push-up dam, and allowed the ditch company much more control over diversion rates. On the downstream side of the structure, large boulders were placed 10 feet past the end of the structure along the entire 30-foot length providing channel grade control and fish passage to the structure.

The structure improved fish passage conditions during the first year of use. During the 1998 spring runoff, flows near 2,300 cubic feet per second (cfs) caused erosion and movement of the grade control boulders, which resulted in a 4-foot drop below the diversion. The movement of rock and resultant drop created a fish barrier at the Poley Allen diversion structure.

Inspection and survey at the structure in the spring of 2000 revealed two problems with the structure. First, it was discovered the structure was designed to pass a maximum flow of 1,400 cfs; spring runoff in 1998 exceeded 2,300 cfs. Second, when the Poley Allen structure was completed, a side channel used to convey water around the work site was inadvertently closed. The original design called for the side channel to pass flows in excess of 1,400 cfs. With the side channel blocked, all flows were routed through the structure.

A simple fix including opening the side channel, installing two rock structures below the diversion, and modifying the fish passage at the diversion was designed by the BOR, funded by the Grande Ronde Model Watershed, and sponsored by the Wallowa Soil and Water Conservation District in 2004. With work scheduled for July and August of 2004, permits were obtained from both the Army Corps of Engineers and Oregon Department of State Lands, cultural resources documentation was com-

Poley Allen diversion structure pre 2005 work. At low mid-to-late summer season flow this structure is a passage barrier. Notice the large drop between the rocks just below the structure. Photo by Coby Menton, October 26, 2004.

pleted, and Endangered Species Act (ESA) consultation was initiated.

Through the ESA consultation process with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service, two issues surfaced: (1) Will fish passage really be accomplished through this modification?, and (2) What effect will construction have on Spalding's Catchfly, an ESA "sensitive" plant?

The fish passage discussion centered on the position of the passage bay through the diversion and its proximity to the Poley Allen head gate. NMFS engineers felt that when the head gate was open, sufficient force would be present to pull small fish from the river into the canal, while BOR engineers maintained this should not be a problem. After nearly nine months of discussion, a solution was reached where a second head gate would be installed behind the original resulting in reduced suction forces from the river into the canal.

During this period the Poley Allen Ditch Company and the Wallowa Soil and Water Conservation District decided to automate the second head gate. Automation allows the ditch company to divert the water it needs, gives the company greater control, and often results in less water diverted. This is accomplished through an in-ditch measuring device (in this case, a parshall flume); phone communication; job-specific computer software; and solar-powered, gear-driven equipment at the head gate. As flow goes up or down through the day due to natural variation or upstream management, the head gate goes up or down automatically. In other words if the Poley Allen Ditch Company needs five cubic feet of water per second, it will divert that amount regardless of flow fluctuation in the river (the head gate will self regulate to deliver that amount).

As to the effect construction will have on Spalding's Catchfly, a survey was conducted in the spring of 2005 at the job site by a botanist. The result of the survey concluded that not only will there be no effect on the plant, but this is not even suitable habitat for Spalding's Catchfly.

By the time all design and construction conflict was resolved, proper paperwork from the consulting agencies did not arrive in time for the job to occur in 2004. In 2005 after two years of planning, consultation and coordination of the instream work, the Poley Allen Diversion Structure Modification Project was completed in less than two weeks during the early part of August. The automation of the second head gate will be complete before the 2006 irrigation season. ■

Poley Allen diversion structure post 2005 modification. Fish passage is accommodated between the head gate and bay on the right. Photo taken by Coby Menton, August 16, 2005.

A friend in OWEB

by Cecilia Noyes, GRMW

The Oregon Watershed Enhancement Board (OWEB) is a state agency that promotes and funds voluntary actions to restore salmon runs, improve water quality, and strengthen ecosystems that are critical to healthy watersheds and sustainable communities. In the Grande Ronde Basin, OWEB and two preceeding Oregon state watershed organizations, the Governor's Watershed Enhancement Board (GWEB) and Oregon Watershed Health Program (OWHP), have funded over 300 projects totaling more than $12 million. These funds were used to cost-share conservation projects including habitat restoration and enhancement; assessment and monitoring; education and outreach; land and water acquisition; watershed council support; and technical assistance.

