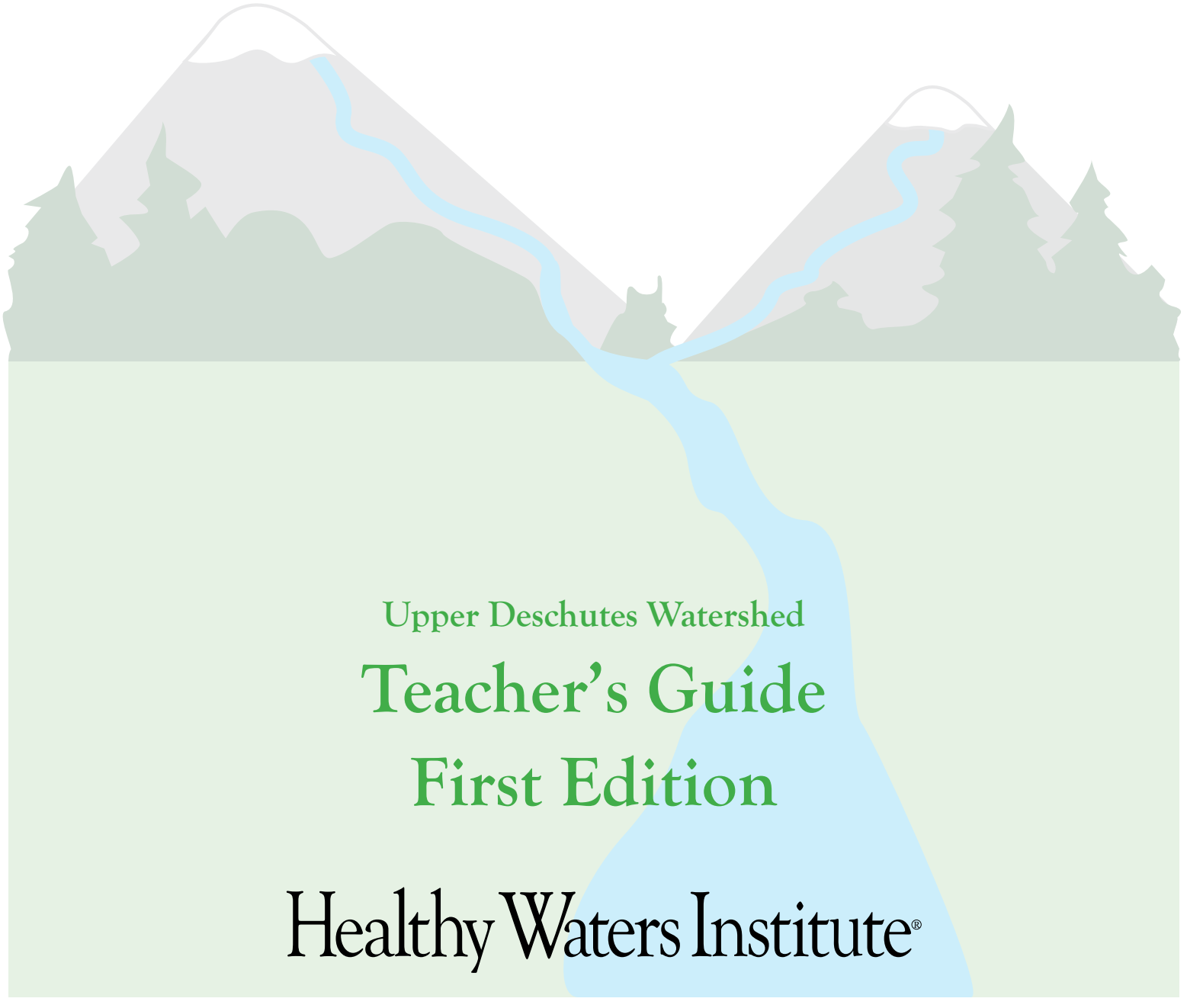
Hometown Waters



Upper Deschutes Watershed

Teacher's Guide

First Edition

Healthy Waters Institute®

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Introduction to Hometown Waters

Middle/High School Watershed Education Program of the *Healthy Waters Institute*® (*HWI*)

"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."

— John Wesley Powell

RATIONALE

Despite Oregon's reputation as a progressive state with a history of strong environmental leadership, the long-term prognosis for our freshwater ecosystems is grave. A recent national sampling shows Oregon's freshwater systems to be less supportive of aquatic life, less able to provide fish safe for human consumption, and more chemically unsafe to swim as compared to the national average. Though there are many local, state, and federal agencies and organizations currently working on-the-ground to improve the health of our home waters, restoration without stewardship is futile. Current efforts can be undone in a single generation if our youth do not understand the value of healthy rivers and streams.

Streams and rivers work like veins and arteries. The health of the water they carry is dependent on the health of the ecosystems and regions through which they flow. Healthy water is an indicator of a healthy watershed. In order to permanently achieve healthy waters in Oregon, we must take meaningful steps today to engage students statewide in the long-term stewardship of our watersheds. By forging a connection between students and their local watersheds through authentic educational experiences, rooted in relevant, experiential and place-based learning, *HWI* seeks to improve watershed health statewide by engaging students in region-specific field experiences and stewardship projects that benefit their home waters.

We all live in a watershed and it is therefore vital that we work together to reach all students in all areas, regardless of their geographic, ecologic, economic and demographic differences. Through the strength of partnerships, *HWI* seeks to build community interest in and support for conservation by bringing together a diverse group of volunteers, teachers, school administrators, students and local partners to educate the next generation of watershed stewards.

GUIDING PRINCIPLES

HWI relies on a set of assumptions to guide our efforts in working to ensure the future health of Oregon's rivers and streams. These guiding principles are considered throughout *HWI* program development and in support and implementation of partner programs and activities.

1. Water is our most valuable resource.
2. Students are future stewards of watershed health.
3. Authentic educational experiences, rooted in relevant, experiential and place-based learning, holistically prepare and empower our students in becoming future stewards.
4. Supporting increased connections between schools and communities will result in a young citizenry better equipped to understand and address community issues in informed and innovative ways, contributing to Oregon's overall livability.

WATERSHED EDUCATION

HWI develops, delivers and brings together watershed education programs, activities and partners that will help move youth from students to stewards. *HWI* considers the following local watershed concepts essential in preparing students for watershed stewardship:

1. Outdoor Ethics
2. Climate
3. Geography
4. Geology
5. Vegetation
6. Fish
7. Wildlife
8. History
9. Demographics
10. Water
11. Economy
12. Ecology
13. Eco-Art
14. Local partners

HWI works with schools, teachers and local partners to maximize student experience with the following concepts as they relate to local watershed education:

Outdoor Ethics – Interaction with the natural world:
- Responsibility for stewardship or care of the land
- Respect for the land and all its resources at all times and on all occasions
- Consideration of impact on the environment

Climate – Long-term weather pattern of the local watershed, including:
- Temperature
- Precipitation
- Wind

Geography – Study of the local watershed and its features, inhabitants and phenomena:
- Physical – processes and patterns in the natural environment
- Human – processes and patterns of human interactions shaping the local environment
- Environmental – spatial aspects of interactions between humans and the natural world
- Techniques – including mapping and GIS

Geology – Study and science of solid matter in the local watershed including:
- Rocks
- Soil
- Processes that shape the matter

Vegetation – Plant life of local watershed:
- Upland Forests
- Riparian
- Grasslands

Fish – With regard to the study of local:
- Native Species
- Non-Native Species
- Hatcheries, barriers to migration, other local issues

Wildlife – With regard to the study of local:
- Native Species
- Non-Native Species
- Habitat locations, endangered species, other local issues

History – With regard to the study of local:
- Native Inhabitants
- Settlement of watershed

Demographics – Population characteristics of local watershed

Water – With regard to the study of local:
- Watershed zoning
- Domestic water supplies
- Water treatment
- Regional hydrology
- Water use

Economy – The role of water in local economy with regard to:
- Products
- Services
- Agriculture

Ecology – The interaction among organisms and between organisms and their environment

Eco-Art – Study of the aesthetics of local watershed characteristics through:
- Streamside sketching
- Journal making
- Creative writing
- Photography
- Painting

Local Partners – It is essential for students to identify and get to know community partners in order to learn from them and get involved in local projects

PURPOSE

Hometown Waters (HW) was designed to help students move from home and school grounds out into the larger watershed unit. HW provides an interdisciplinary approach to watershed education, and opportunity to discover all aspects related to home watersheds through the inquiry process.

HW works to create a watershed-as-home concept by placing students in a web of awareness that will help them understand how water moves through their watershed, how the actions of the citizens of the watershed affect the water, and how each student's life is touched by the water as it moves through their watershed.

The success of HW in connecting students to their local watersheds is dependent on local resources including experts, community partners and existing educational materials. Each community holds the key to unlocking and connecting students with the local watershed. This program is not about *HWI* curriculum. It's about connecting the right people and the right opportunities to help our students develop a greater understanding of and connection to the watershed in which they live. In order for students to truly develop a sense of place, communities need to come together to collectively offer resources and to support teachers in integrating meaningful watershed activities into school curriculum.

HWI's role in HW is to share resources and successes between partners, teachers, schools and students. From its inception, *HWI* has been a collaborative effort, and is reliant on strong partnerships with schools, watershed councils, state and federal agencies, local governments, landowners, citizens, soil and water conservation districts, conservation groups, and others. *HWI* Regional Education Coordinators, Assistants and staff work to enhance delivery of water education and ensure that stewardship projects undertaken by classrooms are meaningful to the community.

Acting as a connector and catalyst, *HWI* seeks to strengthen existing partnerships and form new connections between entities seeking to engage students in hands-on watershed education. By uniting education, community, and stewardship, *HWI* takes an active role in cultivating the next generation of watershed stewards.

OBJECTIVES

The goal of HW is for students to develop a greater awareness and deeper understanding of their local watershed. The objectives are based on watershed features as integral components in fostering a watershed-as-home concept.

Students participating in HW should be able to:

1. Name the watershed (and sub-basin if appropriate) in which they reside.
2. Identify the headwaters and mouth of their home watershed.
3. List major factors influencing the nature of the water in their watershed.
4. Describe the eco-regions and/or primary plant associations in their watershed.
5. Describe personal water use and where that water ultimately comes from and goes within their watershed system.
6. Describe the historical condition of their watershed (pre-European influence) and name ways the watershed has changed over time.
7. Identify wild and domestic creatures that live in their watershed.
8. Name the most important crops, products, and/or services produced in their watershed and describe how water is essential for the economy.
9. Become familiar with organizations involved in restoration, conservation, and/or management of their watershed and know how they can personally get involved to make a difference.

HW TOOLKIT

The following tools are the building blocks of HW:

1. Virtual Watershed Tour
2. Regional Watershed Information

3. Watershed Inventory
4. Programs & Activities
5. WebQuest
6. Service Learning/Extended Application
7. Community Sharing

Stringing these tools together as a packaged program offers students repeat opportunities to learn about their watershed through a variety of disciplines and formats. The progression of these tools takes students from a basic level introduction to their local watershed through in-depth examinations of aspects that both pique their curiosity and satisfy classroom goals. Built-in to this package is flexibility in timing, topic and delivery, much of which will be determined by students, teachers and available local resources. We strongly encourage all teachers and partners to share their use of these tools and activities with *HWI*. *HWI* will continue to share materials through our website. We hope to see the collection of adapted and added ideas continue to grow and serve as inspiration for others in connecting students with their home waters.

SUPPORT FROM HWI

HWI will assist schools incorporating watershed education by offering:

- Educational materials
- Teacher grants – up to $500
- Student grants – $200 maximum for high school students
- Travel and substitute teacher reimbursement
- Networking opportunities with diverse community partners
- Student scholarships – four $1500 awards for juniors and seniors
- Publications – healthy waters kids and journal
- Website – resources, opportunity for students to share projects
- Assistance in developing student summits
- Trainings, workshops and consultation

SYMBOLS FOR COMMON CURRICULUM GOALS

At the beginning of each Hometown Waters activity, teachers will find a symbol that corresponds to the 5th grade Common Curriculum Goals (CCG) and benchmarks that are aligned with that activity. Hometown Waters integrates an interdisciplinary approach for students to more holistically learn about the water cycle and connect to their home waters; therefore, teachers will find cross-curricular CCGs and benchmarks.

The CCGs and benchmarks that can be achieved through comprehensive delivery of Hometown Waters program materials and activities are as follows:

SYMBOL GUIDE FOR BENCHMARK CATEGORIES


Science Inquiry


Science & Technology


English Language Arts


Earth & Space Science


Life Science


Science in Personal and Social Perspectives


Physical Science


Social Science


Mathematical Problem Solving

Geography


Measurement

Healthy Waters Institute®

2008/09 TEACHER GRANT APPLICATION

Oregon Trout

The Healthy Waters Institute (HWI) seeks to connect every student with their home waters. Through meaningful outdoor educational experiences and commitment to local communities, we will cultivate citizens capable of maintaining the health of waters statewide. HWI is a provider of tools, programs and services that help teachers and students connect with their local waters through community-based projects.

HWI offers grants to help teachers engage students with their home waters. Grants up to $500 may be used to pay for field trip transportation costs, substitutes, equipment, rentals, or other relevant science education tools and/or services. HWI encourages teachers to submit grant requests following the guidelines below. One role of the local HWI Regional Education Coordinator is to assist teachers in the grant application process; HWI encourages teachers to contact their local REC for more information and for assistance in creating a project that helps connect students with their home waters.

PILOT RESOURCE POOL GRANTS

Submissions:
- Individual grants up to $500
- Teachers may submit more than one request
- Open ended submission period

To Be Used For:
- Transportation
- Substitutes
- Equipment
- Rentals
- Other science education tools and services

Who Can Apply:
- Teachers within the pilot watersheds
- Salmon Watch teachers
- Other teachers with projects that further the HWI mission.

How To Apply:
- Submit the completed Grant Application Form to your Regional Education Coordinator for consideration (see sidebar).

Additional Requirement:
- Successful applicants are required to submit a final report (with photos) for use on-line or in HWI journal

Traci Price
Director, Healthy Waters Institute
Oregon Trout
65 SW Yamhill St. Suite 300
Portland, OR 97204
503.222.9091 x 25
traci@ortrout.org
www.healthywatersinstitute.org

Information about other HWI watersheds:

Kim Carson
Regional Education Coordinator
Oregon Trout
230 S 3rd St, Suite 202
Corvallis OR 97333
541.753.4280
kim@ortrout.org

Sarah Oakley
Regional Education Coordinator
Oregon Trout
65 SW Yamhill St. Suite 300
Portland, OR 97204
503.222.9091 x 20
sarah@ortrout.org

Kolleen Yake
Regional Education Coordinator
Oregon Trout/Upper Deschutes Watershed Council
700 NW Hill Street
Bend, OR 97709
541.382.6103 x 33
kolleen@ortrout.org

Healthy Waters Institute®

2008/09 TEACHER GRANT APPLICATION

Oregon Trout

Date _____ Phone _____

School _____ Fax _____

Address _____ Name _____

_____

_____ Email _____

Watershed:

☐ Johnson Creek ☐ Marys River ☐ Upper Deschutes ☐ Other _____

List names of teachers/ leaders who will participate in project: _____

_____

_____

YOU MAY ATTACH A SECOND SHEET FOR MORE SPACE TO ANSWER THE FOLLOWING QUESTIONS.

Project Description (maximum 250 words):

Explain, by dollar amount and item, how grant funds will be spent?

Who/how many will benefit from the grant?

How does the project fit into the overall goals of HWI? (maximum 250 words)

If the project is on-going, how will it be funded in the future?

List other sources of funding for the project:

If you are mailing this form, please send it to your Regional Education Coordinator (contact information on previous page) or to our main office:

HEALTHY WATERS INSTITUTE
65 SW YAMHILL, SUITE 300
PORTLAND, OREGON 97204
(503) 222-9091 x20 Fax (503) 222-9187

Healthy Waters Institute®

2008/09 STUDENT GRANT APPLICATION

Oregon Trout

The Healthy Waters Institute (HWI) seeks to forge a lifelong, caretaking bond between students and their local watersheds ensuring the health of Oregon's rivers and streams for generations.
Students across Oregon are participating in valuable stewardship and research projects that benefit their home communities and the health of their local watersheds. HWI is committed to supporting and promoting the efforts of engaged students recognizing their role as citizens, equipped to understand and address community issues in informed and innovative ways.

HWI offers grants to help students participate in watershed projects. Grants up to $200 may be used to pay for transportation, equipment, rentals or other relevant tools and/or services. All Oregon high school students are eligible. Grants will be awarded to students who propose projects benefiting the health of an Oregon watershed. Projects include but are not limited to research, monitoring, creative arts, and public awareness. Projects do not have to be directly affiliated with an HWI program or staff member.

STUDENT GRANTS

Submissions:

- Individual grants up to $200
- Students may submit more than one request
- Submissions accepted on a rolling basis

To Be Used For:

- Transportation
- Equipment
- Rentals
- Other project tools and services

Who Can Apply:

- All Oregon high school students

How To Apply:

- Submit the completed Grant application form and signed letter of support from a teacher on-line (www.healthywatersinstitute.org), to a Regional Education Coordinator (if applicable) or by mail.

Additional Requirement:

- Successful applicants are required to submit a final report with documentation (photos, video, newspaper articles, original or images of products created) for use on-line or in HWI publications.

Traci Price
Director, Healthy Waters Institute
Oregon Trout
65 SW Yamhill St. Suite 300
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Kolleen Yake
Regional Education Coordinator
Oregon Trout/Upper Deschutes Watershed Council
700 NW Hill Street
Bend, OR 97709
541.382.6103 x 33
kolleen@ortrout.org

Healthy Waters Institute®

2008/09 STUDENT GRANT APPLICATION

Oregon Trout

Date _____ Phone _____

School _____ Fax _____

Address _____ Name _____

_____

_____ Email _____

Watershed:

☐ Johnson Creek ☐ Marys River ☐ Upper Deschutes ☐ Other _____

List names of supporting teachers. You MUST include a signed letter of support from at least one teacher.

_____

_____

YOU MAY ATTACH A SECOND SHEET FOR MORE SPACE TO ANSWER THE FOLLOWING QUESTIONS.

Project Description (type of project, timeline, location). _____

_____

_____

_____

Impact—how will the project be shared with the watershed or community? _____

_____

_____

_____

Personal Statement—how does this project relate to personal/career goals? _____

_____

_____

_____

Budget—how will the grant be used? _____

_____

_____

_____

List other partners and organizations invovled in your project.

_____

_____

_____

REMEMBER: Successful applicants are required to submit a final report with documentation (photos, video, newspaper articles, original or images of products created) for use on-line or in HWI publications.

If you are mailing this form, please send it to your Regional Education Coordinator (contact information on previous page) or to our main office:

HEALTHY WATERS INSTITUTE
65 SW YAMHILL, SUITE 300
PORTLAND, OREGON 97204
(503) 222-9091 x20 Fax (503) 222-9187

Getting Started

1. LOCAL PARTNERS

The first step in connecting students to their home waters is finding out who in your community can provide and support watershed education in and out of the classroom. Contact a *HWI* Regional Education Coordinator or get in touch with your local Watershed Council, Soil & Water Conservation District or Natural Resource agency or organization. Talk with other teachers in your school – find out what local groups they are working with. See the chart on the next page for some ideas.

2. RECOMMENDED RESOURCES

In the event that local watershed educational programs and partners are scarce, we recommend keeping the following guides on hand:

- The Streamkeeper's Field Guide: Watershed Inventory and Stream Monitoring Methods, Adopt-A-Stream Foundation (http://www.streamkeeper.org/catalog/books.htm)
- The Stream Scene: Watersheds, Wildlife and People, Oregon Department of Fish & Wildlife (http://www.oregon.gov/OPSW/archives/streamscene/StreamScene.pdf)
- Project WET Curriculum and Activity Guide, Project WET (http://www.projectwet.org/wetguide.htm)
- The Ecology Field Guide, Wolftree, Inc. (http://www.beoutside.org/)
- Create you own "Regional Reading" list – find non-fiction, fiction, essays, natural history, myths, legends, and poetry about your watershed region. Build a regional library for your classroom.

3. HW TOOLKIT

Collect and develop tools to teach your students about their local watershed. You can find some of these through *HWI*. If *HWI* does not have tools for your specific watershed, you will be able to find templates of each tool which you can adapt to incorporate regionally specific information for your watershed. Adapting tools can be a great student project! The local partners you've identified probably have the information you need. We encourage you to share new materials with *HWI* so they can be made available to a larger network of partners.

4. PLAN AHEAD

- Invite local experts and *HWI* staff to share information with your class
- Talk about a Service Learning or Independent Project with your students – what kind of watershed project are they interested in?
- Make nature journals with your students to be used for observing outside, drawing, homework assignments and writing down thoughts, ideas and inspirations! (The use of recycled and/or natural materials is strongly encouraged!)

WATERSHED INFORMATION

Adapted from The Streamkeeper's Field Guide

	Source	Outdoor Ethics	Climate	Geography	Geology	Vegetation	Fish	Wildlife	History	Demographics	Water	Economy	Ecology
Colleges & Universities	Departments of: Biology, Botany, Ecology, Entomology, Environmental Studies, Fisheries, Geology, Natural Resources, Wildlife, Zoology	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Local Agencies	Libraries/Internet: City, County	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cities: Departments of Public Works, Public Health, Planning			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Counties: Departments of Public Works, Planning, Public Health, Government Councils, County Extensions, Conservation Districts, River Basin Teams		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Indian Tribes: Fish & Wildlife Departments, Tribal Councils	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓
Regional	Watershed Councils, Soil & Water Conservation Districts, River Conservation Groups, Water Districts			✓	✓	✓	✓	✓	✓		✓	✓	✓
State Agencies	Department of Fish & Wildlife					✓	✓	✓	✓		✓		✓
	Department of Forestry					✓		✓	✓				✓
	Department of Environmental Quality		✓			✓	✓	✓			✓		✓
	Department of Natural Resources, Lands, etc.				✓	✓	✓	✓	✓	✓	✓		✓
	Department of Ecology			✓	✓	✓	✓	✓	✓		✓		✓
	Department of Social and Health Services						✓		✓	✓	✓	✓	
Federal Agencies	Bureau of Land Management			✓		✓		✓					
	Forest Service					✓	✓	✓	✓				✓
	Environmental Protection Agency					✓		✓			✓		✓
	Fish & Wildlife Service						✓	✓	✓		✓		✓
	Army Corps of Engineers					✓	✓	✓	✓		✓		
	National Resource Conservation Service			✓	✓	✓	✓	✓		✓	✓		✓
	Soil Conservation Service				✓	✓	✓	✓		✓			✓
	National Marine Fisheries		✓				✓	✓	✓		✓		✓
	Geological Survey				✓	✓			✓				
	National Weather Service		✓										

Virtual Watershed Tour

VIRTUAL WATERSHED TOUR

A virtual tour is a general education tool used to introduce students and the general public to their home watershed. Students can research, compile and create their own virtual watershed tour for their area, the process for creating the tour gives students and opportunity to unearth a wealth of watershed information, history, photos and data with which to create a visual and informative tour of their home watershed. This tool offers a glimpse into watershed imagery and the opportunity to communicate information about the geography, hydrology, ecology, history, and community land and water use issues in your watershed. Powerpoint presentations are the ideal format rich with images as opposed to text. Tours should be approximately 35-45 minutes in length.

Options for content include:

1. Tracing the watershed path from headwaters to mouth.
2. Focusing on watershed features: geology, hydrology, historical land use, current land use, exceptional or interesting features—(i.e. petroglyphs, spouting horns, waterfalls)
3. Providing a comprehensive overview of the featured watershed. Names of watershed, major tributaries, counties, and other locators should be used.
4. Covering local land use as a major factor in watershed health in more depth than geology or basic hydrology. Land uses and impacts often reveal patterns - the upper reaches may be impacted by forestry, followed by agricultural impacts slightly lower in the system, with urban development and impacts from industry in the valley floors.
5. Imparting a strong "what you can do" or "what's being done by people who care" theme to give viewers a sense of actions they can take to improve their watershed.

Virtual Watershed Tours can be created through a variety of means. Photos and information can be collected and compiled from local archives and partners; digital cameras can capture what you want to present. Putting together a tour is a great student project!

Regional Watershed Information

REGIONAL WATERSHED INFORMATION

Regional Watershed Information should be integrated into all activities. Creating a document to keep it all in one place is an effective tool to use as a reference for teaching to a variety of concepts.

Regional information should include:

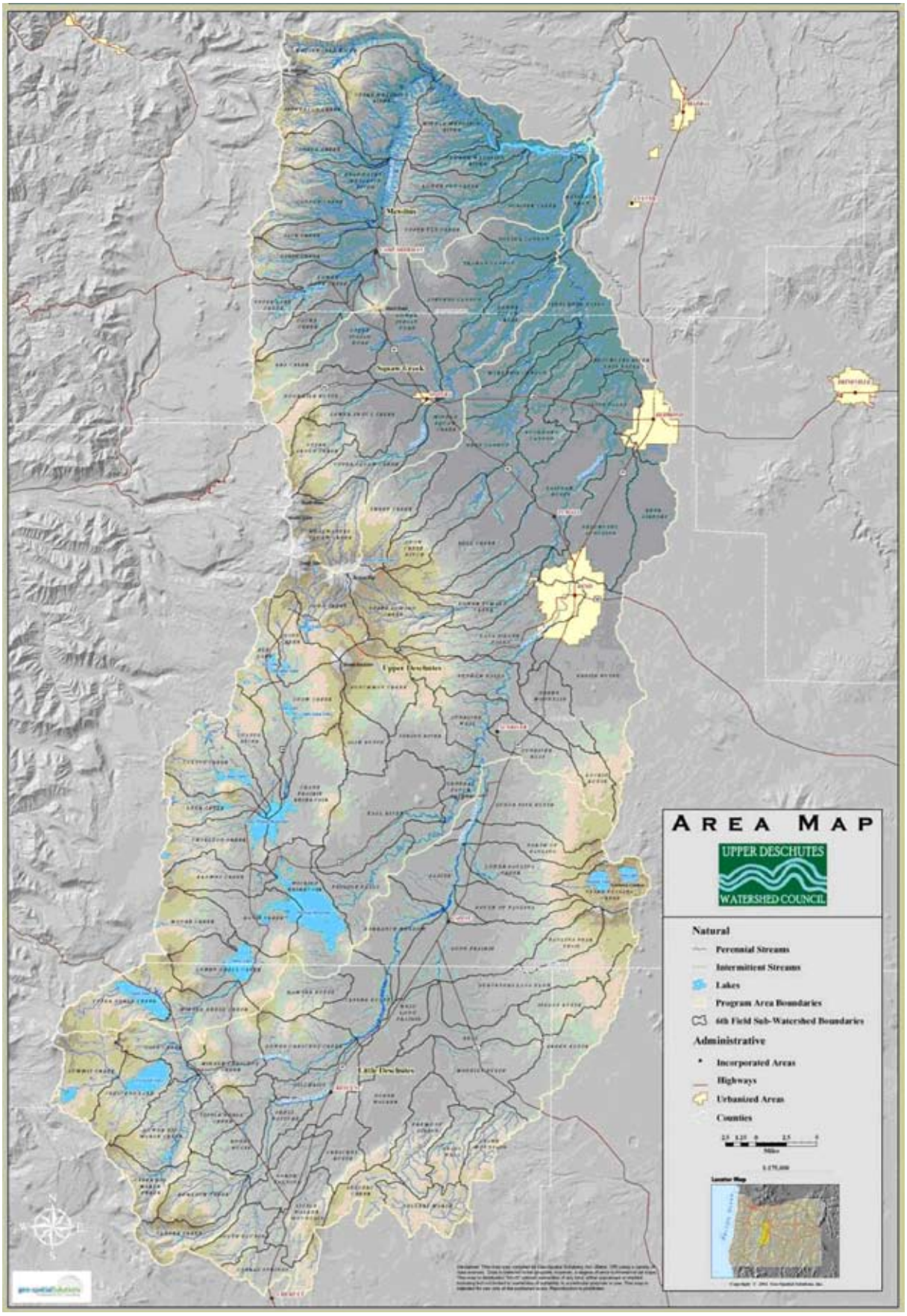
1. Watershed boundaries
2. Headwaters: a written description of the headwaters should include basic hydrology, land use/management, and recharge.
3. Primary watershed issues of concern.
4. Eco-region and/or plant association group maps.
5. History: 1-2 pages describing settlement, European settlement, land use patterns (specifically natural resource extraction activities), historic vegetation, water management (including significant dam implementation and other channel modifications), and the history of regional native fish declines.
6. Wildlife (ODFW wildlife habitat maps might work well for this).
7. Economy: ½ page overview.

Regional information can be compiled through a variety of resources. Students are also a great resource for this project!

Check out *HWI*'s website (www.healthywaters.org) to find regional information about your watershed. If we do not have information for your region use the following template to create your own regional watershed information. Feel free to add or delete sections as needed.

We encourage you to share your watershed information with *HWI* so we can make it available for others through our website.

Upper Deschutes Watershed



EUROPEAN SETTLEMENT

The Deschutes River is and has always been known for its beauty and for the healthy habitat it provides wildlife. In 1916 Warden W.O. Hadley referred to the river by asserting: "The Deschutes River, I think, is the best trout stream in Oregon. I will go further in my claims for this wonderful stream and its tributaries and say that if it is not already, it soon will be the best trout stream in the United States. This stream has a steady flow of good cold water and only varies a few feet from extreme high to low water" (Oregon Sportsman 1916).

The earliest artifact found as evidence of white explorers venturing into Deschutes County is a rock carved by the Astoria Party in 1813. The carving was found at a site near the river approximately 1 mile upstream from Bend. In approximately the same area, just above Benham Falls, Hudson Bay trappers Tom McKay and Finan McDonald traveled across the Deschutes in 1825. A year later, Peter Skene Ogden also traveled across the Deschutes and ventured down toward Mt. Shasta with Tom McKay. Famous Oregon Trail pioneer, Nathaniel Wyeth lived and trapped along the Deschutes in 1843-1853. His party built dugout canoes along the river and Wyeth purportedly stood in the icy water to pull them over Benham Falls. Billy Vandevert was one of the oldest permanent residents in Bend. In 1893, Vandevert built a homestead south of Bend on the Deschutes River and he remained there until his death in 1944.

Bend became an official incorporated city in 1905. Residents of the city received Deschutes River water from the Bend Water, Light, and Power Company water system. Eventually in 1924, the City of Bend purchased the water company and realized the need for an alternate water source due to algae growth in the Deschutes. Tumalo Creek was recommended as a water source due to its high quality water. The City of Bend purchased water rights for Bridge Creek, a tributary of Tumalo Creek, water in 1924 from the Deschutes County Municipal District (now Tumalo Irrigation District). During the period of European settlement of the area, the river was one resource among many that was altered for social or economic uses. Between 1911 and 1935 there was community pressure to build a storage reservoir at Benham Falls. The project was only prevented by the large expense and the geologists' warning about the quantity of water losses into the lava flow on the east side of the river. Wickiup Reservoir site was chosen as a compromise.

Irrigation development started in Deschutes County along Whychus Creek (formerly Squaw Creek) near Sisters around 1869. Irrigation was most likely the first major cultural development in the Upper Deschutes watersheds. With homesteading underway in 1898, irrigation was undertaken on a relatively large scale in about 1900. Many irrigation companies were formed about this time, but most merged into larger companies that eventually evolved into irrigation districts run by local landowners.

The waters of the Deschutes River were used to irrigate as well as to begin to generate power for the area. The dam that created Mirror Pond and introduced the first hydroelectric power to Central Oregon was built in 1910. The powerhouse and hydraulic works for the Bend Hydroelectric Project were renovated in 1913. The dam is located just north of where Newport Bridge is in Bend and is still currently in use today. The dam is operated by Pacific Power and Light and contributes 1,100 kilowatts of energy, enough for 400 homes, to the area's electricity supply. Originally there was a wooden fish ladder, but there is no current means for fish passage.

During the early 1900's, the Upper Deschutes River was home to a vibrant timber industry. Timbermen used axes, crosscut saws, horses, and "high wheel" rigs to cut down and transport huge Ponderosa pine trees to the Deschutes River and the two major mills that operated on its riverbanks. Brooks-Scanlon and Shevlin-Hixon were both Minnesota based lumber firms who built mills near the Deschutes River to cut the timber they had been purchasing throughout Central Oregon. The Shevlin-Hixon Company sawed their first log at their mill on the Upper Deschutes River in March of 1916. The Brooks Scanlon mill operated on the Upper Deschutes River from April 1916 to 1993. Both companies built extensive railroad systems for the transportation of timber

throughout the area. Around 1935, logging railroads were replaced by trucks that would haul timber directly out from the woods. At the height of the industry, the Brooks-Scanlon and Shevlin-Hixon operations were two of the largest pine sawmills in the world, operating twenty-four hours a day and employing more than 2,000 workers each.

As timber supplies in the Upper Deschutes watersheds diminished, Shevlin-Hixon sold its interests to Brooks-Scanlon. Sitting right on the Deschutes River in the southern part of Bend, the Shevlin-Hixon Mill was abandoned and eventually demolished in 1987. Brooks-Scanlon's Mill A closed in 1938 and Mill B was shut down in 1994 due to a shortage of available timber.

The Deschutes River was historically used to transport logs to downstream lumber mills. In order to facilitate the transportation of logs and prevent log-jams during the early 1900s, much of the naturally occurring large woody material was removed from the river channel between where Wickiup Reservoir is currently located to ½ mile above Benham Falls. The lack of large woody material along the river during the early part of the 20th century contributed to a lack of resistance to erosion along the stream banks. In 1939, approximately 10-23 million board feet of logs were transported down the upper Deschutes River. It is estimated that 6.5 billion board feet of timber was cut from the Deschutes National Forest between 1992 and 2002.

WATERSHED INFORMATION

The Deschutes River begins at Little Lava Lake. Little Lava Lake is filled with groundwater inflow that starts in the snowfields of Mt. Bachelor and the Three Sisters mountains. Known to many as North Sister, Middle Sister, and South Sister, the Three Sisters mountains are also called Faith, Hope, and Charity.

From its headwaters at Little Lava Lake, the Deschutes River runs from north to south through Crane Prairie Reservoir and then to Wickiup Reservoir. Crane Prairie Reservoir was once a natural meadow until the dam was built in 1922. Wickiup Reservoir is an earthfill dam that was built in 1949. When the Deschutes River water is released from Wickiup it flows north through the communities of Sunriver and Bend. Downstream from Bend, the Deschutes River converges with the Metolius River and the Crooked River behind the dams that create Lake Billy Chinook.

The Deschutes River is a spring-fed system that historically had very stable flows. As opposed to river systems that are fed by surface runoff, a spring-fed river like the Deschutes has an incredibly stable hydrologic regime in which natural daily, monthly, and even annual fluctuations in water flows are minimal. A 1914 U.S. Reclamation Service report referred to the Deschutes River as "one of the most uniform of all streams in the United States, not only from month to month, but also from year to year. The extreme minimum is usually in midwinter when it occasionally drops, for a few days only to (approximately) 1,100 cfs".

A spring-fed system with such a stable flow regime, the Deschutes River and its tributaries have not been greatly affected by floods throughout history. There exists a high level of permeability within the volcanic rocks in the area and this permeability allows rain and melting snow to quickly sink into the ground and recharge the water table. Therefore, flooding was historically much less common in the Upper Deschutes than in other less stable, less permeable systems.

Some of the other streams within the watershed include Snow Creek, Brown's Creek, the Little Deschutes River, Fall River, and Spring River. The major tributaries to the Deschutes between Bend and Lake Billy Chinook are Whychus Creek and Tumalo Creek. If your school is in Bend, you have probably seen the Deschutes River. There are quite a few fun parks like Farewell Bend Park, Harmon Park, and Drake Park that are right next to the Deschutes. If your school is in Sisters, you might know how beautiful Whychus Creek is. It flows right through Sisters City Park! Also, the Little Deschutes River is really close to La Pine Elementary School.

Have you ever been camping or hiking up in the mountains? Some of the lakes you might have gone canoeing on are Odell, Davis, Cultus, Little Cultus, Lava, Little Lava, South Twin, North Twin, Hosmer, Elk, and Sparks. There are also over 400 smaller high elevation lakes in the Cascades.

Between the headwaters and Lake Billy Chinook, the Deschutes River travels 130 miles. The total length of the Deschutes River from the headwaters to the mouth at the Columbia River is 250 miles!! That's about the same distance as 1000 times around your school track!

GEOLOGY AND TOPOGRAPHY

Much of the hydrology of the Upper Deschutes watersheds has been formed or modified by frequent geologic events throughout history. One vivid example of the connections between geology and hydrology in the area is in the southwestern part of the watersheds at Davis Lake. Approximately 5,500 years ago Odell Creek was dammed by a lava flow several hundred feet thick and Davis Lake was created. The lake currently has no surface outlet, but drains through porous lava openings at approximately the same rate that Odell Creek flows into it. It is believed that Odell Creek was previously hydrologically linked to the rest of the Upper Deschutes watersheds due to the common indigenous fish species including redband trout, mountain whitefish, and bull trout that were historically present in Odell Creek and in the Upper Deschutes.

Due to the volcanic geology of the upper Deschutes watersheds, groundwater is connected to and fed by Cascade precipitation, streams, and irrigation canals. Generally, groundwater flows from the High Cascades, downward through subsurface basalt fractures and volcanic and sedimentary materials, to eventually discharge into streams near Lake Billy Chinook. The High Cascades on the western side of the watersheds are a volcanic aquifer for the region. The Deschutes Basin aquifers are comprised of a sampling of late Miocene to Holocene lava flows, ignimbrites, and volcaniclastic sediments. Groundwater occurs in most rocks of the basin, but fractured lava, interflow zones, and coarse-grained volcaniclastic sediments are particularly productive water bearing units. Groundwater recharge occurs when the water table is refilled with water percolating down from snowmelt or rain on the earth's surface. The High Cascades have a very high recharge rate from rain and snowmelt. Annual recharge is rapid, and water moves quickly down and through porous volcanic soils into the aquifer. Groundwater levels also respond rapidly to changes in river levels and to irrigation canal seepage—even at depths greater than 600 feet.

Most frequently, groundwater wells in the Bend-Redmond area tap down into the deeper volcanic and sedimentary rocks, but some are also developed through the surface lava beds. The general water table trend ranges from approximately 500 or more feet deep at the City of Bend rising to 200-300 feet deep near Redmond. This is due to a northerly downward sloping trend in the ground surface elevation.

SOILS

Cindery soils are found throughout the watersheds. These coarse soils can support some vegetation; however, the nature of this material perpetuates a high erosive potential and makes vegetative growth or reforestation challenging. Soils in the Upper Deschutes watersheds have varying amounts of pumice and ash due to the historic eruption of Mount Mazama. Mount Mazama is the volcano that erupted approximately 8,000 years ago and left Crater Lake in its place. Throughout Central Oregon, the accumulation of litter and duff on pumice and ash soils is relatively low. This layer provides a slightly higher water holding capacity than the Mazama ash and pumice, enhancing the productivity of the site in areas where tree roots reach this layer. These porous soils then rest upon glacial till, glacial outwash, and basaltic lava. Precipitation is easily absorbed and transferred through permeable rocks into subsurface systems resulting in extensive substantial groundwater exchange.

CLIMATE

Temperatures throughout the Deschutes River watersheds are considered moderate with relatively warm days and cool nights. About 10 days per year are really hot with temperatures over 90 degrees Fahrenheit. Winter lows average between 20 and 30 degrees Fahrenheit.

The high elevation portion of the upper Deschutes sees the most precipitation in the area. Often, greater than 75% of the annual total precipitation for the watersheds falls as snow between November and March. Snow creates a deep snowpack that stores water until spring. The mean annual precipitation varies widely throughout the watershed; ranging from 140 inches in the mountains down to 10 inches in the much drier lower elevation eastern parts of the watershed near Redmond, Terrebonne, and Lake Billy Chinook.

DEMOGRAPHICS

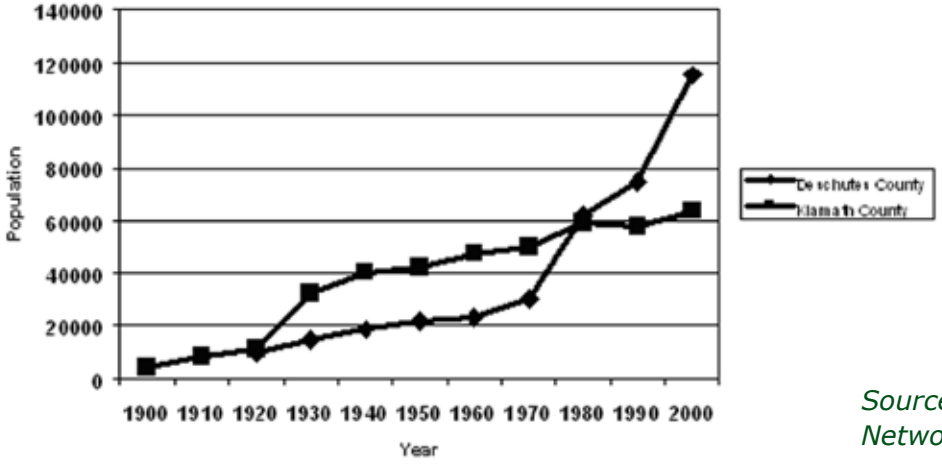
The population in Central Oregon has grown rapidly since the 1990's. The current condition of the upper Deschutes watersheds is affected by land and water use patterns that are connected to the rapid growth occurring throughout the area. One of the things people love most about Central Oregon is the river! However, increased recreation on the river and a high demand for water for irrigation and municipal use has had an impact on the Deschutes River system and its aquatic life. Rapid population growth is the most challenging issue facing the upper Deschutes watersheds. The increase in growth is increasing demands for both groundwater and surface water. Stormwater management in rapidly growing urban areas is becoming an additional concern. Deschutes County is currently the fastest growing county in Oregon and the majority of that growth is due to new residents and families moving into the area.

DESCHUTES COUNTY 2002 COORDINATED POPULATION FORECAST

Year	Bend UGB	Redmond UGB	Sisters UGB*	Non-Urban County	Total County
2000	52,800	15,505	1,100	48,283	117,688
2005	67,180	21,582	1,556	53,564	143,882
2010	76,211	27,873	2,200	60,619	166,903
2015	84,123	34,795	2,757	67,427	189,101
2020	93,712	41,051	3,394	73,447	211,604
2025	102,750	47,169	4,167	77,134	231,220

Source: Deschutes County Coordinated Population Forecast Final Report February 2003

DESCHUTES AND KLAMATH COUNTY: POPULATION 1900 TO 2000



Source: Watershed Professionals Network 2002

WATER QUANTITY

The current stream flow patterns in the upper Deschutes River are different than they were prior to the management of Deschutes water for widespread irrigation purposes. Historic flows in the Deschutes River were very stable year-round. A groundwater-fed river, the Deschutes naturally retained a steady flow around 1200 cubic feet per second throughout the year. Since the construction and management of Wickiup Reservoir, winter stream flows downstream from the dam are much lower now than they were. Also, summer flows in the Deschutes below the City of Bend are much lower then they were before irrigation diversions were put in place. The differences in the amount of water in the river throughout the year has had a negative effect on water quality and fish habitat conditions. When there is not very much water in the river in the summer, the water temperatures heat up to temperatures that are unhealthy for fish and aquatic insects.

WATER QUALITY

There are many sections of the upper Deschutes River that do not meet the Oregon Department of Environmental Quality's water quality standards for either temperature, pH, dissolved oxygen, sedimentation, turbidity, or chlorophyll a. Water quality conditions in the upper Deschutes River are linked to water quantity and flow levels. Temperature, dissolved oxygen, and pH are affected by low stream flow conditions in Tumalo Creek, Whychus Creek, the Little Deschutes, and the Deschutes River.

FISH

Low winter flows below Wickiup Reservoir and low summer flows below the City of Bend contribute to poor water quality conditions that are inhospitable for fish. Dewatered in the winter, part of the streambed and the stream banks below Wickiup are exposed to the effects of freezing and thawing. Trout redds (or eggs) are dewatered and the stream banks become more vulnerable to erosion when the flows increase in the spring. Similarly, low flows in the summer months impact fish habitat and water quality below Bend. At the same time as summer low flows, water temperatures below Bend exceed the state's temperature standard during the summer salmonid rearing period.

Bull trout are currently listed as a Threatened species under the Endangered Species Act (ESA). Indigenous to the Upper Deschutes Watersheds, numbers of bull trout declined following the construction and operation of Wickiup and Crane Prairie Reservoirs. The United States Fish and Wildlife Service has proposed to designate sections of the Deschutes River and Odell Lake as critical habitat for bull trout.

VEGETATION

Early explorers were documented to remark about the type of species and condition of the vegetation as they traveled through the area either on foot or horseback. One such observation was noted by the Williamson and Abbott railroad survey conducted during the spring, summer, and fall of 1853. In the survey, Abbott wrote:

> *We found yellow pine still abundant, forming by far the most constant feature in the vegetation of our route from Pit River to the Columbia. Near or distant, trees of this kind were always in sight; and in the arid and really desert regions of the interior basin we made whole days marches in forests of yellow pine, of which the absolute monotony was unbroken either by other forms of vegetation, or the stillness by the flutter of a bird, or the hum of an insect. The volcanic soil, as light and dry as ashes, into which the feet of our horses sank to the fetlock, produces almost nothing but an apparent unending succession of large trees of P. ponderosa.*

Historic vegetation patterns in the areas of the dry mixed conifer plant association group were shaped by frequent fire activity. Most stands were previously open in appearance and were dominated by ponderosa pine. Forest stands usually only reached a true mixed conifer composition on higher elevation buttes and north facing slopes that received greater amounts of precipitation. Cascade Reserve Forest Survey notes of 1903 describe these forests as having no commercial value-- containing large amounts of yellow pine and minor amounts of lodgepole pine. Other species including mountain hemlock were also noted.

WILDLIFE

In general, the high elevation Cascade Lakes area supports a variety of wildlife and wildlife habitats. According to the Deschutes National Forest, there are over 262 species of wildlife known or suspected to utilize this watershed at some time during the year. 220 of these species will use streamside areas as their primary habitat for breeding, foraging, and resting. The quantity and quality of remaining habitat and the types of disturbances that take place will affect both current and future wildlife species and how they will use the habitat.