A variety of on-the-ground watershed restoration activities have been accomplished, including instream habitat improvements, riparian area treatments, and upland improvements. Examples of the type of work funded include:

- Planting and seeding
- Riparian and upland fencing
- Weed control
- Road improvements
- Road closure and obliteration
- Culvert replacement or improvement
- Wetland restoration
- Off-channel livestock water development
- Instream fish habitat improvements
- Land purchases
- Conservation easements
- Purchase of instream water rights
- Water right transfers

OWEB has a Small Grants Program, which supports landowner projects that improve watershed health. Under this program, soil and water conservation districts, tribes and watershed councils may apply for funds ($10,000 or less) for small projects. The Small Grant Program responds to a need for local decision-making about watershed restoration opportunities on a shorter timeframe than is available under OWEB's regular grant program.

Since 1999, OWEB has provided state match funding for Oregon projects. One such program is the Oregon Conservation Reserve Enhancement Program (CREP). CREP is a federal/state partnership

.....Continued on Page 8, OWEB

What *is a* watershed?

A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. John Wesley Powell, scientist geographer, put it best when he said that a watershed is "that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."

Watersheds come in all shapes and sizes. They cross county, state, and national boundaries. No matter where you are, you're in a watershed!

EXPERIMENT *for kids*

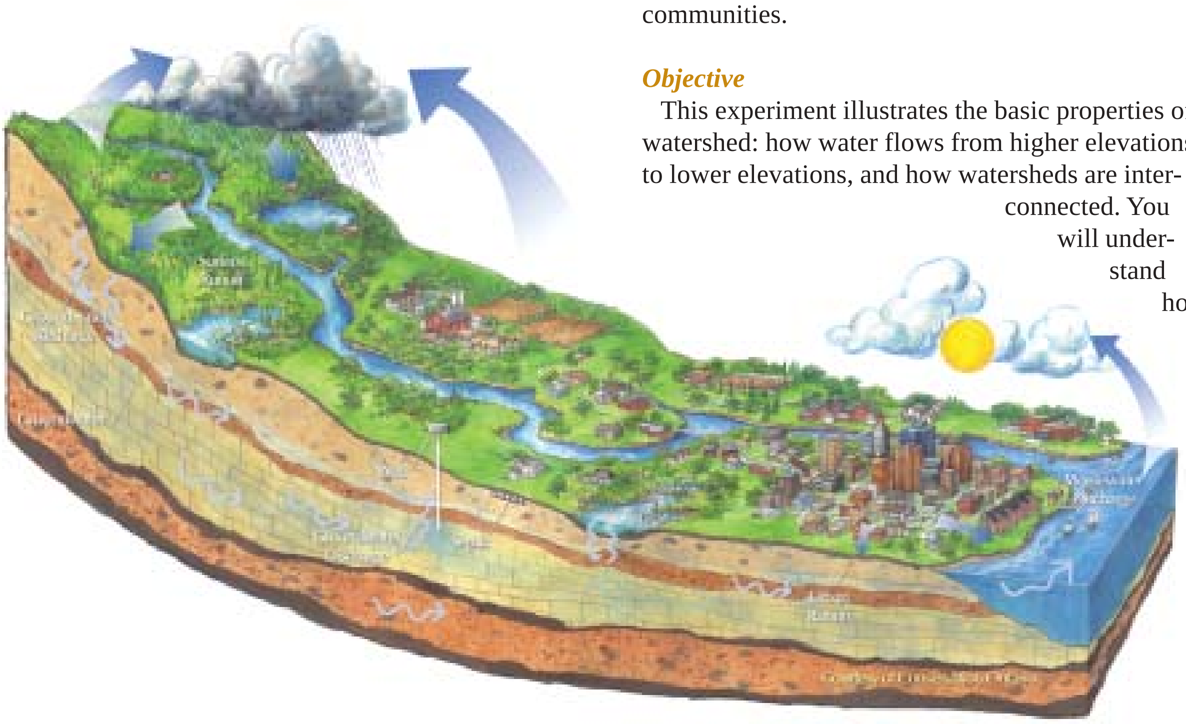
Background

The land we live on is divided into watersheds. A watershed is a land area whose runoff drains into any river, stream, lake, or ocean. Small watersheds, such as the watershed for the creek behind your house, or the watershed for the pond down the road, drain into small bodies of water, and cover small land areas. The runoff from small watersheds join together, and their combined areas become a new, larger watershed. Large watersheds, such as the Columbia River Basin, cover immense land areas. Despite their differences in sizes, all watersheds share common properties. They all perform the same function of transporting water over the earth's surface. The watersheds encompass suburban lawns, parking lots and city streets. Water seeps down through the soil to aquifers, which are underground formations in rock and soil that contain enough ground water to supply wells and springs.

Many human activities have an effect on watersheds. Construction projects like dams can limit the flow of water; construction of roads and buildings can divert and even increase the flow of water. Agricultural fertilizers can run off of crop fields and inadvertently fertilize harmful microorganisms in rivers and lakes, having an adverse effect on water quality and marine life. The irresponsible disposal of household and industrial chemicals can be harmful because these chemicals travel through the watershed, poisoning life and damaging natural ecosystems.