Northern spotted owls (Strix occidentalis caurina) are listed as Threatened under the ESA. These owls require mature or old-growth coniferous forests with complex structures and multiple stand layers. The population size of the species is relative to the amount and distribution of suitable habitat. Nesting, roosting, and foraging habitat for northern spotted owls is available on the Deschutes National Forest. The eastern margin of the Upper Deschutes watersheds is reported to be the eastern extent of the owl's range. Spotted owl pairs are generally located within the mature or old growth conifer forests associated with the buttes or high elevation mountains of the watershed.

In 1967, the northern bald eagle (Haliaeetus leucocephalus) was listed as a Threatened species under the Endangered Species Act. On July 6, 1999 it was proposed for delisting in the conterminous states, but the bald eagle has not yet been officially delisted as a Threatened species. Although there exists no specific documentation on historical nesting sites in the Upper Deschutes watersheds, bald eagles were most likely in the Lava Lakes area, near Davis and Odell Lakes, and along the Deschutes River. Bald eagles were first sighted at Crane Prairie reservoir in 1968. Common threats to bald eagles in the Upper Deschutes watersheds include recreation, logging, shooting, pesticides, and land development. It is believed that some of the eagles in the area may reside year round during milder winters, while during colder winters they most likely migrate south to the Klamath marsh area.

The Canada lynx (Lynx Canadensis) is listed as Threatened under the Endangered Species Act. There are historical records from 1916 that indicate lynx presence approximately 35 miles west of Bend near Lava Lake.

Have you ever seen an elk? If you live in the southwest part of Bend you probably have. There are two key elk habitats near the upper Deschutes River and herds of elk still travel to the river near Elk Meadow Elementary School. In this area, the Deschutes River provides a reliable water supply, valuable food sources, and secure calving areas for elk. This elk habitat could be hurt by excessive land development and land management activities.

The Oregon spotted frog historically thrived from southwestern British Columbia down to the northeast corner of California. Their range and habitat has been dramatically reduced and can now be found only through the Oregon Cascades and in a small part of northeastern California. They are a State listed Sensitive species and are known to currently occur in emergent wetland vegetation near Wickiup Reservoir.

Some of the other wildlife found throughout our watersheds include black bear, cougar, deer, beaver, river otter, and marmot.

The low winter water flows in the Upper Deschutes River between Wickiup and the City of Bend and the low summer water flows in the Middle Deschutes area just downstream from Bend reduces the water quality and the quality of fish habitat in those areas. As the flows have an impact on the fishery, they also play a role in limiting the food source for wildlife such as river otters, mink, bald eagles, osprey, and kingfishers that feed on fish. Songbirds and big game find important shelter and thermal cover in dense lodgepole thickets along the Upper Deschutes River. Towhee, kingbirds, robins, and chipping sparrows seek forage in thinned stands of young ponderosa and lodgepole pines.

Watershed Inventory

Watershed Inventories are worksheets that can be used to track student knowledge. They can be used before, during and after program participation to see how well students learned about their watershed. They are useful for in-class assignments and for generating ideas for student independent research.

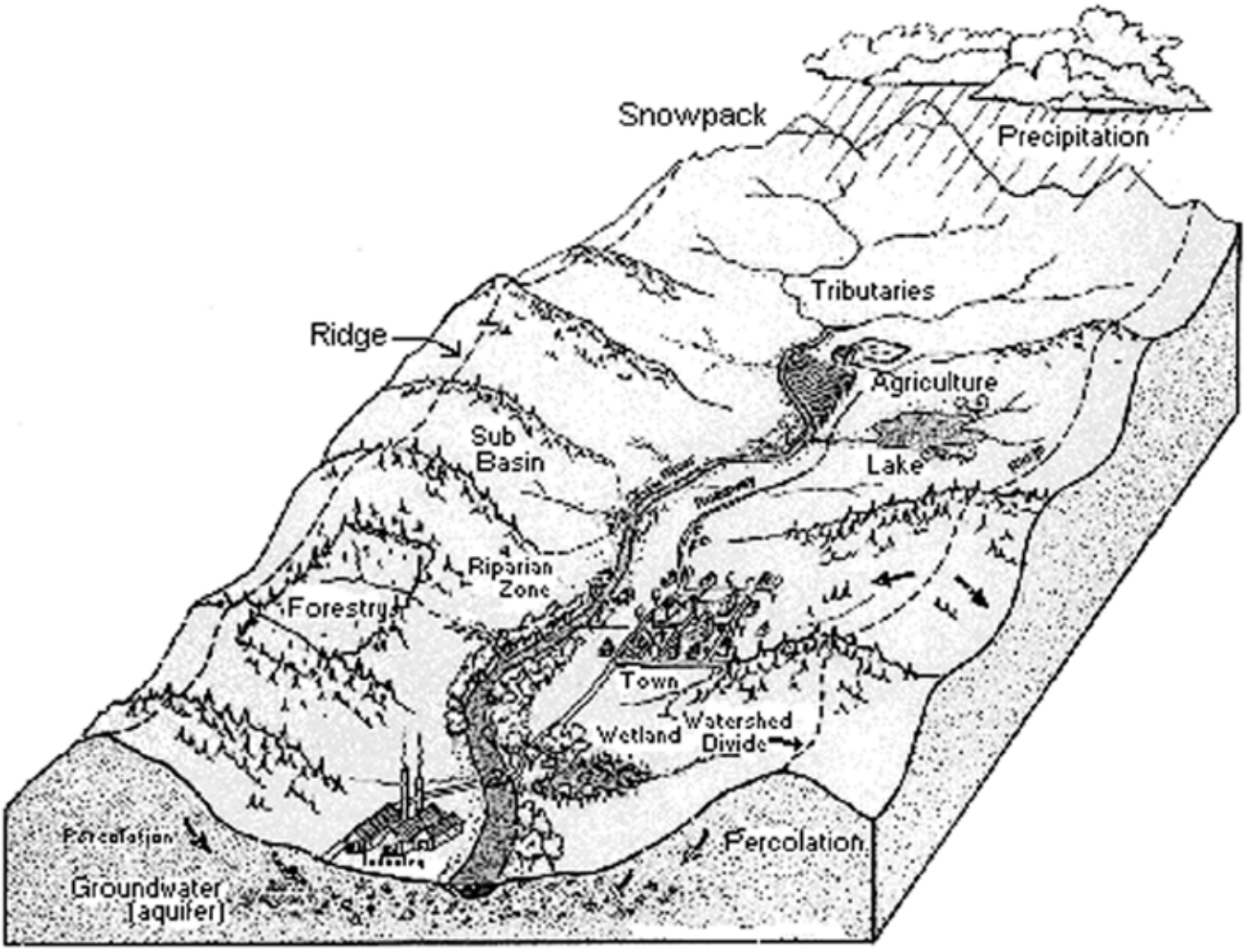
Inventories can include:

1. Basic watershed information (name, length, width)
2. Climate
3. Geology/Topography
4. Water Resources
5. Soils
6. Vegetation
7. Fish
8. Wildlife
9. History
10. Demographics
11. Land & Water Uses
12. Water Quality/Quantity Concerns
13. Areas Prone to Flooding or Drying Up

Check out *HWI*'s website (www.healthywaters.org) to find a Watershed Inventory for your region. If an inventory does not yet exist for your watershed, use the template on the following pages or *The Streamkeeper's Field Guide* "Field Procedure: Watershed Inventory" on pg.32 (student data pages 38-41). Inventories should be created with an answer key!

Please share new inventories with *HWI* so that we can make them available to others through our website.

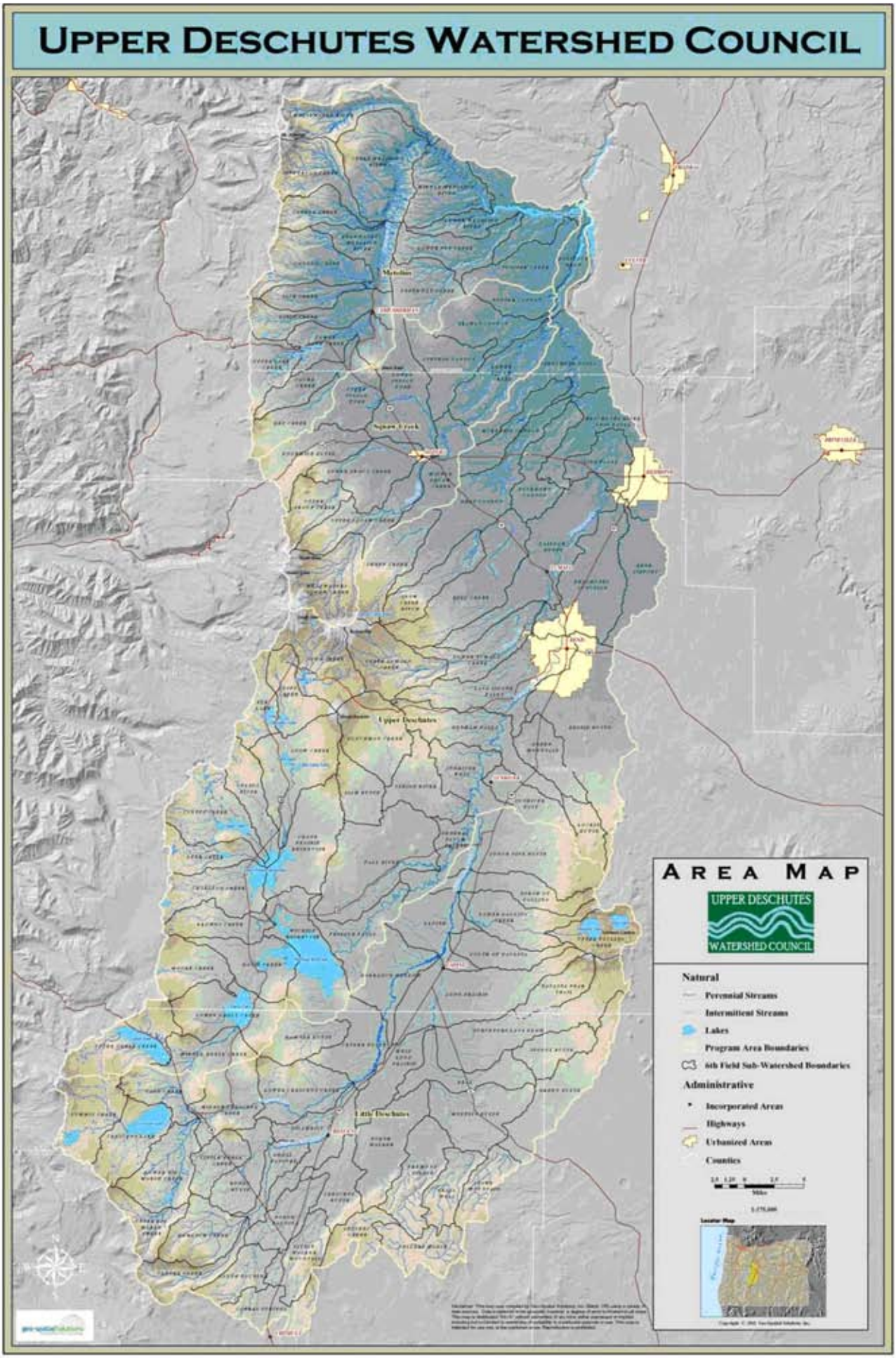
Upper Deschutes Watershed Inventory



A watershed is the entire area, from ridgetop to ridgetop, which drains into a river or stream.

Do you know that YOU live in a watershed??

Upper Deschutes Watershed Council



By exploring and researching to find the answers to the following questions, you will discover many exciting secrets about YOUR watershed!

UPPER DESCHUTES WATERSHED INVENTORY

Name_____ Date_____

Basin name_____ Subbasin name_____

Watershed name_____ USGS quad(s)_____

Begins in_____ Flows through_____

Ends in_____ (towns, counties, states, regions, etc.)

Drains into_____(body of water)

Acres_____ Approx. Length_____ Width_____

CLIMATE

Average yearly precipitation_____

Most of the precipitation is in the form of_____

Most precipitation occurs in the month(s)_____

Which areas of the subbasin receive the most precipitation? _____

_____

Which areas receive the least amount of precipitation? _____

_____

Droughts most commonly occur in month(s)_____ Floods?_____

Coldest month of year:_____ Warmest month:_____ Yearly temp range:_____

GEOLOGY / TOPOGRAPHY

Describe briefly the geology that has shaped your watershed: _____

_____

_____

_____

Describe the physical characteristics of the different reaches:

	Upper	Middle	Lower
Uplands (mountains, hills, flat)	_____	_____	_____
Valley (broad, medium, narrow)	_____	_____	_____
Gradient (steep, medium, gentle)	_____	_____	_____
Channel (straight, meandering)	_____	_____	_____
Bottom (boulder, cobble, gravel, Fines)	_____	_____	_____

Predominate rock types: igneous____ sedimentary____ metamorphic____

Specific rock types that are present _____

Name the five highest peaks in the subbasin _____

_____

_____

Highest elevation point_____ Lowest point_____
(include elev and location)

Geologic activity: check the ones that happen in UDWS

earthquakes____ volcanic eruptions____ landslides____

WATER RESOURCES

Where do the headwaters originate for the Deschutes River? (glaciers, snowmelt, etc.) _____

_____

Little Deschutes?_____

Whychus Creek?_____

Tumalo Creek?_____

Length of your closest stream_____

Names of tributaries_____

Names of lakes_____

Number of wetlands (approx.)_____

Areas underlain by aquifers (if any)_____

SOILS

Predominate soil types_____

Areas with soil suitable for farming_____

Areas with soil unsuitable for development_____

Areas with potential soil erosion problems_____

VEGETATION

List the native and introduced plant species that dominate the different plant communities of your watershed:

	Native	Introduced/Non-Native
Upland Forest	_____	_____
Riparian	_____	_____
Grassland	_____	_____
Other plant communities	_____	_____

Describe how historic vegetation patterns differed from current vegetation throughout the subbasin.

_____

_____

_____

Percent of your watershed now covered by native plant vegetation_____%

Reasons for loss of historic plant vegetation_____

Endangered or threatened plant species _____

_____

FISH

Native Species_____

Non-native species_____

Locations of fish hatcheries and species produced _____

_____

Types and locations of barriers to fish migration _____

_____

WILDLIFE

Native species _____

_____

Non-native species _____

_____

Key wildlife habitat areas _____

_____

HISTORICAL

The earliest human inhabitants were_____

Describe briefly the settlement of your watershed:

_____

Define each name and describe the cultural significance of each word:

Tumalo_____

Deschutes_____

Whychus_____

Wickiup_____

Tenino_____

DEMOGRAPHICS

Current watershed population _____ Projected pop in 10 years_____ 20?_____

Watershed population 10 years ago_____ 50?_____ 100?_____

Areas where most of the people live_____

Deschutes County 2002 Coordinated Population Forecast

Year	Bend UGB	Redmond UGB	Sisters UGB*	Non-Urban County	Total County
2000	52,800	15,505	1,100	48,283	117,688
2005	67,180	21,582	1,556	53,564	143,882
2010	76,211	27,873	2,200	60,619	166,903
2015	84,123	34,795	2,757	67,427	189,101
2020	93,712	41,051	3,394	73,447	211,604
2025	102,750	47,169	4,167	77,134	231,220

Source: Deschutes County Coordinated Population Forecast Final Report February 2003

*Sisters' UGB is outside of the boundaries of the Upper Deschutes Subbasin study area. The population estimates for Sisters contribute to the total county estimates and provide a point of comparison for growth forecasts.

List towns, cities, and counties_____

_____

Name 5 jobs that depend on the river or river use:_____

_____

What makes people want to live (or not) in your watershed? _____

_____

LAND & WATER USES

Estimate the % of your watershed zoned for each land use

Rural residential_____%

Urban/suburban residential_____%

Commercial_____%

Industrial_____%

Agricultural_____%

Forestry_____%

Mining_____% Type of mining_____

Parks/open space_____%

Public land_____% Private land_____%

Sources of domestic water supply for watershed residents _____

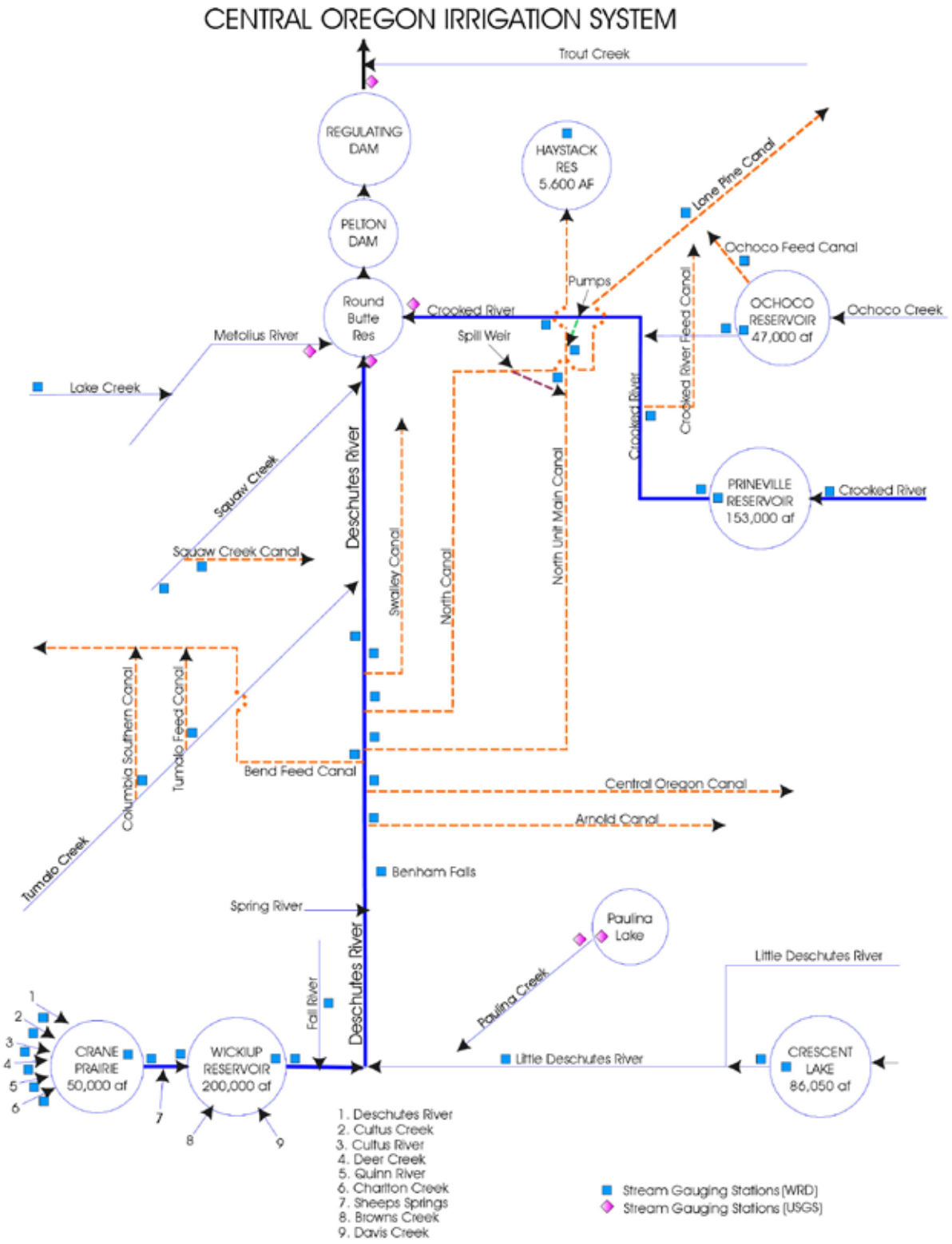
Areas that rely on septic tanks_____

Location of sewage treatment plants (if any) servicing watershed residents _____

_____

Altered hydrology (dams, diversions, detention systems, culverts, etc.)

Type of alteration	Location	Purpose	Impact



WATER QUALITY CONCERNS

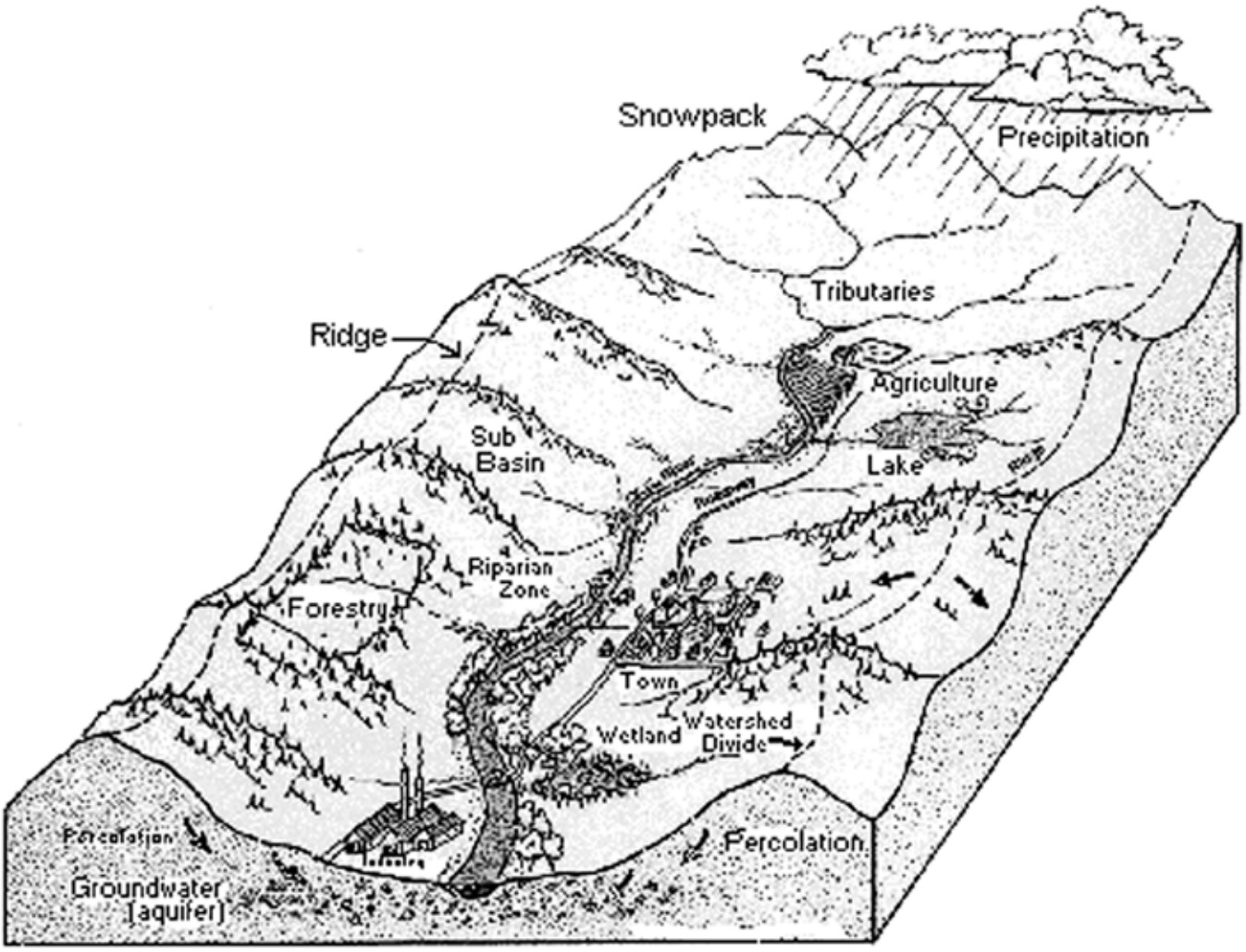
List pollutants of concern and their potential sources (include locations if possible)