Watersheds can also have an effect on humans. Many communities use rivers, streams, and aquifers as their source of drinking water. Water treatment prepares this water for human consumption, but if the water is laden with chemicals and microorganisms, it can be difficult to treat effectively. Floods are one of the major events in a watershed. Homes built on flood plains, low lying areas adjacent to rivers, are susceptible to flooding conditions when heavy precipitation exceeds the watershed's capacity to absorb water. Rivers, streams, and lakes overflow, threaten human lives, and damage or destroy roads, buildings, and flood control measures. Watersheds can also become dry, causing water shortages for those who depend on their lakes and rivers for drinking water.

It is clear that humans have a close relationship with watersheds. The responsible planning of watershed use and development is important to ensure that the ecosystems sustained by the watersheds are not destroyed, and to protect the health and safety of our communities.



Objective

This experiment illustrates the basic properties of a watershed: how water flows from higher elevations to lower elevations, and how watersheds are interconnected. You will understand how the placement of buildings, roads, and parking lots can be important to watershed runoff, and how careless use and disposal of harmful contaminants can have a serious effect on downstream watershed denizens.

Materials Needed

- 1 large tupperware container (about 1.5'W x 3'L x 1'H)
- 2 lbs of modeling clay
- 3 lbs of sand (any type of sand will do)
- 2 lbs of aquarium gravel
- 1 roll of wax paper (or any other impervious, water repellant surface, tin foil, plastic wrap, etc.)
- 1/4 cup of cocoa mix, iced tea mix, or other flavored drink mix (to represent chemicals)
- 1 spray bottle or bucket full of water

Procedure

1. Wash the aquarium gravel carefully to remove any powdery residue that may add cloudiness to the water. Fill the container to about 2 inches from the bottom with the gravel. Slope the gravel slightly so, that at one end (downslope), the gravel is only about ½ inch deep and, at the other end (upslope), the gravel is about 3 inches deep. This gravel layer will represent the aquifer.

2. Mix the clay and the sand. The consistency of this mix should be gritty, with slightly more clay than sand. This mixture should allow water to run freely over it, but if left standing, the water should slowly permeate the surface. Add this mixture to the container carefully, so as not to disturb the slope of the aquifer already placed. The slopes should be similar, with about 2 inches of sand/clay mix overlying the gravel already placed, and on the downhill end there should be about 3 inches of gravel left exposed.

3. Carve a channel in the middle of the clay/sand layer about ½ inch deep and about 1 inch wide. This channel will represent the main river of the watershed. Near the top of the slope, split the channel into two or three separate channels to represent tributaries. You may wish to add other tributaries along the main branch of the "river" to further illustrate other watersheds.

4. With some extra clay/sand mix, build little hills between the tributaries. These hills separate the smaller watersheds, but when looked at as a whole, the entire "river" system is one watershed. You may also wish to add some small model trees or green felt to represent forests or fields. Buildings can be represented with small blocks of wood.

5. Along the main river, flatten out an area that is about 8 inches by 3 inches. Cut out a piece of wax paper to be about 4 inches by 3 inches in size. Stick this down onto the clay sand mix, sloping it slightly

.....Continued on Page 8, EXPERIMENT

Ladd Marsh

Access for birds and birders alike

by Beth Stewart, Editor

They fly in from Arizona, California, Mexico, even South America. They come in all shapes and sizes. Long legs, short legs. Tall and slender, short and fat. Some stop on their way home from wintering down south. Others take a reprieve in the fall as they wing south after spending the summer months in Canada. One thing they do have in common is feathers … and the need to rest and gain strength before continuing their journeys.

Ladd Marsh Wildlife Area in Union County, Oregon, is 6,200 acres of bird paradise. And they come in by the thousands. Until recently, however, the only time bird watchers could venture on the marsh with binoculars in hand was during hunting season. That has changed with the opening of the Tule Lake Restoration Project public access area.

"Our goal is to increase access to the marsh," says Cathy Nowak, a wildlife biologist with the Oregon Department of Fish and Wildlife (ODFW) who works at the Ladd Marsh headquarters on Pierce Road in La Grande. During the fall game bird seasons, hunters may hunt on the marsh on Saturdays, Sundays, Wednesdays and holidays only, says Nowak. Birders and other non-hunters are restricted to these same days from October 1 through February 28 as well. Come March 1, however, any member of the public may venture into the new 400-acre public access area any day of the week.

For the energetic types, the new Tule Lake Restoration Project features a 3-mile walking trail that takes you through upland habitat and wetland areas in search of birds and other wildlife. For the less mobile, the public access area also features a one-mile auto tour route with pull-outs. The gate to the new access area is located on Peach Road, 1.3 miles north of Highway 203 (near the Hot Lake bridge).

Nowak says the Tule Lake Restoration Project has been a cooperative effort among ODFW and 11 other agencies and organizations, and now provides the needed access to non-hunters, birders and the general public. As part of the project, more than 1,000 acres of wetlands and three miles of Ladd Creek (a tributary to Catherine Creek) have been restored, benefiting hundreds of species of fish and wildlife, including thousands of migrating waterfowl. ODFW recently installed an informational kiosk at the front gate and hopes to erect interpretive signs soon.

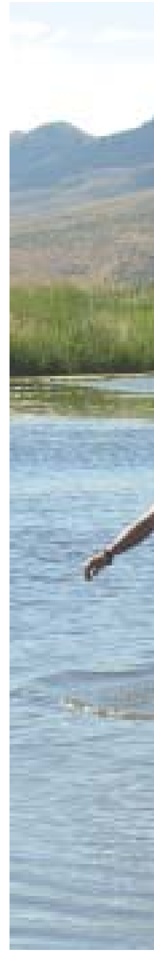
Efforts to reclaim other sections of Ladd Creek and restore more wetlands within Ladd Marsh Wildlife Area are under way. The Grande Ronde Model Watershed and ODFW are proposing a project to restore near-historic channel configuration and hydrology by constructing approximately six miles of new stream channel to replace 3.3 miles of ditches. The aim is to increase rearing habitat for steelhead and trout in the Ladd Creek system; improve water quality; increase groundwater recharge; improve wetland habitat for wildlife; and promote natural, stable stream channels and instream habitat diversity.

Historically, the Grande Ronde Valley teemed with bird life and big game. Tule Lake and the surrounding marsh once spanned 25,000 acres. In the mid-1800s, the discovery of gold in Baker County, and the lure of rich farmland and endless forests in eastern Oregon brought settlers to the valley. As they turned the fertile ground into farm crops, they drained wetlands, rechannelized streams, and plowed under native grasslands. In 1891, a single canal drained nearly 20,000 acres of the historic marsh. Smaller projects drained remnants of Tule Lake as late as the 1940s. With the loss of wetlands, of course, came the loss of wildlife and the valley's capacity to retain moisture during the dry season.

In 1949, when a local landowner approached ODFW offering to sell his 240 acres of the last remaining 400-500 acres of wetlands, the agency jumped at the chance. And so was born the Ladd Marsh Wildlife Area. Today, Ladd Marsh totals 6,200 acres that span both sides of Highway 203 between the Flying J Truck Plaza in La Grande and the small town of Union. The wildlife area is an intensively managed patchwork of wetlands, upland areas, and an intricate dike system that uses treated waste water from the City of La Grande. While Ladd Marsh

Tule Lake Restoration Project Cooperators

- Bonneville Power Administration
- City of La Grande
- Confederated Tribes of the Umatilla Indian Reservation
- Ducks Unlimited
- Federal Aid in Wildlife Restoration
- Natural Resources Conservation Service
- North American Wetlands Conservation Council
- Oregon Department of Fish and Wildlife
- Oregon Watershed Enhancement Board
- Rocky Mountain Elk Foundation
- The Nature Conservancy
- U.S. Fish and Wildlife Service



Top: Black-necked Stilt with chick. Right: American White Pelicans with Great Blue Herons in the background. Top right: Nadine Craft and David Bronson of ODFW carry ducks from a trap at Ladd Marsh to be banded. Far right: Fledgling short-eared owls. Photos by Cathy Nowak, ODFW.

offers excellent bird hunting, hunting is not allowed in various safety zones, private land holdings and two wildlife refuges within the marsh's boundaries.