Pollutant	Point Source	Nonpoint source
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

AREAS PRONE TO FLOODING/DRYING UP

Location	Circle One	Dates	Why?
_____	Dry/Flood	_____	_____
_____	Dry/Flood	_____	_____
_____	Dry/Flood	_____	_____
_____	Dry/Flood	_____	_____

Upper Deschutes Watershed Inventory (Teacher Version)



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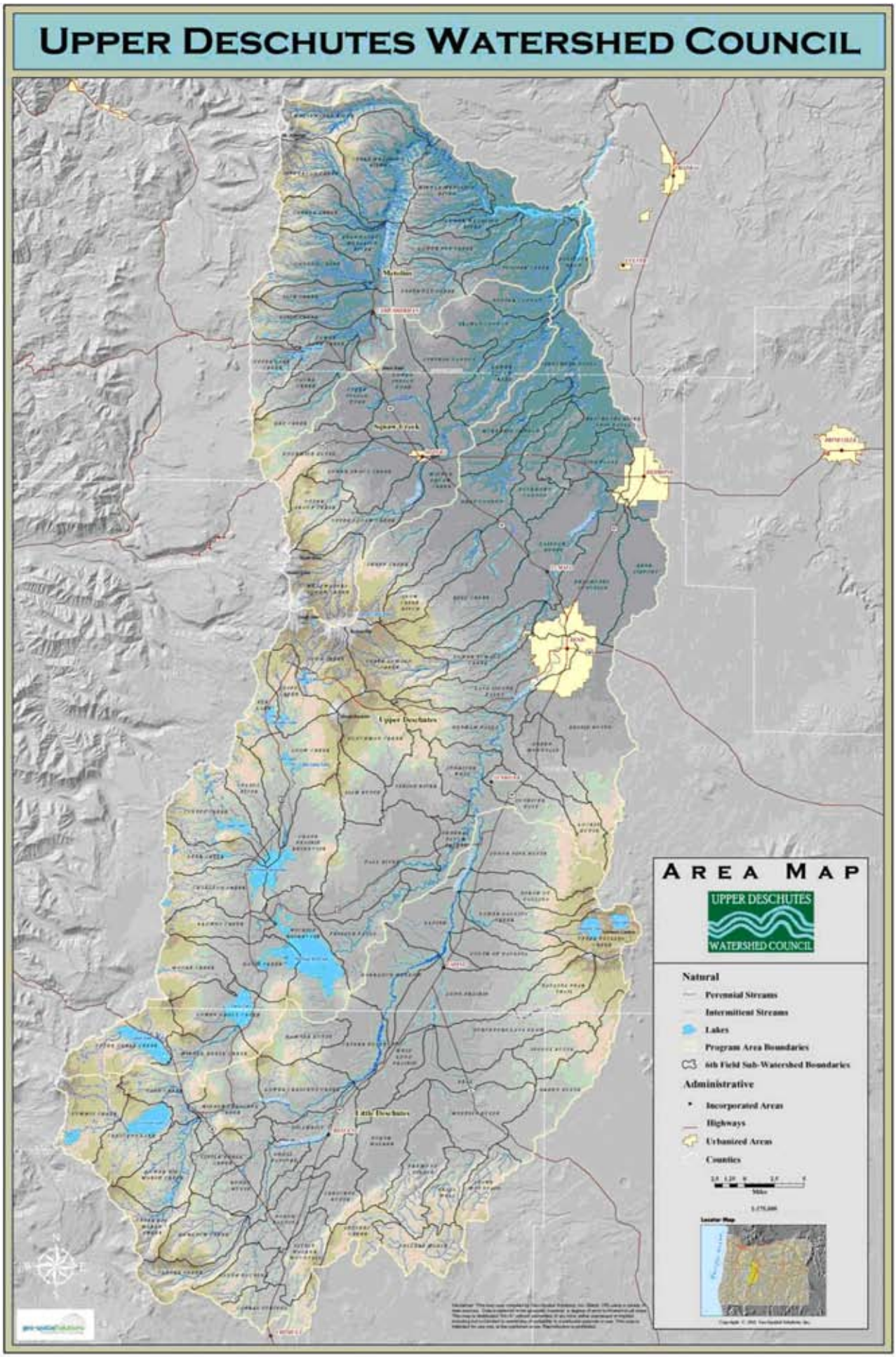
Do you know that YOU live in a watershed??

Upper Deschutes Watershed Council



By exploring and researching to find the answers to the following questions, you will discover many exciting secrets about YOUR watershed!

UPPER DESCHUTES WATERSHED INVENTORY

Name_____ Date_____

Basin name__**Deschutes**_____ Subbasin name__**Upper Deschutes**_____

Watershed name__**Depends on school location**_____

Begins in__**High Cascades**_____ Flows through__**Bend/Sunriver**_____

Ends in__**The Dalles**_____ (towns, counties, states, regions, etc.)

Drains into__**Columbia**_____(body of water)

Acres__**878,437**_____

CLIMATE

Average yearly precipitation__**between 16 & 35 in. – High cascades:70-90in. Low areas:16-30in**_____

Most of the precipitation is in the form of__**snow**_____

Most precipitation occurs in the month(s)__**Nov. & Jan**_____

Which areas of the subbasin receive the most precipitation? _____
Cascade crest montain forest ecoregion

Which areas receive the least amount of precipitation? _____
Pumice plateau forest ecoregion

Droughts most commonly occur in month(s)__**July and August**_____ Floods?__**April & Nov**_____

Coldest month of year:__**Jan**_____ Warmest month:__**August**_____ Yearly temp range:__**20-100 degrees**_____

GEOLOGY / TOPOGRAPHY

Describe briefly the geology that has shaped your watershed: _____
35 million years of glacial and volcanic activity combined with structural faulting and erosion.

Describe the physical characteristics of the different reaches:

	Upper	Middle	Lower
Uplands (mountains, hills, flat)	**all**		
Valley (broad, medium, narrow)	**medium**		
Gradient (steep, medium, gentle)	**medium/gentle**		
Channel (straight, meandering)	**meandering**		
Bottom (boulder, cobble, gravel, Fines)	**Above Wickiup: gravel**		**Below Wickiup: fines**

Predominate rock types: igneous__X__ sedimentary__X__ metamorphic____

Specific rock types that are present **Basalt, pumice, tuff**

Name the five highest peaks in the subbasin **Broken Top, 3 Sisters, Jefferson**

Highest elevation point **Jefferson 10,497 ft** Lowest point **Lake Billy Chinook 1,940 ft**
(include elev and location)

Geologic activity: check the ones that happen in UDWS
earthquakes__X__ volcanic eruptions__X__ landslides____

WATER RESOURCES

Where do the headwaters originate for the Deschutes River? (glaciers, snowmelt, etc.) **Little Lava Lake (groundwater fed)**

Little Deschutes? **Southern Klamath County – Crescent, Hemlock, Big Marsh Creeks**

Whychus Creek? **Broken Top**

Tumalo Creek? **Broken Top**

Length of your closest stream **250 miles**

Names of tributaries **Fall River, Little Deschutes, Spring River, Tumalo & Whychus Creek**

Names of lakes **Lava, Cultus, Elk, Davis, Sparks, O'Dell**

Number of wetlands (approx.) **Thomas Preserve**

Areas underlain by aquifers (if any) **most areas**

SOILS

Predominate soil types **Ash, cinders, pumice – bedrock – extrusive volcanic rocks**

Areas with soil suitable for farming **none naturally due to low fertility levels of volcanic ash**

Areas with soil unsuitable for development **unknown**

Areas with potential soil erosion problems **Upper Deschutes Streambanks**

VEGETATION

List the native and introduced plant species that dominate the different plant communities of your watershed:

	Native	Introduced/Non-Native
Upland Forest	**Mt. Hemlock, Ponderosa Lodgepole.**	**Knapweed**
Riparian	**Spiraea, alder, willow, woods rose**	**Dalmation toad flax, scotchbroom**
Grassland		**Knapweed everywhere**
Other plant communities		**Knapweed**

Describe how historic vegetation patterns differed from current vegetation throughout the subbasin.
Fire suppression & management activities have lead to increased small diameter trees, thicker denser forests, & increased number in damages from pine bark beetle.

Percent of your watershed now covered by native plant vegetation_____%

Reasons for loss of historic plant vegetation **fire suppression, development, invasive species, western pine beetle.**

Endangered or threatened plant species
peck's penstamon, pumice grape fern, newberry's gentian

FISH

Native Species **Rainbow, redband, bulltrout, mt. whitefish, sculpin**

Non-native species **brook trout, atlantic salmon, kokanee, brown trout**

Locations of fish hatcheries and species produced
Fall river, Wizard Falls: atlantic salmon, kokanee

Types and locations of barriers to fish migration
Pelton Round Butte dam, Big Falls

WILDLIFE

Native species
Osprey , eagles, lynx, pacific fisher, wolverine, silver haired bat, Oregon spotted frog

Non-native species **(all over Oregon) Virginia Opossum, Fox Squirrel, Eastern Gray Squirrel, Eastern Cottontail, Nutria, Egyptian Goose, Bullfrog, Red-eared Slider, Snapping Turtle**

Key wildlife habitat areas **Wetlands by Wickiup, River Rim Development, area between Middle Deschutes and Tumalo Creek.**

HISTORICAL

The earliest human inhabitants were **Tenino, Klamath, Molalla 7-8000 yrs ago**

Describe briefly the settlement of your watershed: **1813- earliest evidence of explorers, Astoria pary. 1905- Bend became a city – primary founder Alexander Drake 1877 – Farewell Bend ranch settled by John Y Todd original name for city "Farewell Bend"1915- two mills went in – Shevlin/Hixon and Brooks/Scanlon**

Define each name and describe the cultural significance of each word:
Tumalo_____
Deschutes **River of the falls**
Whychus **Place to cross the creek**
Wickiup **Pole to dry fish**
Tenino **Fork in the trail**

DEMOGRAPHICS

Current watershed population **150,000** Projected pop in 10 years **195,000** 20? **235,000**

Watershed population 10 years ago **100,000** 50? **45,000** 100? **8,000**

Areas where most of the people live **Bend, Redmond**

Deschutes County 2002 Coordinated Population Forecast

Year	Bend UGB	Redmond UGB	Sisters UGB*	Non-Urban County	Total County
2000	52,800	15,505	1,100	48,283	117,688
2005	67,180	21,582	1,556	53,564	143,882
2010	76,211	27,873	2,200	60,619	166,903
2015	84,123	34,795	2,757	67,427	189,101
2020	93,712	41,051	3,394	73,447	211,604
2025	102,750	47,169	4,167	77,134	231,220

Source: Deschutes County Coordinated Population Forecast Final Report February 2003

*Sisters' UGB is outside of the boundaries of the Upper Deschutes Subbasin study area. The population estimates for Sisters contribute to the total county estimates and provide a point of comparison for growth forecasts.

List towns, cities, and counties
Bend, Redmond, Sisters, Lapine, Crescent, Gilchrist, Deschutes County, Klamath County

Name 5 jobs that depend on the river or river use: **River Guide, Watershed Council, Deschutes River Conservancy, Farmer, (Good question for discussion with class!)**

What makes people want to live (or not) in your watershed?
(Good question for discussion with your class!)

LAND & WATER USES

Estimate the % of your watershed zoned for each land use

Rural residential **5** %

Urban/suburban residential **8** %

Commercial **2** %

Industrial **1** %

Agricultural **9.5** %

Forestry **73** %

Mining **0.5** % Type of mining **gravel**

Parks/open space **1** %

Public land **75** % Private land **25** %

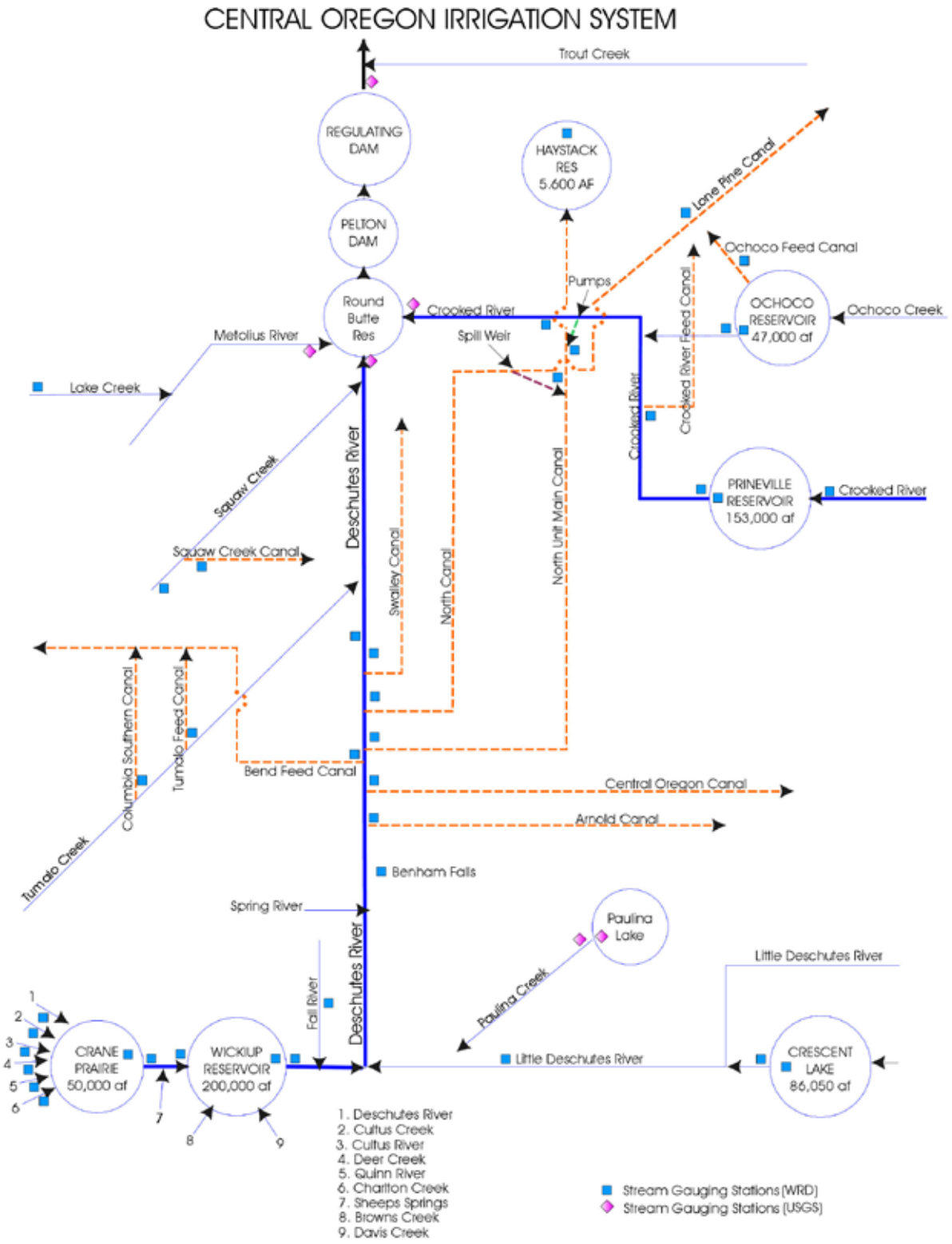
Sources of domestic water supply for watershed residents **Bridge Creek, wells**

Areas that rely on septic tanks **Lapine, South Bend**

Location of sewage treatment plants (if any) servicing watershed residents
Redmond, Bend by the airport

Altered hydrology (dams, diversions, detention systems, culverts, etc.) **See Graph**

Type of alteration	Location	Purpose	Impact



WATER QUALITY CONCERNS

List pollutants of concern and their potential sources (include locations if possible)

Pollutant	Point Source	Nonpoint source
Temperature		**Yes**
P.H.		**Yes**
Dissolved Oxygen		**Yes**
Sedimentation		**Yes**
nutrients		**Yes**
chlorophyll A		**Yes**

AREAS PRONE TO FLOODING/DRYING UP

Location	Circle One	Dates	Why?
Tumalo Creek	Dry/**Flood**	**Fall/Spring**	**Rain on snow event/snowmelt**
Whychus Creek	Dry/**Flood**	**Fall/Spring**	**Rain on snow event/snowmelt**
Upper Deschutes	Dry/**Flood**	**Winter**	**Water storage**
Middle Deschutes	Dry/**Flood**	**Summer**	**Water diverted for irrigation**

Programs & Activities

The purpose of HW is to connect students with their local watershed and create a watershed-as-home concept. Utilizing local resources including experts, community partners and existing educational materials, provides the most effective and efficient way of connecting students with their home waters.

It can be overwhelming and especially time consuming to make and maintain connections with local partners who are willing and able to assist in the delivery of watershed education in the classroom. If you have a Regional Education Coordinator, Natural Resource Coordinator or Community Outreach Coordinator in your school or watershed, work with them to help plan your HW schedule. *HWI* has developed some tools to help get you started working with your coordinator or on your own. We strongly request the sharing of program and activity information once you discover what works for you. This information will assist *HWI* in compiling a catalog of information that can be shared between teachers, schools and districts.

We encourage connecting with community partners as often as possible. If local watershed education program providers are scare, there are a plethora of exceptional curriculum guides you can use. All programs and activities should support authentic educational experiences, rooted in relevant, experiential and place-based learning.

The Foxfire Approach to Teaching and Learning (http://www.foxfire.org/teachi.html) can be used to guide whether a program or activity should be included in HW.
The Core Practices of the Foxfire Approach include:

- The work teachers and learners do together is infused from the beginning with learner choice, design, and revision.
- The academic integrity of the work teachers and learners do together is clear.
- The role of the teacher is that of facilitator and collaborator.
- The work is characterized by active learning.
- Peer teaching, small group work, and teamwork are all consistent features of classroom activities.
- There is an audience beyond the teacher for learner work.
- New activities spiral gracefully out of the old, incorporating lessons learned from past experiences, building on skills and understandings that can now be amplified.
- Reflection is an essential activity that takes place at key points throughout the work.
- Connections between the classroom work, the surrounding communities, and the world beyond the community are clear.
- Imagination and creativity are encouraged in the completion of learning activities.
- The work teachers and learners do together includes rigorous, ongoing assessment and evaluation.

PLANNING & TRACKING

The *HWI* Watershed Education Matrix was developed to help in planning and tracking HW programs and activities. The matrix is broken by watershed education category which is further broken down by discipline. The overarching watershed theme inherently provides a multidisciplinary approach to education. Teachers across disciplines can relate student learning to real events, features and functions found in the local watershed. When planning programs and activities, consider working in partnership with teachers from other disciplines (or other grade levels) to offer students repeat opportunities to connect with their watershed from a variety of perspectives.

Each program or activity used to connect students to their home waters should be entered into the matrix. It can be used for individual classrooms or the entire school. Entries are based on the number of hours students spend annually (school year) on a particular program or activity. The number in each box should be equal to:

(# of students) x (# of hours)

For example:

If all 6th grade students from Sunnyside Environmental School participate in a watershed mapping activity with their science teacher:

(3-6th grade classes) x (32 students in each class) x (2 hours on the activity)
3 x 32 x 2
192 hours

For this example, you would enter "192" into the box for "Watershed Mapping" – "Science". If the students were participating in a 1000 Drops mapping activity, you would list "Healthy Waters Institute" as the provider.

Detailed descriptions for each entry should used to track actual program information. Data pages have been included for your use.

A few notes:

- Keep it simple
- Use the matrix to bring partners and teachers together
- Share it with school administration as exhibition of students learning and the valuable contributions of community partners
- Include examples of how programs also satisfy standards and benchmarks
- Keep track of as much information you can about the programs – it will be invaluable to share with others
- Provide feedback to the *HWI* always and often – share completed documents, comments and questions

If you need more support for teaching students about their home watershed, or just want to keep your school informed – consider using the "Watershed Education Partnership Agreement".

USING THIS BINDER

Use this binder to keep track of your regional HW toolkit. We've included sections for each component of the toolkit along with tabs to segregate each program area. There's a worksheet at the front of every program section to keep track of local partners who can help. Add new program and activity pages as you discover them. We've included some examples to help get you started.

Let us know how you're connecting students with their home waters so we can share your ideas and accomplishments! Check in with *HWI* to find new ideas from others in the field.

PROGRAM & ACTIVITY DESCRIPTION

Teacher Name				
Email				
Discipline				
Grade Level				
Name of Activity				
Description				
Where (circle)	In-Class	Schoolyard	Outdoor Field Trip	Indoor Field Trip
Length				
Benchmarks/Standards				
Partners				
Partner Contact Info				
Where to find activity				

PROGRAM & ACTIVITY DESCRIPTION

Teacher Name				
Email				
Discipline				
Grade Level				
Name of Activity				
Description				
Where (circle)	In-Class	Schoolyard	Outdoor Field Trip	Indoor Field Trip
Length				
Benchmarks/Standards				
Partners				
Partner Contact Info				
Where to find activity				

Healthy Waters Institute®

CATALOG FOR INVITATION

Year:

School:

Address:

Contact:

Phone #:

Email:

Provider	Outdoor Ethics						Climate						Geography						Soils & Geology						Forestry & Vegetation						Fish						Wildlife					
	Arts	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*
TOTAL HOURS																																									

History						Demographics						Water						Economy						Ecology						Eco-Art						Local Partners						
Arts	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	*Arts*	*English*	*Language Arts*	*Mathematics*	*Science*	*Social Sciences*	**TOTAL HOURS**

Watershed Education Partnership

The Healthy Waters Institute (*HWI*) seeks to forge a lifelong, caretaking bond between students and their local watershed, ensuring the health of Oregon's rivers and streams for generations. By uniting education, community, and local stewardship, *HWI* takes an active role in cultivating the next generation of watershed stewards.

Teachers, schools and community organizations throughout Oregon are actively connecting students to their local watersheds and supporting youth as they move from student to steward. Although these efforts are intricately interwoven, they are often disconnected.

HWI requests your help in tracking participation in watershed education programs and activities. Successful tracking will result in:

- Increased communication and collaboration within schools
- Increased connections between schools and community partners
- Dynamic catalog of programs and activities accessible to teachers statewide

HWI will assist schools incorporating watershed education by offering:

- Educational materials
- Teacher grants – up to $500
- Student grants – $200 maximum for high school students
- Travel and substitute teacher reimbursement
- Networking opportunities with diverse community partners
- Student scholarships – four $1500 awards for juniors and seniors
- Publications – healthy waters kids and journal
- Website – resources, opportunity for students to share projects
- Assistance in developing student summits
- Trainings, workshops and consultation

Signing this document demonstrates agreement with the following:

"I support the work of *HWI* and local community partners in working with teachers and schools to satisfy curriculum and graduation requirements through watershed education while equipping our students with essential lifelong learning skills. I recognize the value of incorporating watershed education into my classroom. I will provide *HWI* with necessary information to support their statewide watershed education efforts."