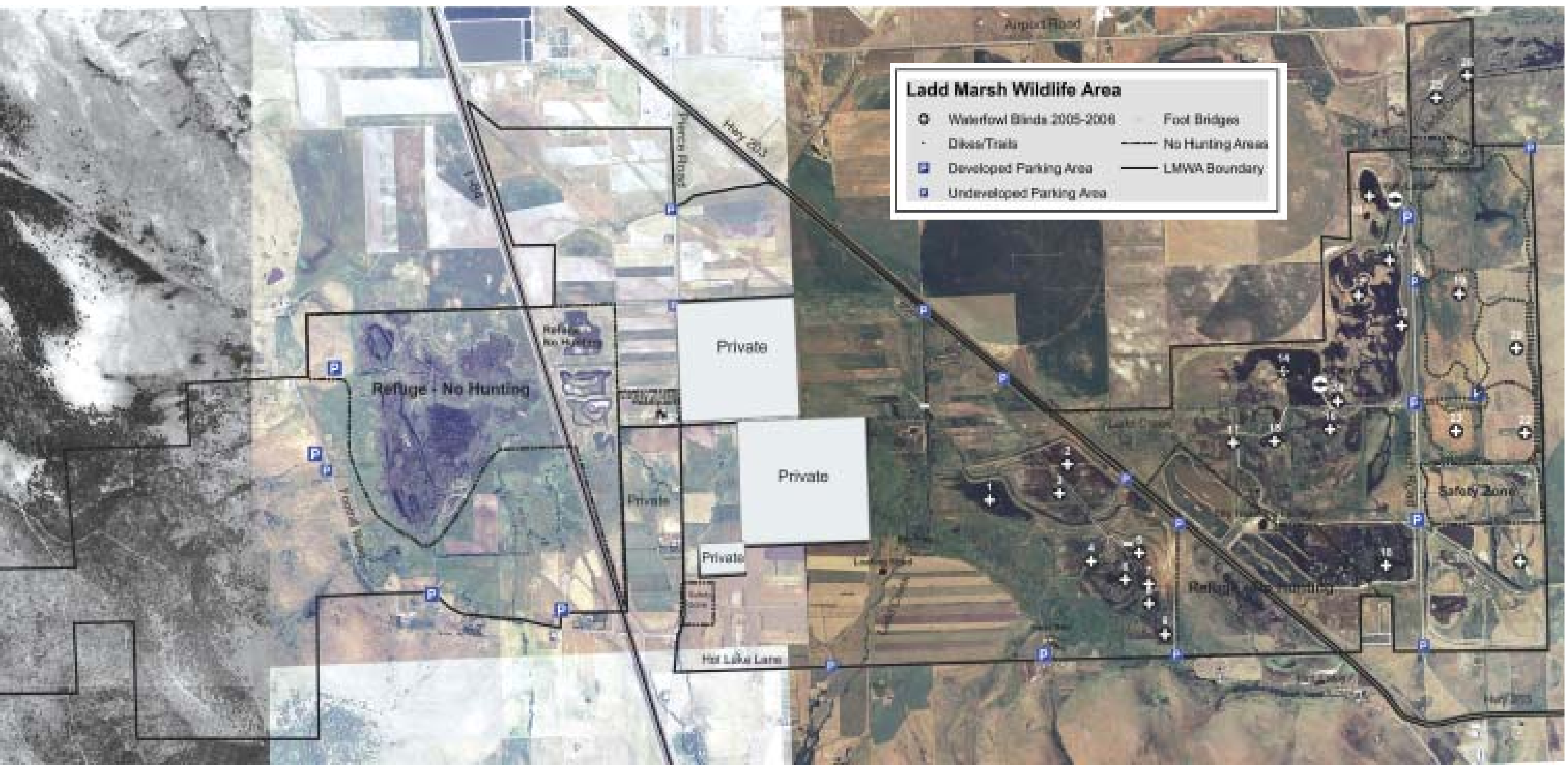
Today Ladd Marsh is home to elk; pronghorn antelope; mule deer; white-tailed deer; foxes; coyotes; numerous non-game species; upland game birds such as ring-necked pheasants and California quail; and a myriad of shorebirds, waterfowl, raptors and songbirds. More than 200 species of birds, 40 species of mammals, and 10 species of reptiles and amphibians inhabit or visit Ladd Marsh in any given year. ODFW manages the area for several habitat types such as native prairie, tree and shrub areas, grain and hay fields, marshland and open water. Wet meadows and grassy uplands provide safe nesting areas during the summer, while grain fields feed the multitudes of migrating waterfowl in the fall. Funding for Ladd Marsh Wildlife Area comes primarily from the sale of Oregon hunting licenses and from federal Pittman-Robertson funds, which are generated from sales of hunting equipment.

Ladd Marsh's 6,200 acres may be a fraction of the Tule Lake wetlands of old, but is no doubt an oasis in its own right. A long-time draw to birds and bird hunters, Ladd Marsh's new Tule Lake Restoration Project now offers access to birders as well. ■

For more information about Ladd Marsh Wildlife Area and the new public access area, contact wildlife biologist Cathy Nowak, ODFW, 963-4954, cnowak@dialoregon.net.