Participating teachers, please sign below:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Name of School: _____

Total # of students participating in watershed education: _____

Total # of student hours on watershed education: _____

Signature of School Administration, Title:	Date:
_____	_____
_____	_____

Geography

PRACTICE READING A TOPOGRAPHICAL MAP

- Use The Stream Scene "Tour of a topo" (pg.71) with a State of Oregon Map
- Trace the watershed boundaries

CREATE YOUR OWN WATERSHED MAP

- Use The Stream Keeper's Field Guide "Creating your own Watershed Map" (pg.24)
- Compare to a real map of your watershed

ADDITIONAL ACTIVITIES

- Use regional maps of your watershed to identify the headwaters, mouth, bodies of water, ridgelines, communities, industry, highest elevation, lowest elevation, mountains, buttes, rivers, lakes and streams
- Create vocabulary lists for topographical maps
- Create writing prompts for your students
- Make 3-D Models (The Stream Scene #19 pg.41 & "What a relief" pg.91)
- Have your students create crossword puzzles and word searches
- Find your Ecological Address (The Stream Scene "A sense of place: your ecological address" pg.53)

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
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Type of Activity/Program				
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Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

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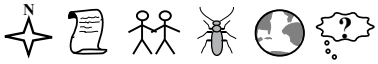
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

Getting To Know Your Watershed

Main Focus: Geography
Benchmarks:



Approximate time: Various (ideally 1-3 class sessions)

This activity helps students define a watershed. It also teaches students about the specific watershed in which their school is located. In Getting To Know Your Watershed activity students will discover many exciting secrets about their home watershed!

COMMON CURRICULUM GOALS AND BENCHMARKS

The Getting to Know Your Watershed activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography–Understand and use geographic skills and concepts to interpret contemporary and historical issues.

History–Relate significant events and eras in United States and world history to past and present issues and developments.

Social Science Analysis–Design and implement strategies to analyze issues, explain perspectives, and resolve issues using the social sciences.

Life Science–Understand structure, functions, and interactions of living organisms and the environment.

Earth and Space Science–Understand physical properties of the Earth, and how those properties change.

Science Inquiry–Use interrelated processes to pose questions and investigate the physical and living world.

GOALS AND OBJECTIVES

Students will:

- Be able to verbally describe a watershed
- Be able to verbally identify which watershed their school is located
- Be able to name three components of a watershed unit

MATERIALS

- Upper Deschutes Regional Watershed Information (see page RWI3-RWI10)
- Computer
- Note Paper (For Interview purposes)

PROCEDURE

1. Review the Upper Deschutes Watershed Information (pages RWI3-RWI10) and take notes or highlight interesting information.

2. Log onto the internet and perform research to complete the student worksheet (WI3-WI10, teacher version on WI11-WI18).

Here are a few websites to get started:

Upper Deschutes Watershed Council
http://www.restorethedeschutes.org

Deschutes and Ochoco National Forest
http://www.fs.fed.us/r6/centraloregon/

Science In Your State: USGS
http://www.usbr.gov/pn/

Bureau of Reclamation
http://www.usgs.gov/state/state.asp?State=OR

Oregon Water Resource Department
http://egov.oregon.gov/OWRD/

Deschutes River Conservancy
http://www.deschutesrc.org

Creating Your Own Watershed Map

Main Focus: Geography
Benchmarks:

Approximate time: 45 mins.

This activity helps students define a watershed. It also teaches students about the specific watershed in which their school is located. In Creating Your Own Watershed Map students can learn about the path of water from higher elevations to lower elevation points of the watershed.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Creating Your Own Watershed Map activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

Earth and Space Science – Understand physical properties of the Earth, and how those properties change.

The Arts – Apply ideas, techniques and processes in the arts.

GOALS AND OBJECTIVES

Students will:

- Be able to verbally describe a watershed
- Be able to verbally identify which watershed their school is located
- Be able to name three components of a watershed unit
- Be able to verbally describe contour lines and map legends

MATERIALS

- USGS topographic maps illustrating Deschutes River and surrounding tributaries.
- Ruler
- Colored Pencils and Magic Markers

PROCEDURE

1. Determine the boundaries of your watershed

2. Locate the outlet point of your watershed. It will be the lowest elevation point in your watershed and in most cases will be the mouth of your stream.

3. Trace the stream from its mouth up to its tributaries. Using a pencil, make marks along the stream and its tributaries every inch or so, dividing them into one inch sections.

4. At each mark, draw a line perpendicular to the stream or tributary, running out in both directions.

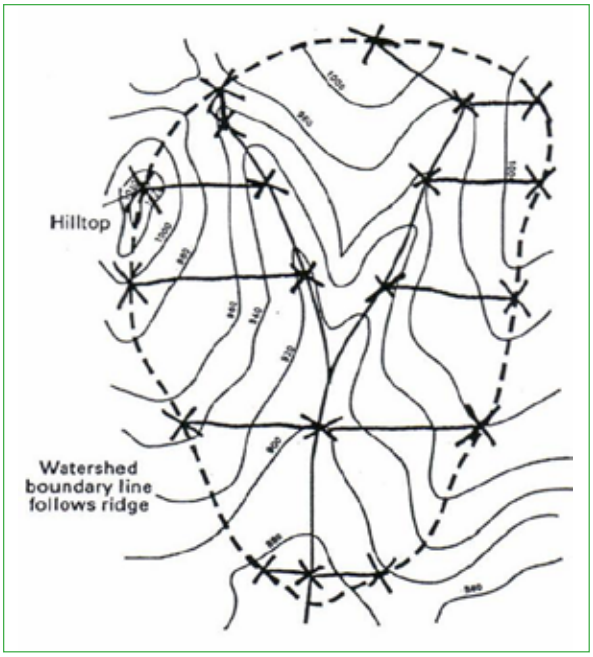
5. Follow each perpendicular line out from the stream or tributary until you reach a maximum elevation. Mark all these high elevation points with an "X".

6. Locate the beginning of each tributary, or the place where the stream's water originates. Extend a line out from each of these locations, in the direction opposite to the flow of water. Follow these lines until you reach a maximum elevation. Mark the high points with an "X".

7. Connect all the high points with a line, following the ridges and crossing slopes at right angles to contour lines. The line resulting from 'connecting the dots' will be the boundary of your watershed. Double check your boundaries to ensure accuracy, and then mark them with a pen or magic marker.

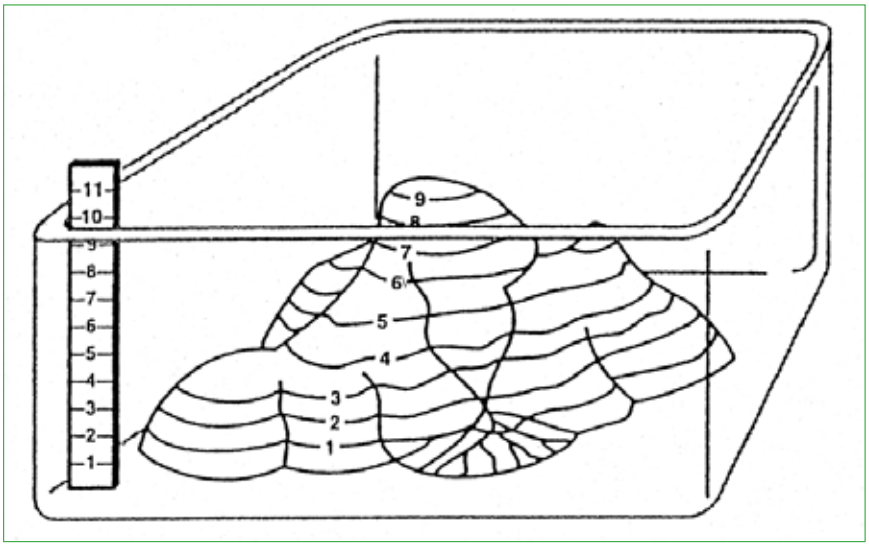
Highlighting Features on Your Map

1. Highlight your stream and its tributaries. You will be able to see the pattern of the stream network. Count the number of tributaries and classify the various streams to their orders.

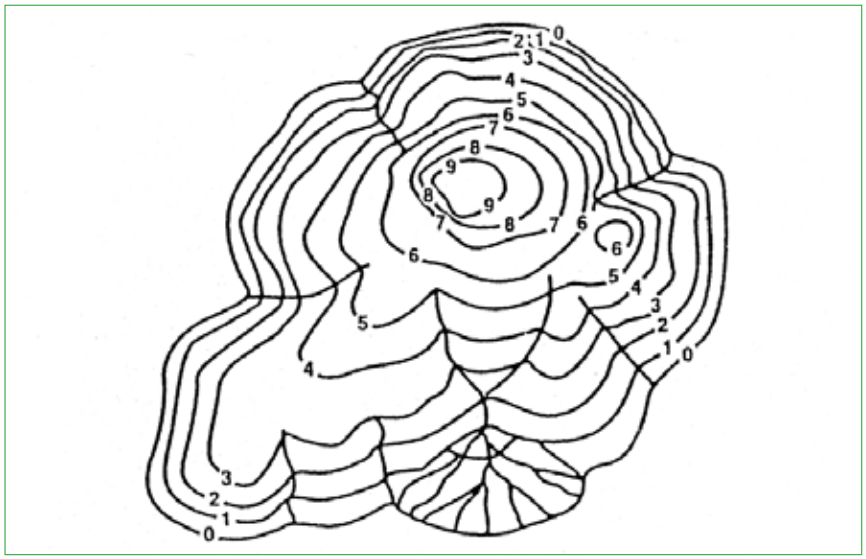


2. Since you know the scale of the map, you can estimate the length of each stream. Lay a piece of string along scale at the bottom of your map and mark off the inches. Next, lay the string along your stream and estimate its length. Note the locations where tributaries enter your main stream.

3. Pinpoint the other surface water features, such as lakes and wetlands. Also trace the roads and highways. How many roads cross your watershed? What political boundary, such as counties, cities, states, and counties does the watershed cross? Locate other features of interest, such as geologic formations, mountain peaks and recreational sites.



Introducing Students to Contours



Top View of Contour

History

- Read "The Bath" in "Easy Street" (Project WET pg.382). Brainstorm with students how they think their watershed has changed throughout history.
- Create writing prompts for your students - first person account of what it would have been like around the time of "The Bath".
- Recruit members from your local Historical Society to give a presentation to your class with pictures and stories
- WebQuest - use as a research tool for answering critical questions (Hometown Waters pg.WQ1)
- Create a mural of your watershed's historical timeline with drawings for major dates or events (Hometown Waters pg. H5)
- "Nature Rules" – (Project WET pg.263)
- "Old Water" – (Project WET p.171)

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

Timeline Mural

Main Focus: History
Benchmarks:

Approximate time: 1 hour

The Timeline Mural is an activity that will introduce students to the many historic events among the upper Deschutes watersheds. Once the students have completed their watershed investigations, they can use their data from WebQuest and Watershed Inventory to create a Timeline Mural.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Timeline Mural activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

History – Relate significant events and eras in United States and world history to past and present issues and developments.

Social Science Analysis – Design and implement strategies to analyze issues, explain perspectives, and resolve issues using the social sciences.

Science Inquiry – Use interrelated processes to pose questions and investigate the physical and living world.

The Arts – Apply ideas, techniques and processes in the arts.

GOALS AND OBJECTIVES

Students will:

- Be able to verbally describe the beneficial (both current and historical) factors of having Deschutes River and other tributaries flow through Central Oregon.
- Be able to verbally describe the health of the upper Deschutes watersheds.
- Be able to understand and discuss the threats that are currently threatening Deschutes River and watersheds.

MATERIALS

- Colored pencils and Magic markers
- Butcher paper and/or poster-board
- Scissors
- Tape and glue-sticks
- Watershed Inventory Sheet
- Local newspapers or local magazines

PROCEDURE

1. Spread a large (20 foot) piece of butcher paper on the floor.

2. Use a heavy black marker to draw a line along the length of the paper.

3. In groups of 3-4 students can refer to their watershed inventiory or WebQuest to select a major event or time period.

4. Students can create drawings for major dates and events that they have researched to create the Timeline Mural.

5. Once completed, students can then place their piece of the Timeline Mural around the classroom in its correct position to the others.

Figure 3: Historic photo of log deck at current site of Farewell Bend and Riverbend Park

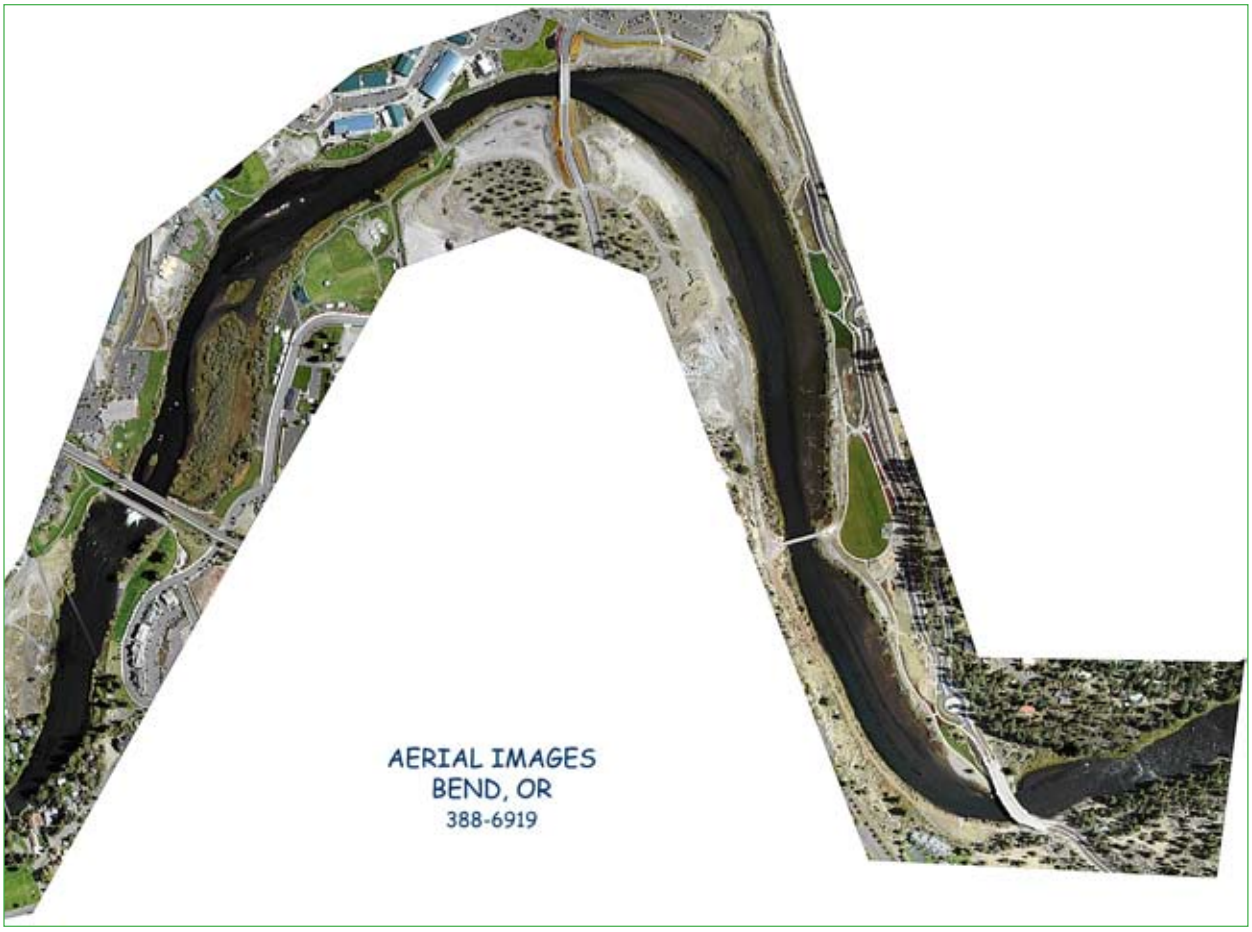


Figure 4: Aerial photo of the Deschutes River through the Old Mill District

Connecting the Watershed with the Community

Main Focus: Demographics
Benchmarks:

Approximate time: 50 mins.

Connecting the Watershed with the Community activity will help the students understand interconnections between their community and the watershed in which they live in. It will allow the students to make meaningful connections with the natural world where they would not otherwise have a similar opportunity.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Connecting the Watershed with the Community activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

Earth and Space Science – Understand physical properties of the Earth and how those properties change.

Science Inquiry – Use interrelated processes to pose questions and investigate the physical and living world.

GOALS AND OBJECTIVES

Students will:

- Be able to verbally describe a watershed
- Be able to verbally identify in which watershed their school is located
- Be able to name three components of a watershed unit
- Be able to make meaningful connections with the natural world

MATERIALS

- Chalk and chalkboard
- Chart paper
- Colored Pencils and Magic Markers
- Map of watershed

PROCEDURE

1. As a whole group, have the students brainstorm a list of the natural features in their watershed. Have a student record this list on the chalkboard. (The Watershed map can be used here to come up with ideas).

2. Divide up into smaller groups of 4-5 students. Begin to identify how people have used these natural features. (Include actual water use activities as well as activities that affect the watershed). Each group of students will record their responses on chart paper.

3. Come back together as a large group and each group will report out their results. Post the results of each group on the wall. Compile this data onto one list and have the group add any additional ideas.

4. Discuss with the group how the human uses of the watershed have affected the quality of the water and the health of the watershed and how the community is dependent on the watershed.

5. Lastly finish this activity with a reflection from the following questions:

   a. What happens if individuals and/or communities make natural resource use choices without thinking about the effect on the environment? On the future of the community?

   b. What happens if individuals and/or communities make any choices or decision without thinking about the impact on others, the surrounding, or the future?

Water

WATER CYCLE

- Review the water cycle with your students
- Use "The Incredible Journey" (Project WET pg.161)
- Review graphs and graphing techniques

WATERSHED MODEL

- Create a simple watershed model (Hometown Waters pg. G7)
- Find out how water moves through a watershed

STREAMFLOW

- Use "Snow way!" (Hometown Waters pg. W5)
- Share your regional data (precipitation vs. streamflow) with *HWI*
- Have your students create a graph of data and compare with regions throughout Oregon

ADDITIONAL ACTIVITIES

- "Hold that raindrop" (The Stream Scene pg.117)
- Get your students to track water use at home with a "Water Tally Sheet" (http://www.nationalgeographic.com/geographyaction/rivers/ax/PDF1_WaterTally.pdf) or "Home Water Audit" (http://www.portlandonline.com/shared/cfm/image.cfm?id=31562)
- "Get the Ground Water Picture" (Hometown Waters pg. W11)
- "Water Meter" (Project WET pg.271)
- "Just Passing Through" (Project WET pg.166)

PERSONAL WATER USE

- "Water Tally Sheet" or "Home Water Audit" – what did your students discover about their water use at home? Discuss. Have students graph their results.
- Neighborhood inventory – what do your students see in their neighborhood: Wildlife, pollution, water, drains, vegetation, cars? Have them record their observations and discuss in class.
- "Common Water" (Project WET pg. 232)
- Have students write in journals about how what they can do to conserve water.
- "Every Drop Counts" (Project WET pg.307)
- "A Grave Mistake" (Project WET pg.311)

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

Snow Way!

Main Focus: Water
Benchmarks:

Approximate time: 35 mins.

This activity illustrates how snow is such an important part of the total precipitation of our watershed. It is the main source of water for streams in the Cascade Mountains. Melting snow may affect stream flow long after it falls as precipitation. Snow may melt slowly, creating stream-flow throughout the otherwise dry summer. Or it may melt rapidly, creating floods. Mountain snow-packs are measured to predict how much water will be available when it melts later in the year. To evaluate how much water is in the snow it is important to measure not only its depth, but its water equivalent. This is the amount of water that would be released if all of the snow melted.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Snow Way activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

History – Relate significant events and eras in United States and world history to past and present issues and developments.

Social Science Analysis – Design and implement strategies to analyze issues, explain perspectives, and resolve issues using the social sciences.

Earth and Space Science – Understand physical properties of the Earth, and how those properties change.

Science Inquiry – Use interrelated processes to pose questions and investigate the physical and living world.

GOALS AND OBJECTIVES

Students will:

- Be able graph the annual rainfall for the Upper Deschutes Watershed
- Be able to graph annual snow-pack.
- Be able to graph stream flow-flow during the same period.
- Be able to analyze and describe the response of the stream to various types of precipitation.

MATERIALS

- Colored pencils and magic markers
- Ruler
- Graph paper or Excel spreadsheet Hydro-graph
- Annual precipitation chart

PROCEDURE

Creating your own Snow Way Hydrograph

1. The information in the following table shows annual precipitation and snow-pack amounts and stream-flow for a basin in Upper Deschutes Watershed. The data for precipitation includes snowfall. Even though it falls as precipitation, snow may not affect stream-flow until later in the year. When temperatures are below freezing, snow is stored in the watershed rather than being captured or stored by soils. The data given for snow-pack shows the accumulated amounts over a season.

2. On the graph provided, create a line graph by plotting the annual precipitation and snow-pack of the Upper Deschutes Watershed recorded from Wickiup dam. Repeat the process for the stream-flow data. This graph is called a streamflow hydrograph.

High Elevation figures for the Upper Deschutes Sub-basin

Mean Averages for 30 year Period at Wickiup Dam

Water, Water, It's Everywhere

	Monthly Precip (inches)	**Monthly Snow Fall (inches)**	**Snow (inches of water equivalent)** *(25%)*	**Streamflow (cfs)**
Oct.	1.33	1.69	0.4225	512
Nov.	3.12	11.69	2.9225	32.5
Dec.	3.56	18.12	4.53	30.1
Jan.	3.46	18.77	4.6925	31
Feb.	2.59	16.55	4.1375	33.5
Mar.	2.01	9.97	2.4925	33.3
Apr.	1.32	4.2	1.05	581
May	1.17	0.49	0.1225	1110
June	1.01	0.01	0.0025	1470
July	0.81	0	0	1680
Aug.	0.84	0	0	1500
Sept.	0.81	0.04	0.01	1190

QUESTIONS:

1. Which month had the greatest precipitation? The most water stored as snow? The highest stream-flow?

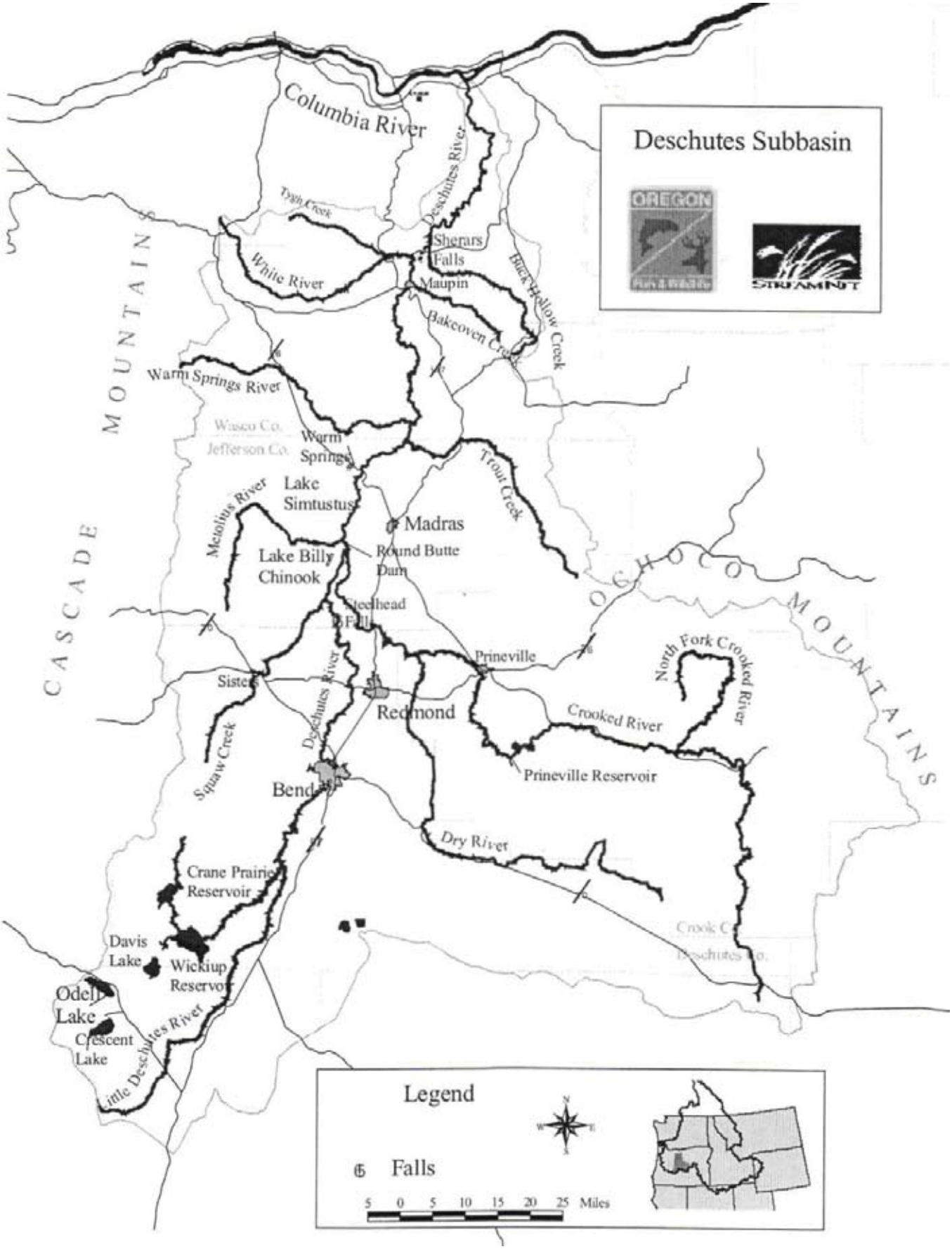
2. How long was it from the precipitation peak to the stream-flow peak?

3. How long was it from the peak storage of snow to the stream-flow peak?

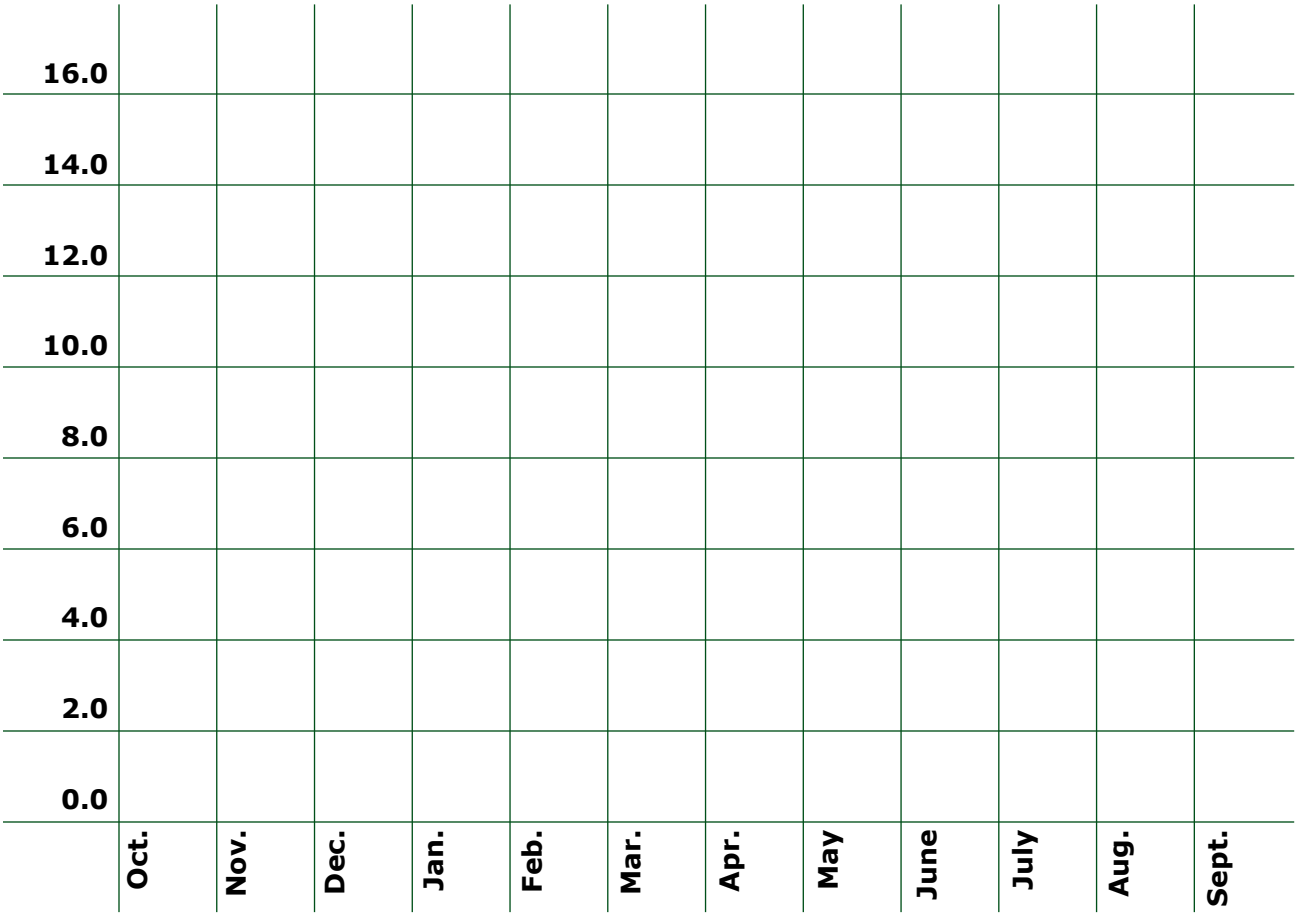
4. Which has a greater influence on the peak stream-flow of Deschutes River, total precipitation or snow storage? Why?

5. Use the concepts of "capture, store, and safe release" to explain where the water from the melting snow was between the time it melted and when it reached to the stream?

6. How has the water use and/or water management of the Deschutes River affected the quality and the quantity of the flow that leaves Wickiup Reservoir?

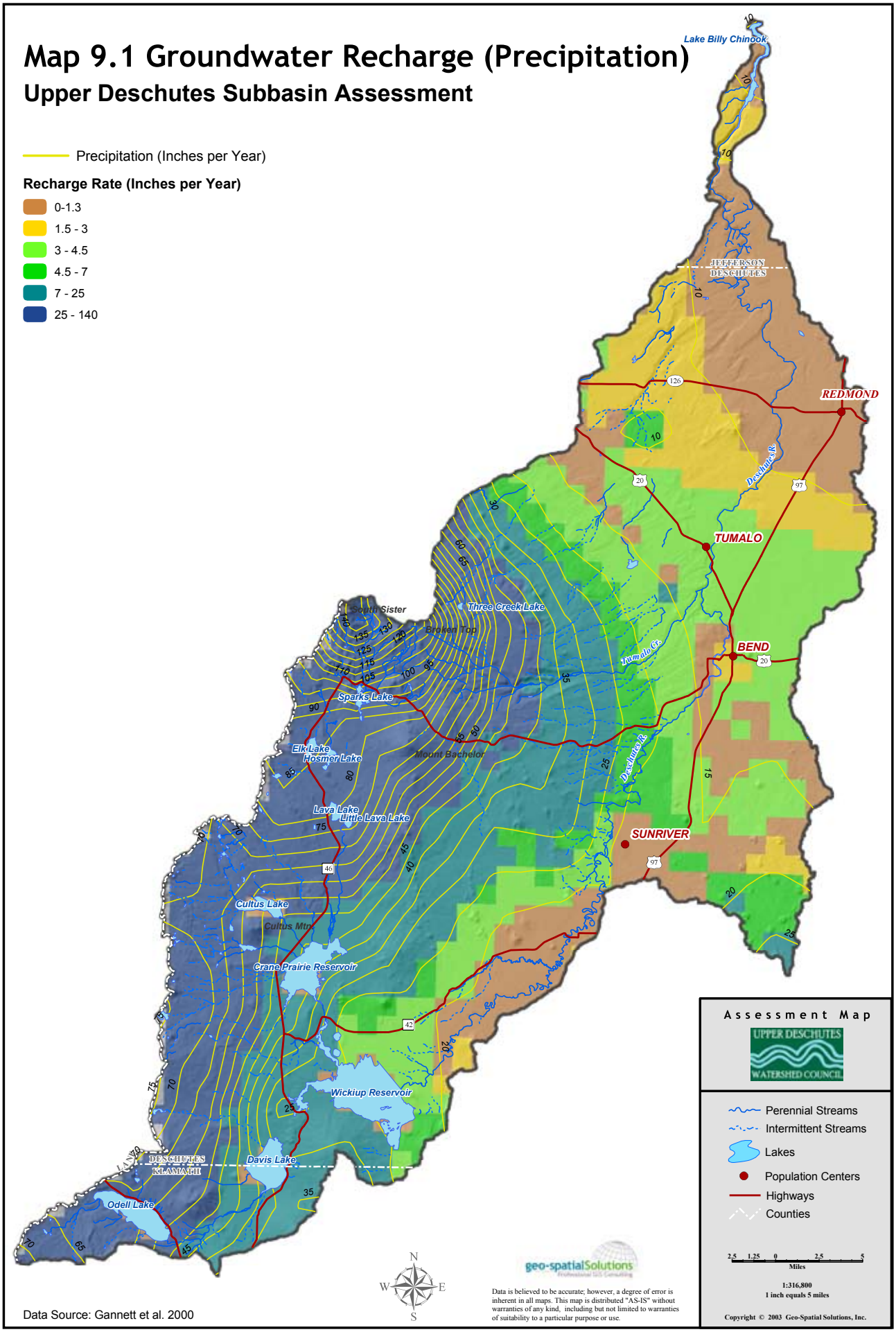

Deschutes Subbasin
OREGON
Columbia River
Deschutes River
Tygh Creek
Sherars Falls
Maupin
White River
Buck Hollow Creek
Bakeoven Creek
Warm Springs River
CASCADE MOUNTAINS
Wasco Co.
Jefferson Co.
Warm Springs
Lake Simtustus
Trout Creek
Madras
Metolius River
Lake Billy Chinook
Round Butte Dam
Steelhead Falls
OCHOCO MOUNTAINS
Prineville
North Fork Crooked River
Sisters
Deschutes River
Redmond
Crooked River
Squaw Creek
Bend
Prineville Reservoir
Dry River
Crane Prairie Reservoir
Davis Lake
Wickiup Reservoir
Odell Lake
Crescent Lake
little Deschutes River
Legend
Falls
5 0 5 10 15 20 25 Miles

Stream-Flow Hydrograph



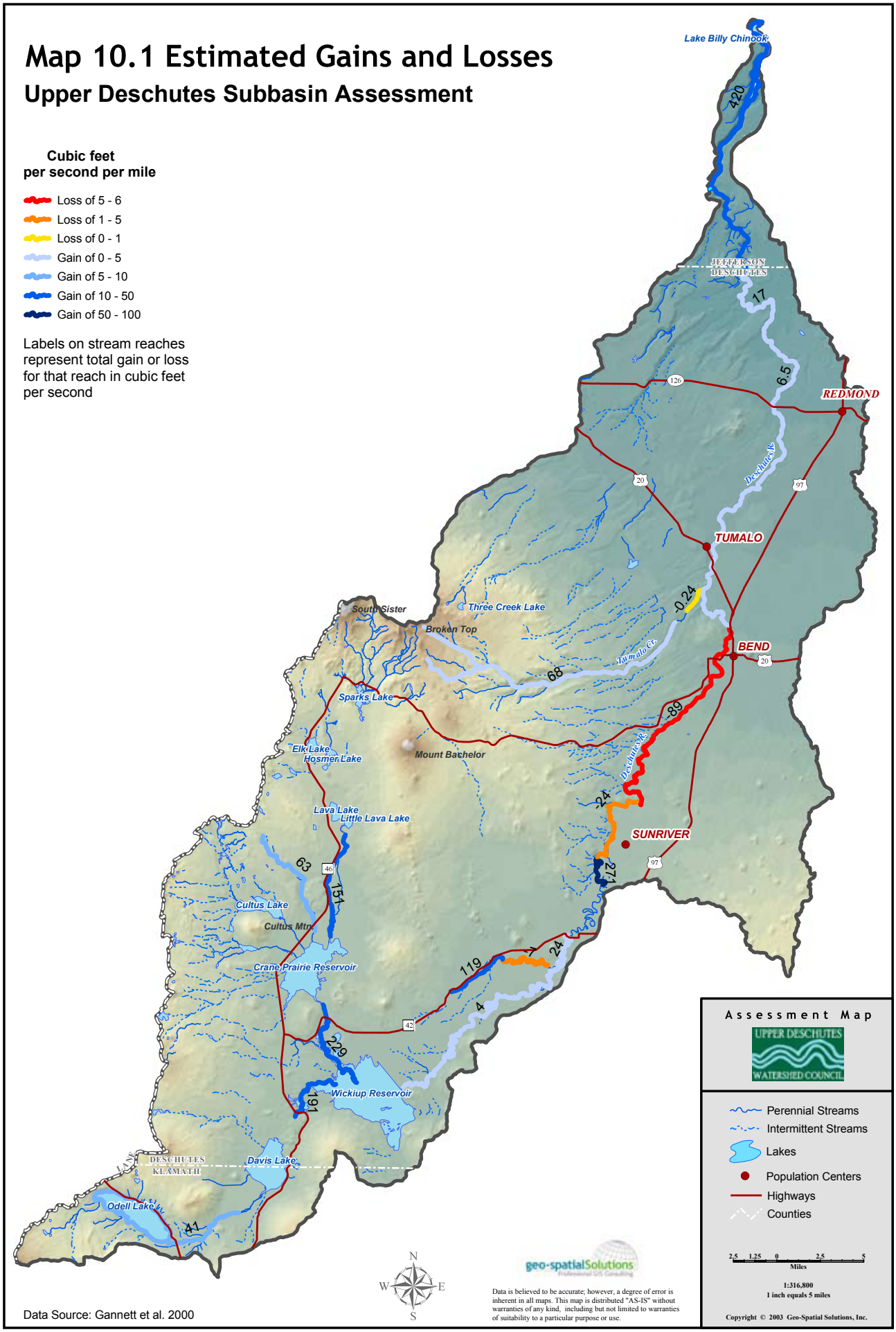
Map 9.1 Groundwater Recharge (Precipitation)

Upper Deschutes Subbasin Assessment



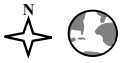
Map 10.1 Estimated Gains and Losses

Upper Deschutes Subbasin Assessment



Get The Ground Water Picture

Main Focus: Water
Benchmarks:



Approximate time: 20 mins.

This activity helps students understand groundwater. As ground water is hidden below the Earth's surface, students do not have a visible reference point as they do when they look at water in lakes or rivers. With the upper Deschutes Basin among the fastest growing regions in Oregon, that is also accompanied by an increased demand for water. A large proportion of the precipitation in the upper Deschutes Basin falls in the Cascade Mountains, making it the principle ground-water recharge area for the basin.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Get the Ground Water Picture activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

Earth and Space Science – Understand physical properties of the Earth and how those properties change.

GOALS AND OBJECTIVES

Students will:

- Be able to identify the parts of a ground water system
- Be able to compare movement of water through diverse substrates
- Be able to relate different types of land uses to potential ground water contamination

MATERIALS

- Clear 16-ounce soda bottles
- Gravel
- Sand
- Clay
- Hand-held magnifying glass
- 25 1"X12" strips of paper (numbered 1-25)
- Colored pencils

PROCEDURE

Making connections to our Ground Waters, Seeing it move through different soil types

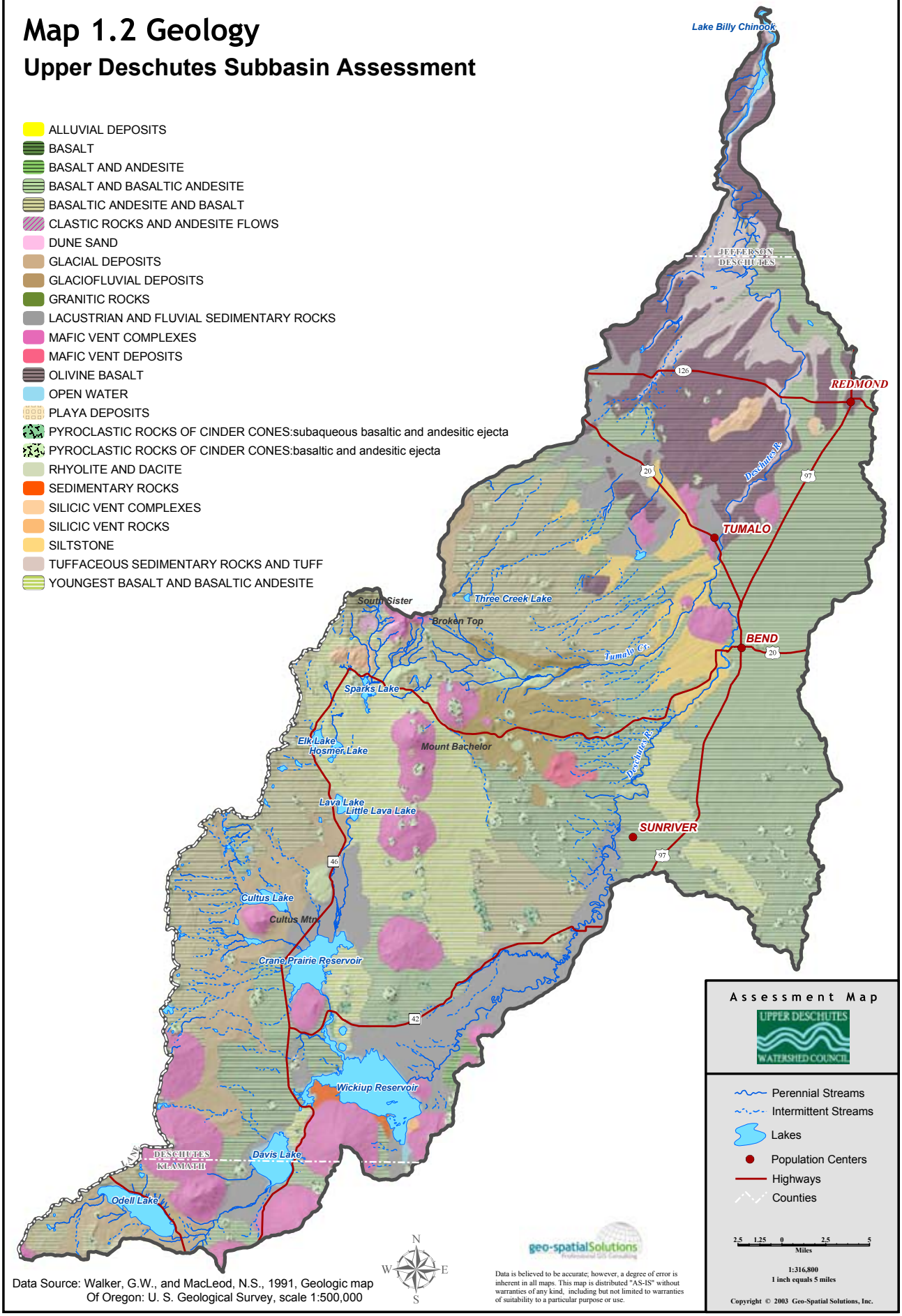
1. Cut the top off the soda bottles (to the rounded part) and punch a hole through the bottom with the sharp end of scissors (about the size of a dime).

2. Place gravel, sand, and clay in each of the clear soda bottles. Have a partner slowly pour water over the underground rock formations.

3. Observe how fast or slow the water moves through each container and then discuss the results. Which container emptied the fastest, the slowest? How would the different materials influence water movement in natural systems.

Map 1.2 Geology

Upper Deschutes Subbasin Assessment

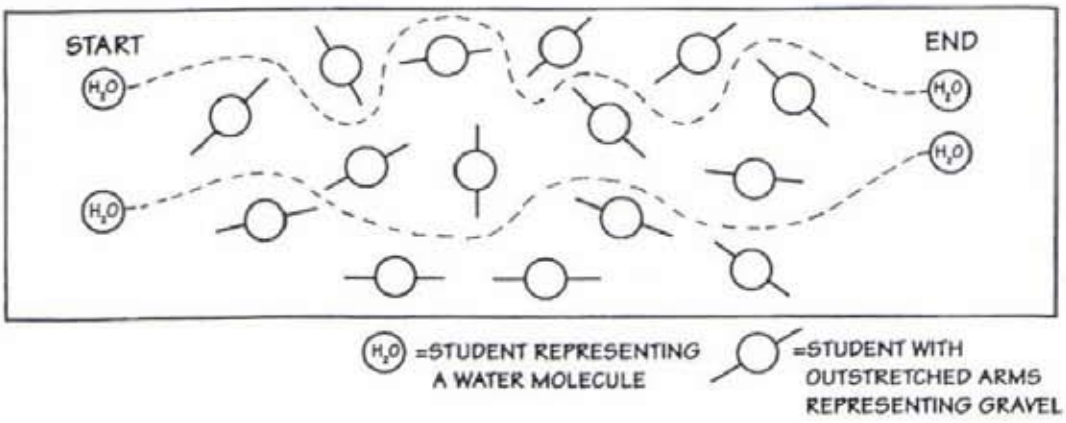


Data Source: Walker, G.W., and MacLeod, N.S., 1991, Geologic map Of Oregon: U. S. Geological Survey, scale 1:500,000

Some fun activities to do as a large group to further represent underground rock formations…

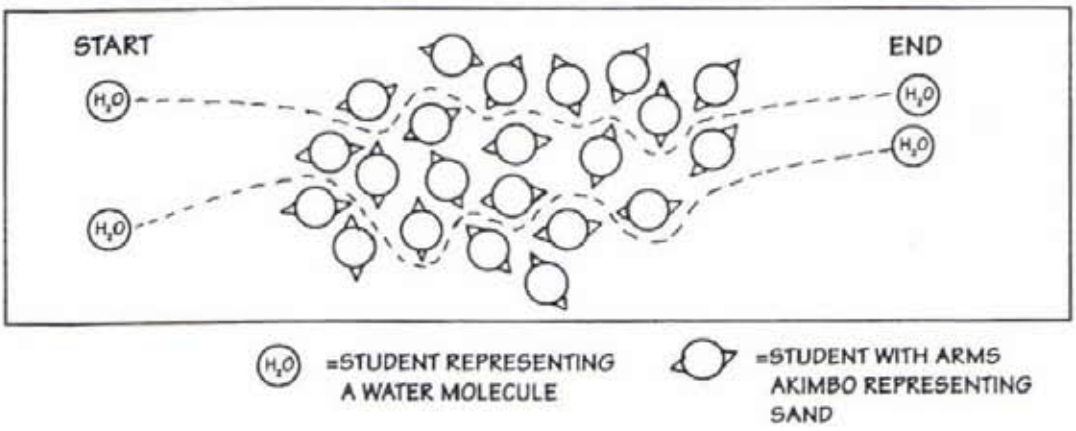
A

WATER MOVEMENT THROUGH GRAVEL



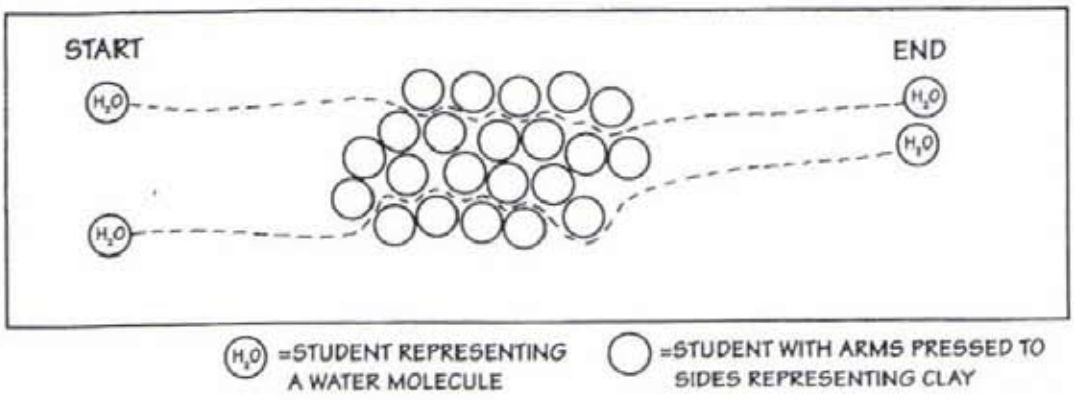
B

WATER MOVEMENT THROUGH SAND



C

WATER MOVEMENT THROUGH CLAY



Ecology

- Brainstorm with your students: what types of plants, animals and bugs live in your watershed?
- Are they different from other regions?
- Make some guesses and have your students research to find out

ONE DAY OUTSIDE

- Spend a day outside with your students
- Touch, smell and have your students use journals for recording observations and drawing pictures.
- Practice sensory observation (Project WET, "Stream Sense" p.195)

ADDITIONAL ACTIVITIES

- WebQuests – find and create on-line activities for identifying trees, plants, and animals. Have students discover answers for themselves and discuss in class. (Hometown Waters pg. WQ3)
- Powerpoint Presentation – create or have students create presentations about regional wildlife and plant life.
- Invertebrate Collection - Dig holes in spots around your watershed (schoolyard, home yard, forest, near creek). Plant cups in the holes to collect bugs. Identify your specimens! (Check out: http://caplter.asu.edu/explorers/protocol/arthropods/arthro.htm

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
Organization/Affiliation				
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Email				
Type of Activity/Program				
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Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

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Name				
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Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

Journal Making!!