Ladd Marsh's Namesake

Ladd Marsh, Ladd Creek and Ladd Canyon in the Grande Ronde Valley are named after John Ladd, who settled in the area when gold was discovered in Baker County in the 1860s. He and his wife, Rachel, had camped at the mouth of Ladd Canyon on their way to the mines, when they decided to stay and build a cabin and roadhouse. Rachel ran the business while John freighted supplies to the mines in Baker County. As the story goes, John later ran a toll road in Ladd Canyon.



What does **shade** *have to do with it?*

Part 1

Excerpt from "Science Findings," a monthly publication of the Pacific Northwest Research Station, U.S. Forest Service, Portland, Oregon. Keeping it cool: unraveling the influences on stream temperature, June 2005. Published with the permission of the PNW Research Station.

Water temperature influences virtually every biotic component of a stream, so it would be difficult to overstate the importance of water temperature in regulating stream ecosystems. Temperature sets the pace of nearly every living organism – from caddisflies to the bacteria that cycle essential nutrients. Most notably, water temperature affects fish. In Pacific Northwest streams, where salmon and trout reign supreme, the proper temperature is cold, very cold.

Fish are exothermic, or cold-blooded. The temperature of the water surrounding them acts as a throttle on their metabolism. From the very start, temperature controls how fast salmon eggs mature and the timing of emergence of larval salmon from the nursery gravels of the streambed. And at the end of their lives, when adult spring chinook salmon return to their natal streams, temperature will control how fast they burn reserves of body fat and if they survive the warm summer months to spawn in the fall. Moreover, several diseases that infect fish are kept in check by cold water. When temperatures rise, all these adaptations are thrown off, and fish populations – some of which are already imperiled – are put at higher risk. Given this, it is not surprising that scientists and land mangers are so concerned with rising stream temperatures throughout the Pacific Northwest.

"Stream temperature dynamics have been the focus of much controversy and have been at the center of a long-standing policy debate," says Sherri Johnson, a research ecologist at the Pacific Northwest Research Station in Corvallis, Oregon. "To add to the controversy, numerous contradictions exist in the published literature about the controlling factors of stream temperature, such as the role of air temperature, shade, substrate, and timber harvest."

When Johnson joined the station she inadvertently entered a debate over the controls. Stream temperature has been studied for many years, yet until recently, there remained considerable uncertainty and controversy over the relative influence of shade, air temperature, and substrate in controlling stream temperatures. This research uses new technologies to make more accurate determination of the factors affecting stream temperature, allowing management practices to be tailored to minimize their influence on stream ecosystems.

Air temperature was once thought to be a major factor influencing the water temperature in streams. A heat budget analysis, using data from streamside climate stations, showed that direct solar radiation, not air temperature, is the largest contributor to changes in daily temperature on stream temperature.

"Although it might seem like a 'no-brainer,' people were still arguing over the importance of shade associated with streamside vegetation on water temperature," says Johnson. "I was able to conduct an experiment that can hopefully put that question to rest." Johnson's experiment involved a profusion of black plastic and more than a mile of parachute cord. But more on that later. Shade is just one factor – albeit an important one – in the debate on how to keep streams cold.

Interconnectedness is the essence of ecology, so the complexity of natural systems makes it difficult to isolate one process from another. Therefore, when an ecologist devises an experiment that simply and accurately measures a single ecological process, it is termed elegant. And that is how colleague Steve Wondzell describes Johnson's shading experiment, elegant. Johnson credits her experience in boating with her ability to suspend 1,500 square yards of black plastic tarp 6 feet above a stream. "A recent flood had removed all the trees from the stream bank, so we had to experiment with ways to support and suspend the plastic; in the end we used more than a mile of parachute cord to keep it in place," she says. "Once the tarp was up, it effectively shaded the stream without influencing the air flow directly above the water."

The experiment was conducted on a small mountain stream in the western Cascades of Oregon within the H.J. Andrews Experimental Forest. Scientists have been collecting ecological data, including stream temperature data, in this particular watershed over several decades. Johnson measured the water and air temperature at half-hour intervals around the clock in multiple places along the stream reach. Data was collected for three weeks before shading, three weeks during shading, and three weeks after shading. She also measured incoming solar radiation above and below the tarp.

"Although it might seem obvious that shade would affect the water temperature, there were many people who believed that shade had a minor role in the heat

.....Continued on Page 7, SHADE

GRANDE RONDE MODEL WATERSHED

Meet the Staff

Jeff Oveson

Jeff Oveson has served as the executive director of the Grande Ronde Model Watershed since January 2000. Prior to coming to the Model Watershed, Jeff spent 19 years operating the family ranch in Wallowa County, where he first became interested in watershed restoration, both through his involvement as a director on the Wallowa Soil and Water Conservation District Board and through the implementation of some restoration projects of his own. Jeff cites the active participation of SWCD board members and others in agriculture as good examples of land and natural resource stewards who provided encouragement for him to pursue restoration projects on the Oveson family property, and to become involved in processes that incubated local decision making about the management of natural resources so critical to the livelihoods of so many eastern Oregonians.

Jeff says the things he likes about his job are the interaction with a "very dynamic, involved and committed board of directors, and the wide variety of people who really care about making the Grande Ronde and Imnaha subbasins a better place." He also points out that from a relatively small population base, there are a number of widely recognized people who are determined that local decisions are made locally, and that those people are willing to devote immense amounts of time and effort taking their case to Salem, Washington, D.C. and elsewhere in the name of local leadership.

A graduate of Oregon State University in animal science, Jeff worked six years for Ralston Purina Company in Seattle and Spokane before returning to Wallowa. He and Nancy, his wife of 22 years, along with daughter Hayley, 17, and son Nathaniel, 14, now reside in La Grande.

SHADE, continued from Page 6.....

budget of a stream," says Johnson. "Air temperature was thought to be the major player."

The debate over the role of air temperature in controlling stream temperature harkens back to a lesson you might have learned in an introductory statistics class: correlation does not imply causation. For many years, natural resource managers have been using predictive equations, based on air temperature, to estimate stream temperature. When air temperature goes up, stream temperature generally goes up – when air temperature goes down, stream temperature goes down. This has been an effective way to estimate stream temperature over broad areas. The use of these equations led people to assume that stream temperature was controlled by air temperature. However, just because air and stream temperatures are correlated does not mean that there is a cause-and-effect relationship. Johnson's shading experiment went a long way in resolving this debate. "The major factor influencing both stream and air temperature is incoming solar radiation," she explains. "They are correlated because they are both responding to daily cycles of solar energy."

Shading reduced the direct radiation to the stream water under the plastic, so it was cooler than the stream water in the sun, regardless of what happened to the air temperature. "The effect of the shade was seen primarily through decreases in the maximum daily water temperature," says Johnson. ■

Sherri Johnson is a research ecologist in the Forest Ecosystems and Landscapes Team of the Ecosystem Processes Research Program of the PNW Research Station.Steve Wondzell is a research ecologist in the PNW Research Station's Aquatic and Land Interactions team in Olympia, Washington.

Grande Ronde Model Watershed

Upcoming Board Meetings

The public is welcome to attend

- Tuesday, January 24, 6:30 p.m.
  Nez Perce Wallowa Band Interpretive Ctr, Wallowa
- Tuesday, February 28, 6:30 p.m.
  St Mary's Catholic Church, 12th Street, Elgin
- Tuesday, March 28, 6:30 p.m.
  Nez Perce Wallowa Band Interpretive Ctr, Wallowa
- Tuesday, April 25, 6:30 p.m.
  St Mary's Catholic Church, 12th Street, Elgin

Meeting dates subject to change. Please call 541-663-0570 to confirm dates. Thank you!

OWEB, continued from Page 2.....

program that provides funding to agricultural landowners to protect and enhance riparian areas along streams.

The Oregon Watershed Enhancement Board consists of 17 members representing natural resource agency commissions, federal agencies, and the public at large. The board brings together a diverse range of interests to review and approve applications for grant awards. The current list of board members can be found at *www.oweb.state.or.us.* The OWEB board has regional panels with expertise in such disciplines as forest and range management, water quality, hydrology, and fisheries to evaluate project applications within each region. This helps to bring knowledge of local conditions and concerns to the evaluation process.

OWEB receives funding from Oregon Lottery revenues and other sources, including salmon license plate fees, federal salmon funds, and funds that come from the purchase of "salmon-friendly" electric power.

OWEB has been an integral part of watershed restoration efforts in Oregon through its direct financial support of restoration projects, education, watershed assessments and monitoring. OWEB, through its support of watershed councils, has indirectly promoted grass-roots watershed restoration at the local level. There are 87 watershed councils in Oregon (see map). Watershed councils offer local residents the opportunity to evaluate watershed conditions and identify opportunities to restore and enhance watershed conditions. ■