Main Focus: Eco-Art
Benchmarks:

Approximate time: 30 mins.

This activity helps students make a connection with the natural world. Through this journaling activity students have an opportunity to make this a meaningful and a fun learning experience.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Snow Way activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

The Arts – Apply ideas, techniques and processes in the arts.

GOALS AND OBJECTIVES

Students will:

• Be able to create a nature journal will be used for observing outside, drawing, homework assignments, and writing down thoughts or ideas.

MATERIALS

- Cut up paper bags (cut into squares)
- Cut up white paper for inside of journals (squares a little smaller than paper bag squares).
- Twine or yarn
- Colored pencils and magic markers
- Glue Stick
- Hole punch
- Rubber bands
- An assortment of leaves and needles

PROCEDURE

Creating your very own journal

1. Tell the students that they may only use the materials that are listed above and no others. Nothing from their desks or other art from the supply cupboard.

2. The challenge is to get the students to use only these materials to create a journal that they may use throughout the remainder of the Hometown Waters unit.

3. They may decorate it any way they like, but be sure they conserve so that others may use the materials in demand.

4. The journal must be sturdy enough to hold up for a week or two and will be taken outside.

Local Partners

IDENTIFYING AND BECOMING FAMILIAR WITH LOCAL PARTNERS

- "What's Happening?" (Project WET pg.425)
- "Humpty Dumpty" (Hometown Waters pg.LP5)
- Invite community members to your class to give presentations about local restoration projects
- Have your students find out about community organizations and events they can get involved with
- Have your class develop a plan of action for getting involved in the community
- Writing – have students write in journals or for *HWI* publications and local newspapers about how they are contributing to the health of their watershed
- Finish Watershed Inventory
- "Dilemma Derby" (Project WET pg.377)
- Watershed Wheel – kids can create their own watershed - ART http://natsci.edgewood.edu/wingra/watershed/watershed_wheel.htm
- Contact your local watershed council

LOCAL CONTACT

Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

LOCAL CONTACT

Name				
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Name				
Organization/Affiliation				
Address				
Phone				
Email				
Type of Activity/Program				
Description				
Where (circle)	In-class	Schoolyard	Outdoor Field Trip	Indoor Field Trip

Humpty Dumpty

(What would Humpty Dumpty have looked like if they could have put him back together again?)

Main Focus: Local Partners
Benchmarks:

Approximate time: 50 mins.

This activity creates a connection for the students as they relate the challenges of doing environmental restoration projects to piecing together a simple puzzle. Some of you may have tinkered with an old clock or a radio, taking it apart and realizing that it is much more difficult putting it back together. Just like some puzzles that students have taken part with, which tend to be more difficult than thought to be.

COMMON CURRICULUM GOALS AND BENCHMARKS

The Humpty Dumpty activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

Earth and Space Science – Understand physical properties of the Earth and how those properties change.

Science Inquiry – Use interrelated processes to pose questions and investigate the physical and living world.

GOALS AND OBJECTIVES

Students will:

- Be able to describe the challenges of restoring an altered natural environment
- Be able to develop a restoration plan for a local site.
- Be able to name three components of a watershed unit

MATERIALS

- Photos of altered sites
- Object with multiple parts (e.g. an old radio)
- Old magazines
- Glue
- Scissors
- Ruler
- Drawing materials
- Poster board

PROCEDURE

1. Divide up into small groups of 4-5 students and have each group with a puzzle pattern. Have the groups glue the pattern (face-up) onto the poster-board and cut around the circle. Distribute old magazines and have students locate nature scenes, preferably ones containing water. Have the students cut out a picture and glue it to the poster-board side. An alternative is to have the students draw a picture of an ecosystem on the poster-board.

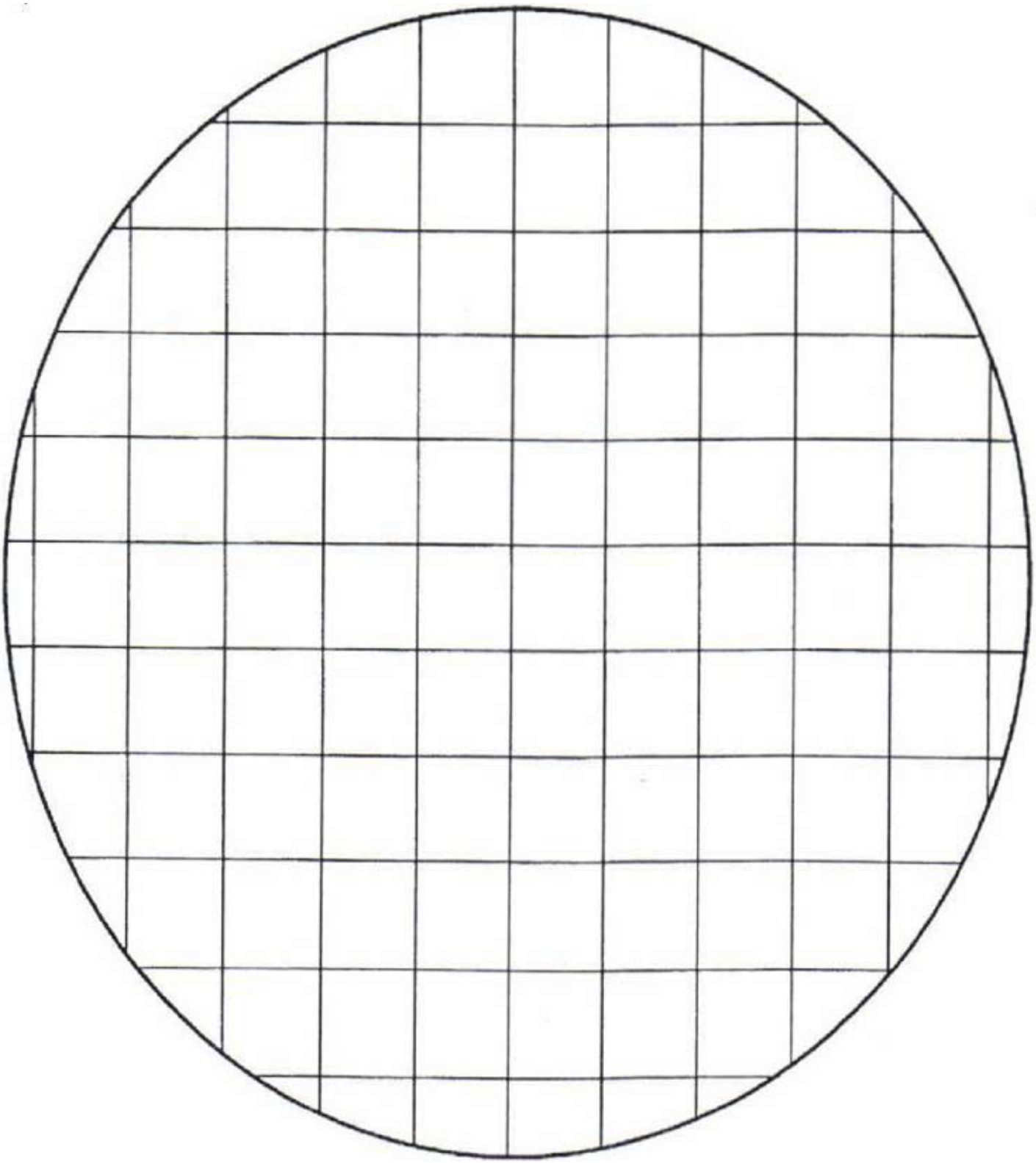
2. Have the students carefully cut the poster-board on the lines of the pattern.

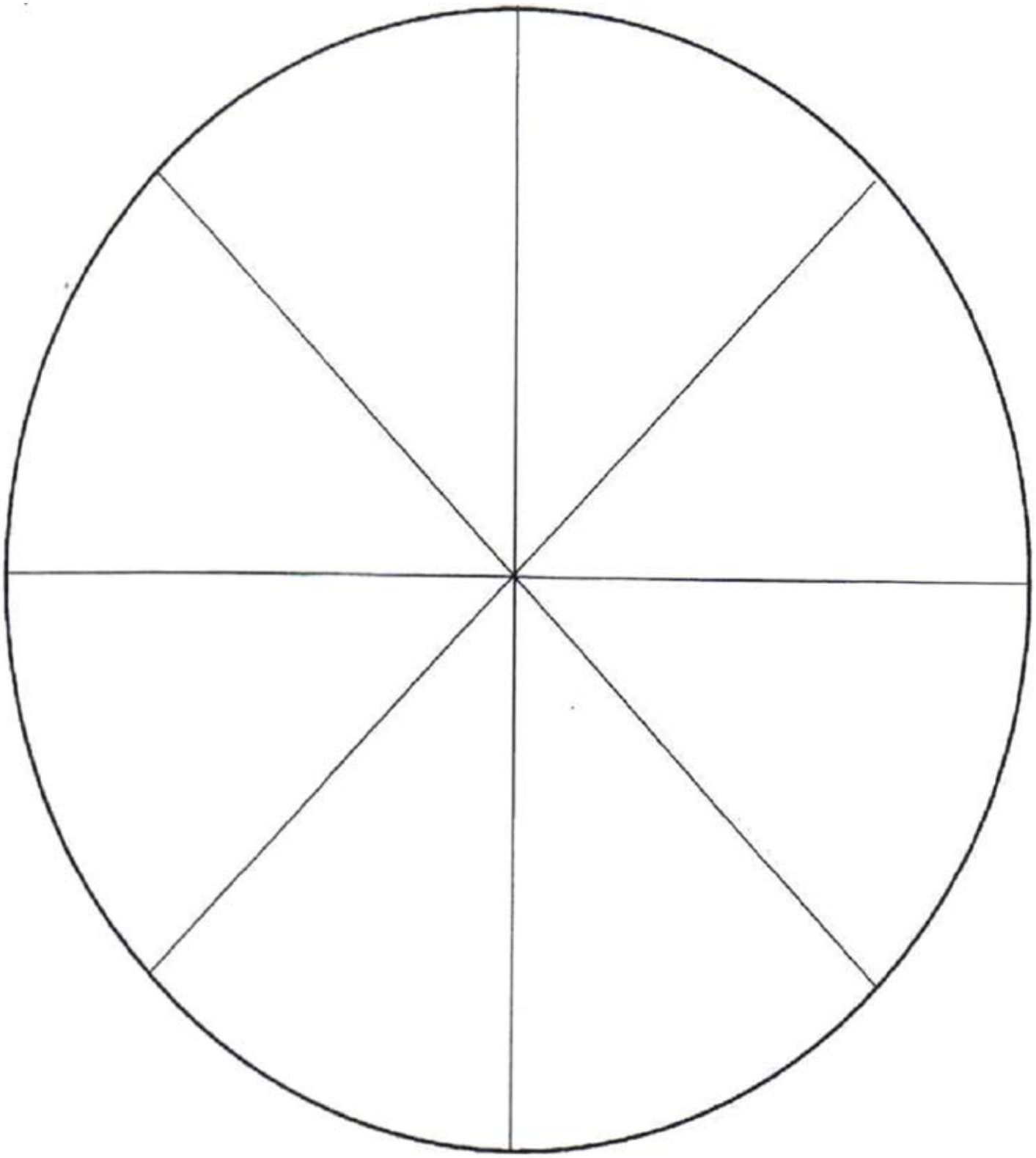
3. Instruct students to scatter the pieces on their desk top. Explain that this represents a natural area that has been altered.

4. Discuss the complications of putting ecosystems back together again.

5. Have the students arrange their pieces so the cut up picture is facedown. Have them switch places with another group. Without turning the pieces over, the groups should try to put the puzzles together again.

6. Have groups tape the puzzles together and turn the puzzles over. Some of the pictures may be accurately reconstructed, but because of pairs of mirror images that can be interchanged (without the visual clue of a picture to guide students), some may not. This emphasizes the point that the parts of a system must fit together properly, and that incomplete knowledge of the parts can complicate its restoration. (Even if the puzzle has been put together properly, it is still different from the original because it has been cut apart).





WebQuest

A WebQuest is an inquiry-oriented lesson format in which most or all of the information that learners work with comes from the web. WebQuests provide specific websites for students to explore in order to find the information they need to answer a question.

WebQuests are one more resource for teachers to use in getting their students involved in answering realistic questions about the health and local issues of their watershed. A WebQuest is also an opportunity for teachers to include technology as they are integrating regional watershed education into their curriculum.

AN EXAMPLE WEBQUEST

Students might explore the impacts of dams on rivers, specifically dams on the river in their basin.

The quest may ask students to address the following questions:

1. Do the benefits of dams outweigh the ecological costs?
2. Do the ecological costs outweigh the benefits?

Students would be split into groups to examine the issue. Topics for investigation might include fish passage, upstream effects, downstream effects, cultural effects, benefits and reasons for the dam.

Each student is responsible for exploring their assigned topic from a given vantage point. A student might assume the role of a "Fish Biologist" and be responsible for researching their topic from that perspective. Additionally one student might examine the issue from the perspective of a farmer or a rancher. WebQuests provide specific websites to explore in order to find information.

Visit *HWI*'s website for more examples of WebQuests. If you create your own WebQuest please let us know!

WebQuest

Main Focus: WebQuest
Benchmarks:

Approximate time: Varies (from 2-8 class sessions)

WebQuest can be a tool to be used any time during Hometown Waters. It is a research tool for topics that we are teaching. For example stream hydrology, and how it affects the flow of the Deschutes River.

COMMON CURRICULUM GOALS AND BENCHMARKS

The WebQuest activity can help teachers meet Oregon Department of Education common curriculum goals and benchmarks for middle school within the following areas:

Geography – Understand and use geographic skills and concepts to interpret contemporary and historical issues.

History – Relate significant events and eras in United States and world history to past and present issues and developments.

Social Science Analysis – Design and implement strategies to analyze issues, explain perspectives, and resolve issues using the social sciences.

Earth and Space Science – Understand physical properties of the Earth, how those properties change, and the Earth's relationship to other celestial bodies.

Science Inquiry – Use interrelated processes to pose questions and investigate the physical and living world.

GOALS AND OBJECTIVES

Students will:

- Be able to verbally describe the beneficial (both current and historical) factors of having Deschutes River flow through Central Oregon.
- Be able to verbally describe the health of the Upper Deschutes Watershed.
- Be able to understand and discuss the threats that are currently threatening Deschutes River and Watershed.

MATERIALS

- Computer
- Upper Deschutes Watershed Information (see page RWI3-RWI10)

PROCEDURE

In teams or individually, you will investigate the watershed of the Deschutes River. During your travels you will collect data about the importance, health, threats and the restoration efforts that are in place along this Wild and Scenic River. Throughout this activity you will attempt to examine the following questions:

1. Why is the Deschutes River important and how does it affect the community of Central Oregon?
a. Historically
b. Economically (i.e. fisheries, drinking water, irrigation, power generation)
c. Ecologically
d. Recreationally

2. How healthy is the Deschutes River today and why?
a. Fisheries
b. Riparian
c. Recreationally

3. What are the largest threats to health of the Deschutes River today?

WEB RESOURCES

Deschutes and Ochoco National Forest
http://www.fs.fed.us/r6/centraloregon/

Bureau of Reclamation
http://www.usbr.gov/dataweb/html/ordams.html
http://www.usbr.gov/pn-bin/rtindex.pl?cfg=deschutes

Upper Deschutes Watershed Council
http://www.restorethedeschutes.org/Publications/Technical_Resources/default.aspx

Deschutes River Conservancy
http://www.deschutesriver.org/Our_Basin/default.aspx

Deschutes Basin Land Trust
http://www.deschuteslandtrust.org/BTHW.htm

Upper Deschutes Watershed Information
http://www.healthywatersinstitute.org/pdf/Upper%20Deschutes%20Regional%20Information.pdf

Surf Your Watershed/U.S. Environment Protection Agency
http://cfpub1.epa.gov/surf/huc.cfm?huc_code=17070301

Science In Your State: USGS
http://www.usbr.gov/pn/

Oregon Water Resource Department
http://egov.oregon.gov/OWRD/

Service Learning / Extended Application

Since its launch in 2005, *HWI* has witnessed engaged students assuming responsibility for the health of their watersheds through valuable stewardship projects. Projects large and small have a remarkable impact on students, giving them a profound sense of place. Though many of these efforts have revolved around inquiry-based science, it is important to note that the opportunities *HWI* seeks to encourage are by no means bound by explorations in science.

The natural world provides one of the most dynamic contexts for learning and allows students to discover the complex interactions and relationships found in every ecosystem. Recognizing the interconnectedness of these systems opens the door for limitless interpretation and expression of ideas. It is a living, breathing system full of opportunities to be awed, humbled and inspired by. The scope of projects in which students participate should, and currently do, reflect a multi-disciplinary approach in communicating our relationship to the natural world. Some students are inspired to capture the colors and textures of nature through photography and art while others are inspired to conduct research and expand their understanding of what they see.

Service Learning and Extended Applications provide students with the opportunity to become truly engaged in the maintenance and preservation of their local watershed. Students should be supported and encouraged in developing their own ideas for projects based on the information they learn through HW. Project ideas should address local issues related to watershed health.

In Service Learning and Extended Applications, students apply and extend their knowledge in new and complex situations related to their personal and career interests and post high school goals. Students extend prior knowledge through critical thinking, problem solving or inquiry in real world context.

Participation in projects offers students opportunities for:

- Enhanced awareness of their local watershed
- Connections to community organizations and partners
- Public speaking occasions
- Career related learning experience
- Recognition for the merit of their work

Qualifying experiences generally:

- Support the educational goals of the school district
- Contextualize learning
- Connect students to the community
- Promote citizenship
- Prepare students for transitions beyond high school
- Benefit all partners involved, help to meet a community need

Corvallis School District has developed tools to help teachers and students track Service Learning and Extended Learning Projects.

There resources are available on the Corvallis SD Web site:

http://www.csd509j.net/district_information/departments_and_services/extended_learning/service%20learning.html

Projects may satisfy graduation requirements for "Essential Skills" including:

- Speak and present publicly
- Applying mathematics in a variety of settings
- Using technology
- Think critically and analytically (including scientific inquiry, problem solving)

- Demonstrate civic and community engagement
- Demonstrate global literacy
- Demonstrate career related learning, personal management, teamwork, employment foundations, career development

Collections of evidence should document a student's participation in Service Learning and Extended Applications. Collections may include, but are not limited to:

- Documentation of learning through a career related learning experience
- Projects related to school, student organization, or workplace activities
- Community-based projects related to a community problem or need
- Certificate of Initial Mastery (CIM) work samples
- Research or technical reports
- Storyboards
- Artwork
- Video or audio presentations
- PowerPoint displays
- Photo collections
- CD-ROMs with multimedia presentations
- Reflection pieces
- Journals
- Internship logs
- Job shadow notebooks

Projects can range from scientific investigations to creative arts explorations. The following are examples of student projects:

1. A Day in the Life of the Columbia Pacific: several partners in 1999 pulled this project together. It included about 75 high school students from 6 different high schools being taught by local photojournalists. Students all went out on one day and took photos in these categories: 1) arts and communications; 2) business; 3) infrastructure; 4) health, safety and recreation; 5) human resources; and 6) natural resource systems. Best photos were published with help from a grant and the local newspaper in an insert.

2. Marking Our Place: Susan Cross, Bear Creek Regional Education Coordinator for *HWI* in 2005, coordinated this project. It was mostly adults with a few youth participants. It was designed to build community between naturalists and artists and to also grow a body of art and literature about the Klamath-Siskiyou. Susan matched up teams of 3 artists or writers with a naturalist and sent them out to either urban, rural, or wilderness places for a long day. The participants then were required to create some art or writing that came out of the experience.

3. State of the Watershed Reports: These were done by a number of different school groups in the late 1990's. Peter Hayes, former *HWI* director conducted one with his students in the Thornton Creek Watershed in Washington. Students went out to different locations in their watershed to collect the same data sets on the same day. The product is a snapshot of watershed health on one day in several locations. Kids might collect WQ data, EPA Streamwalk style data, and state of litter or vandalism or macroinvertebrate populations. It would be best to collect the same sets of data so kids can compare apples and apples.

TRACKING & EVALUATION

We've included a set of tools to be used for tracking and evaluating student projects. The information obtained from your students can be used to document graduation requirements or held for personal records. We encourage the use of the *HWI* tools in order to provide *HWI* with the opportunity to share the work of your students with their peers. Students throughout the state are engaging in meaningful projects and deserve recognition for the merit of their work.

Healthy Waters Institute®

INDEPENDENT/SERVICE LEARNING PROJECT

Oregon Trout

Please use this document to report independent project activity. This information will be used for tracking and evaluation purposes and may be shared as part of on-going assessment of HWI.

Date _____ Name of person reporting _____

Project Information

School _____

Address _____

_____

Teacher _____

Grade _____

# of Students _____

Total # of Hours with Students _____

Student Names

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Partners _____

_____

_____

Project Dates _____

Description _____

_____

_____

_____

_____

_____

List supporting curriculum programs or activities (ie. Salmon Watch, 1000 Drops, etc.)