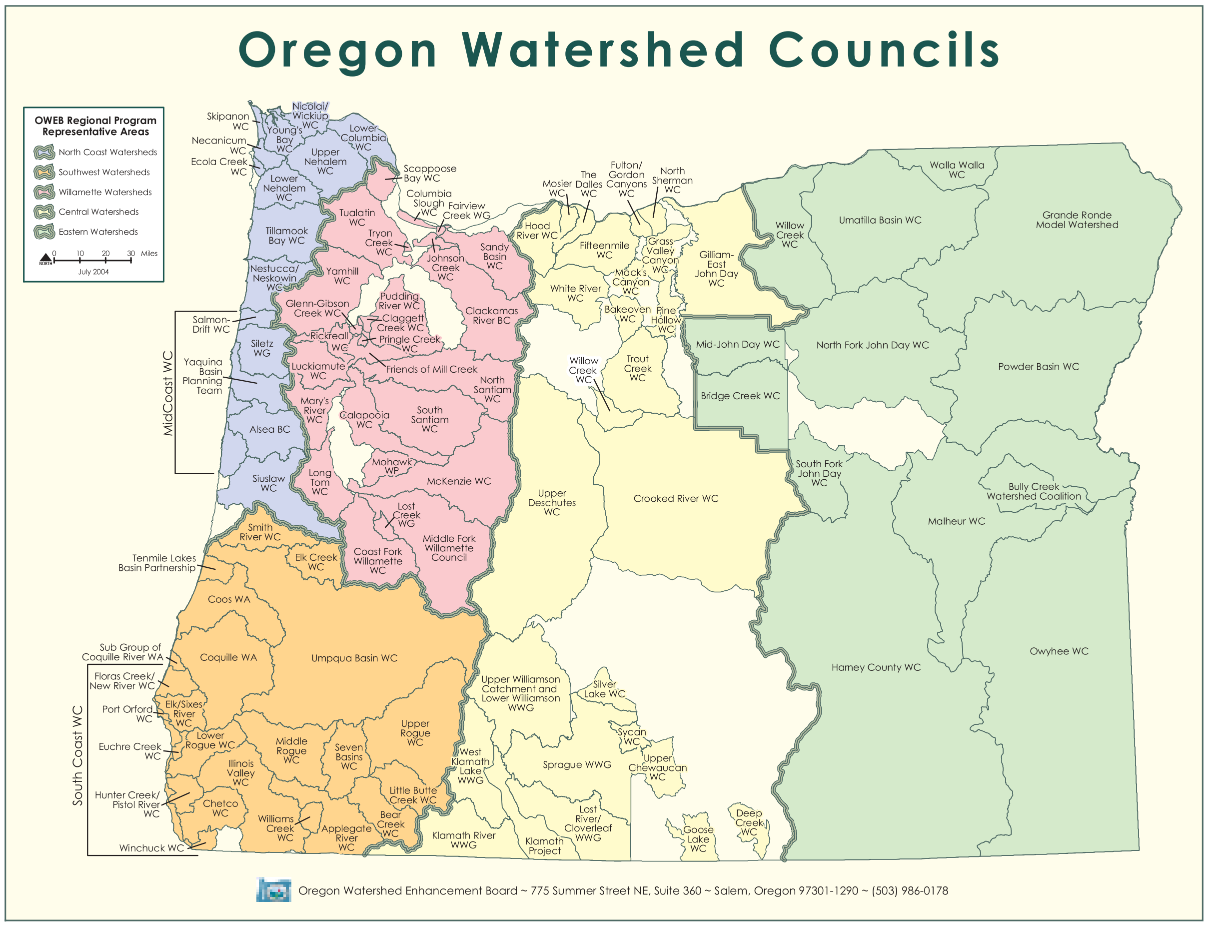
EXPERIMENT, continued from Page 3.....

toward the river. If necessary, use some clay to hold the edges down. This wax paper represents the impervious surface of a parking lot.

6. Fill the bottom of the aquarium up to about 2 inches from the bottom with water. The water should fill all of the aquarium gravel "aquifer" area, and should just reach up to the lowest extent of the clay/sand mixture. The aquifer captures and transports water that seeps down through the soil.

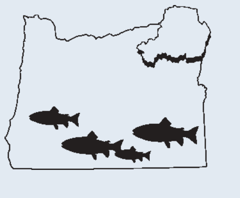
7. Using the spray bottle, simulate rain over the flattened soil area and the parking lot. Note that the "rain" soaks through the soil, but runs off the parking lot to the river. What would the effect be if the entire watershed was "paved?"

8. Sprinkle some cocoa mix over the sides of one of the smaller watersheds. The cocoa represents pollution. Over one of the unpolluted "watersheds," cause some rain with the spray bottle (it may be necessary to cause more rain by pouring water). Note that the runoff from the rain is clean. Now, make it rain over the polluted area. Note how the pollution travels down through the watershed, contaminating all downstream areas. Why is pollution a problem? What can be done to fix the problem? ■



Grande Ronde Model Watershed

1114 J Avenue ■ La Grande OR 97850
ph 541-663-0570 ■ fax 541-962-1585



Beth Stewart, Editor
bstewart@eoni.com