_____

_____

_____

How useful was the curriculum in planning, implementing and evaluating the project?

☐ Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor

Please report on the following if applicable to project:

_____ # stream miles worked on by students (in linear feet)

_____ # native plants planted

_____ # invasive plants removed

_____ # bags of trash collected

List any indicator, threatened or endangered species involved: _____

_____

_____

Please check all of the following skills that apply to this project:

☐ Reading
☐ Writing
☐ Speaking and presenting publicly
☐ Applying mathematics
☐ Using technology
☐ Thinking critically and analytically (scientific inquiry, problem solving)
☐ Demonstrating civic and community engagement
☐ Demonstrating career related learning
☐ Service learning

Did students have an opportunity to earn proficiency credit? (Please circle one) YES NO

Was an education grant awarded for this project? YES NO

If YES,

Was a summary submitted with photos or products? YES NO

Project Outcome _____

_____

_____

_____

_____

Additional Comments _____

_____

_____

_____

_____

_____

_____

Please return completed forms to:

OREGON TROUT
HEALTHY WATERS INSTITUTE
65 SW YAMHILL, SUITE 300
PORTLAND, OREGON 97204

Fax (503) 222-9187

Healthy Waters Institute®

STUDENT SURVEY (PRE-PARTICIPATION)

Oregon Trout

Name _____ Grade _____

School _____ Date _____

Email _____ Program or Project _____

Please circle the number that best describes what you think:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I enjoy learning about the natural environment.	1	2	3	4	5
2. I am more interested in other things than nature.	1	2	3	4	5
3. I like talking with other people about environmental issues.	1	2	3	4	5
4. I am concerned about environmental problems and issues.	1	2	3	4	5
5. I am not interested in learning more about nature.	1	2	3	4	5
6. I value/appreciate the natural environment.	1	2	3	4	5
7. I would rather spend my time inside than in nature.	1	2	3	4	5
8. I don't care about issues affecting my local environment.	1	2	3	4	5
9. I think humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
10. I believe humans must live in harmony with nature in order to survive.	1	2	3	4	5
11. I think conserving natural resources is unnecessary.	1	2	3	4	5
12. I believe humans have a responsibility to solve environmental problems.	1	2	3	4	5
13. I believe that I have a personal responsibility to help the environment.	1	2	3	4	5
14. One person can't really do anything to help the environment.	1	2	3	4	5

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
15. I am not interested in volunteering to care for the environment by planting trees, trash clean-ups, etc.	1	2	3	4	5
16. I would like to spend more time learning outside during school.	1	2	3	4	5
17. I conserve water at home.	1	2	3	4	5
18. I write letters to politicians about environmental issues.	1	2	3	4	5
19. I have had an internship/job with a watershed council, as a field scientist (hydrologist, botanist, etc), in stream and river restoration or with another natural resource organization.	1	2	3	4	5

Please use the following space to draw a picture of a healthy watershed or natural environment:

Healthy Waters Institute®

STUDENT SURVEY (POST-PARTICIPATION)

Oregon Trout

Name _____ Grade _____

School _____ Date _____

Email _____ Program or Project _____

Please circle the number that best describes what you think:	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I enjoy learning about the natural environment.	1	2	3	4	5
2. I am more interested in other things than nature.	1	2	3	4	5
3. I like talking with other people about environmental issues.	1	2	3	4	5
4. I am concerned about environmental problems and issues.	1	2	3	4	5
5. I am not interested in learning more about nature.	1	2	3	4	5
6. I value/appreciate the natural environment.	1	2	3	4	5
7. I would rather spend my time inside than in nature.	1	2	3	4	5
8. I don't care about issues affecting my local environment.	1	2	3	4	5
9. I think humans have the right to modify the natural environment to suit their needs.	1	2	3	4	5
10. I believe humans must live in harmony with nature in order to survive.	1	2	3	4	5
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12. I believe humans have a responsibility to solve environmental problems.	1	2	3	4	5
13. I believe that I have a personal responsibility to help the environment.	1	2	3	4	5
14. One person can't really do anything to help the environment.	1	2	3	4	5
15. I am not interested in volunteering to care for the environment by planting trees, trash clean-ups, etc.	1	2	3	4	5
16. I would like to spend more time learning outside during school.	1	2	3	4	5

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
17. I will conserve water at home.	1	2	3	4	5
18. I will write letters to politicians about environmental issues.	1	2	3	4	5
19. I would like to find an internship/job with a watershed council, as a field scientist (hydrologist, botanist, etc), in stream and river restoration or with another natural resource organization.	1	2	3	4	5

Is there anything you will do differently because of this program? _____

_____

_____

_____

Do you think this experience will impact your choices for college or career? How? _____

_____

_____

_____

Why are healthy watersheds or natural environments important? _____

_____

_____

_____

What is the one thing from this experience you will remember? _____

_____

_____

_____

Please use the following space to draw a picture of a healthy watershed or natural environment:

PRE-PROJECT TEACHER WORKSHEET: SERVICE-LEARNING

Project Title: _____

Teacher: _____ Ph. #_____ Planned Start Date: _____

School: _____ Planned End Date: _____

Course Area/Title: _____

This worksheet is designed to help you develop a project for your class that links community service to the course curriculum, fulfilling the Extended Student Learning Through Service-Learning component of the graduation requirements. Please review the Developing Ideas for Service-Learning and Post-Project Report sheets for additional ideas and guidelines.

Community Benefit/Benefactors (What will the service be? Who will be served?):

Curriculum Connection (How will the project be linked to in-class curriculum?):

*The process of Service-Learning includes four essential stages. Please check the **PARC/D** elements that will be included in your project:*

Preparation

- ☐ Student-generated project ideas
- ☐ Student planning (time schedules, budgeting, materials, tools, etc)
- ☐ Research
- ☐ Brainstorming possible partners/resources

Action

- ☐ Contacting partners
- ☐ Surveys
- ☐ Interviews
- ☐ Off-campus service
- ☐ Conducting experiments
- ☐ Collecting data

Reflection

- ☐ Journaling/Reflection
- ☐ Assessing outcome of project

Celebration/Demonstration

- ☐ Presenting the project (oral report, visual display, etc.)
- ☐ Final class discussion or wrap-up session

Your Service-Learning project can and should qualify as meeting the Career-Related Learning Standards (CRLS) and Civic Standards. Reviewing these requirements can also help with brainstorming ideas. Please mark the components that you plan to incorporate into your project.

CRLS

- ☐ *Personal Management (PM)*
  - ☐ CS.PM.01: Identified tasks to be completed and initiated necessary action
  - ☐ CS.PM.02: Planned, organized and completed projects on time and met quality standards
  - ☐ CS.PM.03: Took responsibility for decisions and actions and anticipated the consequences
  - ☐ CS.PM.04: Maintained regular and punctual attendance
  - ☐ CS.PM.05: Maintained appropriate interactions with colleagues

- ☐ *Problem Solving (PS)*
  - ☐ CS.PS.01: Identified problems and located information that would lead to solutions
  - ☐ CS.PS.02: Identified alternatives to assist in problem solving
  - ☐ CS.PS.03: Assessed the consequences of the alternatives
  - ☐ CS.PS.04: Selected and explained a proposed solution and course of action
  - ☐ CS.PS.05: Developed a plan to implement the selected course of action
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- ☐ *Communication (CM)*
  - ☐ CS.CM.01: Located, processed and conveyed information using traditional and technological tools
  - ☐ CS.CM.02: Listened to and summarized key elements of verbal and non-verbal communication
  - ☐ CS.CM.03: Gave and received feedback in a positive manner
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  - ☐ CS.CM.05: Wrote instructions, technical reports, and business communications clearly and accurately
  - ☐ CS.CM.06: Spoke clearly, accurately, and appropriately when giving oral instructions, technical reports and business communications

- ☐ *Teamwork (TW)*
  - ☐ CS.TW.01: Identified teams and roles within teams; described importance of roles
  - ☐ CS.TW.02: Demonstrated skills that improve team effectiveness (e.g., negotiation, compromise, conflict management, shared decision-making)

- ☐ *Employment Foundations (EF)*
  - ☐ CS.EF.01: Applied academic knowledge and technical skills in a career context
  - ☐ CS.EF.02: Selected, applied and maintained tools and technologies appropriate for the workplace
  - ☐ CS.EF.03: Identified parts of organizations and systems and how they fit together
  - ☐ CS.EF.04: Described how work moves through a system
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  - ☐ CS.EF.06: Demonstrated appropriate dress, appearance and personal hygiene
  - ☐ CS.EF.07: Explained and followed health and safety practices
  - ☐ CS.EF. 08: Explained and followed regulatory requirements, security procedures and ethical practices

☐ *Career Development (CD)*

- ☐ CS.CD.01: Assessed personal characteristics related to educational and career goals
- ☐ CS.CD.02: Researched and analyzed career and educational information related to project
- ☐ CS.CD.03: Developed and discussed a plan designed to achieve personal, educational and career goals
- ☐ CS.CD.04: Monitored and evaluated educational and career goals
- ☐ CS.CD.05: Demonstrated job-seeking skills (e.g., writing resumes, completing applications and participating in interviews)

CIVIC STANDARDS

- ☐ Understand rights and responsibilities of citizens
- ☐ Understand that limited resources make economic choices necessary
- ☐ Design and implement strategies to analyze issues, explain perspectives and resolve issues
- ☐ Other, please explain _____

There are four methods of conducting Service-Learning. Once your project design is decided, you should be able to categorize it as one or more of the following:

1. **Direct:** Students' service directly affects and involves the recipients (e.g., tutoring, animal care, working w/ elderly).
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4. **Research:** Students find, gather and report information in the public interest (e.g., developing surveys, conduct formal studies, evaluations, experiments or interviews)

Please describe your project and action plan:

POST-PROJECT TEACHER REPORT: SERVICE-LEARNING

Project Title: _____

Teacher: _____ Ph. #_____ Start Date: _____

School: _____ End Date: _____

Course Area/Title: _____

Service Site: ☐ School Site ☐ Other _____

Please provide a brief description of your project:

A) # of students participating _____ students

B) # of student classroom hours per student _____ avg. hrs/student
(Include project selection, planning, reflection and celebration time)

C) # of student non-classroom hours _____ avg. hrs/student
(Include only hours spent as a class)

D) Total # of Project Hours **_____ total hours**
(Line A) x (Line B + Line C) = Line D

E) # of Adult Volunteers _____ adults
(Include Partners, Parents, AmeriCorps Members, etc)

F) # of Adult Volunteer hours _____ avg. hours/adult

COMMUNITY PROJECT PARTNER(S) **PHONE #**

_____ _____

_____ _____

PLEASE LIST COMMUNITY RESOURCES (ESTIMATED $)

Materials _____

Grants _____ Total $_____

Donors _____

Please mark the Career-Related Learning Standards and Civic Standards met by your project.

CRLS

- ☐ *Personal Management (PM)*
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CIVIC STANDARDS

- [ ] Understand rights and responsibilities of citizens
- [ ] Understand that limited resources make economic choices necessary
- [ ] Design and implement strategies to analyze issues, explain perspectives and resolve issues
- [ ] Other, please explain _____

PRE-PROJECT STUDENT WORKSHEET: SERVICE-LEARNING

Name: _____

Project Title: _____

Teacher: _____ Ph. #_____ Planned Start Date: _____

School: _____ Planned End Date: _____

Course Area/Title: _____

This worksheet is designed to help you develop a project with your classmates and instructor that links community service to the course curriculum, fulfilling the Extended Student Learning Through Service-Learning component of the graduation requirements. Please review the Post-Project Report for additional ideas and guidelines.

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Please describe your project and action plan:

POST-PROJECT STUDENT REPORT: SERVICE-LEARNING

Name: _____

Project Title: _____

Teacher: _____ Ph. #_____ Start Date: _____

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Course Area/Title: _____

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A) # of students participating _____ students

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D) My Total Project Hours **_____ total hours**
(Line B + Line C) = Line D

E) # of Adult Volunteers _____ adults
(Include Partners, Parents, AmeriCorps Members, etc)

F) # of Adult Volunteer hours _____ avg. hours/adult

Community Project Partner(s)	**Phone #**
_____	_____
_____	_____

Please list community resources (estimated $)

Materials _____

Grants _____ Total $_____

Donors _____

Please mark the Career-Related Learning Standards and Civic Standards met by your project.

CRLS

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CIVIC STANDARDS

- [ ] Understand rights and responsibilities of citizens
- [ ] Understand that limited resources make economic choices necessary
- [ ] Design and implement strategies to analyze issues, explain perspectives and resolve issues
- [ ] Other, please explain _____

CAREER-RELATED LEARNING EXPERIENCE
STUDENT REFLECTION

Name: _____

Project Title: _____

Class: _____ Grade: _____

☐ SERVICE-LEARNING Teacher: _____

☐ OTHER_____

RELEVANCE: How did this experience relate to your personal interests?

RIGOR: What skills and knowledge have you acquired from this experience that will help you achieve your post-high school goals?

REFLECTION: What is something new or surprising that you learned or experienced while participating in this project?

STUDENT SERVICE HOURS LOG

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Jun																																
July																																
Aug																																
Sept																																
Oct																																
Nov																																
Dec																																
Jan																																
Feb																																
Mar																																
Apr																																
May																																

http://www.csd509j.net/district_information/departments_and_services/extended_learning/service_learning_resources.html

Community Sharing

When a student shares a project, they convey their inspiration of the natural world and hearten others to seek similar ventures. Opportunities for sharing student projects should be identified from the onset of participation in HW. By recognizing and rewarding youth engaged in civic activities that benefit their home waters, we seek to encourage their continued involvement and spark the interest of new audiences by showcasing student work.

Suggested products of student work include:

- Photos, drawings, wildlife art
- Maps, charts, graphs
- Power Point Presentations
- Essays, poetry, journal entries
- Oral histories
- WQ data, riparian assessments, bird counts
- Public art, murals
- Ephemeral art, music, skits, plays
- Anything a creative group can imagine!

Created products can be shared through:

1. *healthy waters* Journal, *healthy waters kids* and *HWI* website
2. Local newspaper
3. Watershed council events
4. Watershed symposiums or celebrations
5. Public libraries or other public buildings

Projects can also be shared through student summits or symposiums. These events provide opportunities for students to see what other students have created in their community.

Summits can tie into existing events and take place in an auditorium, theatre, or environmental center. Members from the general public including watershed council boards, community members and parents can be invited to attend and share in the work of their students.

Student summits provide opportunities for students to:

1. Interpret their watershed
2. Celebrate their watershed
3. Present projects to the public and their peers
4. Learn from other students
5. Teach the greater community
6. Develop public speaking skills
7. Integrate their learning into the larger community.

We encourage the sharing of student work through *HWI*! Please submit the Service Learning/ Independent Project Tracking Sheet to *HWI* for publication in our journal or through our website.

Culminating Project

1. This project should be something that is woven into the program and not done at the end. There may be a week to finish up projects after the core curriculum is taught, but the project should be thought about and information gathered, if possible, throughout the unit.

2. The project can be big or small, but chosen in cooperation with the teacher and student.

3. There should be a final product that can be presented at the culminating event and possibly showcased in the community after.

Here are some culminating project topic ideas:

1. Problems facing your watershed
2. Great things happening in your watershed (restoration projects, community action)
3. How the government or politics have affected your watershed historically, presently. Policies, laws…
4. Who takes care of your watershed? What do they do? Where does the money come from?
5. How can you be involved? What do people do to help or hinder progress?
6. Restoration projects…
7. Future: If things continued as they are today…
8. If things continued as they were 30-40 years ago.
9. One specific area of focus about the watershed
    a. history
    b. plants & other veg.
    c. water quality
    d. animals
    e. insects
    f. source
    g. cleanliness
    h. soil
10. Their ideas. What needs to they see?
11. The affect of people on the watershed
    a. urbanization
    b. farms
    c. factories
    d. construction
    e.living everyday
    f. water use/management
12. How do you affect the watershed?
13. How students can help with organized movements within the city toward the future. Some examples: Bend 2030 Vision, watershed assessments, etc.

EXAMPLES OF FINAL PROJECTS

- Posterboard
- Powerpoint presentation
- Trifold presentation board
- Video
- Picture diary/photo journal
- Poetry
- Artwork
- Brochure
- Web Page/site
- Watershed Maps (3-dimensional, GIS, habitat maps, etc.)
- Restoration project plan
- Anything creative the kids can come up with. The possibilities are endless.

Appendix

Benchmark List

GETTING TO KNOW YOUR WATERSHED

Geography

Benchmark SS.08.GE.01
Benchmark SS.08.GE.02
Benchmark SS.08.GE.02.01
Benchmark SS.08.GE.03.01
Benchmark SS.08.GE.07
Benchmark SS.08.GE.07.02

History

Benchmark SS.08.HS.01
Benchmark SS.08.HS.03
Benchmark SS.08.HS.07

Social Science Analysis

Benchmark SS.08.SA.01
Benchmark SS.08.SA.02
Benchmark SS.08.SA.04
Benchmark SS.08.SA.05

Life Science

Benchmark SC.08.LS.04
Benchmark SC.08.LS.04.04
Benchmark SC.08.LS.05.02

Earth & Space Science

Benchmark SC.08.ES.01
Benchmark SC.08.ES.01.01
Benchmark SC.08.ES.02
Benchmark SC.08.ES.02.05
Benchmark SC.08.ES.03.02
Benchmark SC.08.ES.03.03

Scientific Inquiry

Benchmark SC.08.SI.01
Benchmark SC.08.SI.03

CREATING YOUR OWN WATERSHED MAP

Geography

Benchmark SS.08.GE.01
Benchmark SS.08.GE.01.01
Benchmark SS.08.GE.02.01
Benchmark SS.08.GE.03.01
Benchmark SS.08.GE.07

Social Science Analysis

Benchmark SS.08.SA.02

Earth & Space Science

Benchmark SC.08.ES.02.05
Benchmark SC.08.ES.03.02
Benchmark SC.08.ES.03.03

The Arts

Benchmark AR.08.CP.02

TIMELINE MURAL

Geography

Benchmark SS.08.GE.01
Benchmark SS.08.GE.02
Benchmark SS.08.GE.02.01
Benchmark SS.08.GE.07
Benchmark SS.08.GE.07.02

History

Benchmark SS.08.HS.01
Benchmark SS.08.HS.03
Benchmark SS.08.HS.07

Social Science Analysis

Benchmark SS.08.SA.01
Benchmark SS.08.SA.02
Benchmark SS.08.SA.04
Benchmark SS.08.SA.05

Scientific Inquiry

Benchmark SC.08.SI.01
Benchmark SC.08.SI.03

The Arts

Benchmark AR.08.CP.02

CONNECTING THE WATERSHED AND THE COMMUNITY

Geography

Benchmark SS.08.GE.01.01
Benchmark SS.08.GE.03.01
Benchmark SS.08.GE.07

Earth & Space Science

Benchmark SC.08.ES.02.05
Benchmark SC.08.ES.03.02
Benchmark SC.08.ES.03.03

Scientific Inquiry

Benchmark SC.08.SI.03

SNOW WAY

Geography

Benchmark SS.08.GE.02

Benchmark SS.08.GE.02.01

Benchmark SS.08.GE.03.01

History

Benchmark SS.08.HS.01

Benchmark SS.08.HS.07

Social Science Analysis

Benchmark SS.08.SA.01

Benchmark SS.08.SA.04

Benchmark SS.08.SA.05

Earth & Space Science

Benchmark SC.08.ES.02

Benchmark SC.08.ES.02.05

Benchmark SC.08.ES.03.03

Scientific Inquiry

Benchmark SC.08.SI.03

GET THE GROUND WATER PICTURE

Geography

Benchmark SS.08.GE.01.01

Benchmark SS.08.GE.02

Benchmark SS.08.GE.03.01

Benchmark SS.08.GE.07

Earth & Space Science

Benchmark SC.08.ES.01

Benchmark SC.08.ES.02

Benchmark SC.08.ES.02.05

Benchmark SC.08.ES.03.02

Benchmark SC.08.ES.03.03

JOURNAL MAKING

The Arts

Benchmark AR.08.CP.02

HUMPTY DUMPTY

Geography

Benchmark SS.08.GE.02.01

Benchmark SS.08.GE.07

Benchmark SS.08.GE.07.02

Social Science Analysis

Benchmark SS.08.SA.01

Benchmark SS.08.SA.04

Benchmark SS.08.SA.05

Earth & Space Science

Benchmark SC.08.ES.01

Benchmark SC.08.ES.01.01

Benchmark SC.08.ES.03.03

Scientific Inquiry

Benchmark SC.08.SI.01

WEBQUEST

Geography

Benchmark SS.08.GE.01

Benchmark SS.08.GE.02

Benchmark SS.08.GE.02.01

Benchmark SS.08.GE.07

Benchmark SS.08.GE.07.02

History

Benchmark SS.08.HS.01

Benchmark SS.08.HS.03

Benchmark SS.08.HS.07

Social Science Analysis

Benchmark SS.08.SA.01

Benchmark SS.08.SA.02

Benchmark SS.08.SA.04

Benchmark SS.08.SA.05

Earth & Space Science

Benchmark SC.08.ES.02.05

Benchmark SC.08.ES.03.02

Benchmark SC.08.ES.03.03

Scientific Inquiry

Benchmark SC.08.SI.01

Benchmark SC.08.SI.03

Benchmarks Table

	Geography	History	Social Science Analysis	Life Science	Earth & Space Science	Science Inquiry	The Arts
GETTING TO KNOW YOUR WATERSHED	✓	✓	✓	✓	✓	✓	
CREATING YOUR OWN WATERSHED MAP	✓		✓		✓		✓
TIMELINE MURAL	✓	✓	✓			✓	✓
CONNECTING THE WATERSHED & THE COMMUNITY	✓				✓	✓	
SNOW WAY	✓	✓	✓		✓	✓	
GET THE GROUND WATER PICTURE	✓				✓		
JOURNAL MAKING	✓				✓		✓
HUMPTY DUMPTY	✓				✓	✓	
WEBQUEST	✓				✓	✓	

Benchmarks and Common Curriculum Goals (CCG)

The study of the social sciences (civics, economics, geography, and history) prepares students for responsible citizenship. It enables students to evaluate historical and contemporary issues, understand global relationships, and make connections between the past, present, and future.

Geography: Understand and use geographic skills and concepts to interpret contemporary and historical issues.

CCG – Understand the spatial concepts of location, distance, direction, scale, movement, and region.

Benchmark SS.08.GE.01 Understand fundamental geography vocabulary such as concepts of distance, latitude, longitude, interdependence, accessibility, and connections.
Benchmark SS.08.GE.01.01 Use maps, charts, and graphs to understand patterns of movement over time and space.

CCG – Use maps and other geographic tools and technologies to acquire, process and report information from a spatial perspective

Benchmark SS.08.GE.02 Read, interpret, and understand how to construct geo graphic representations to analyze information, understand spatial relationships, and compare places.
Benchmark SS.08.GE.02.01 Use maps, charts, graphs, and photographs to analyze spatial distributions and patterns.

CCG – Locate major physical and human (cultural) features of the Earth.

Benchmark SS.08.GE.03.01 Identify the location of major mountain ranges, des erts, rivers, cultural regions and countries in the world.

CCG – Understand how people and the environment are interrelated

Benchmark SS.08.GE.07 Understand how human modification of the physical environment in a place affects both that place and other places
Benchmark SS.08.GE.07.02 Understand how clearing vegetation affects the physical environment of a place and other places.

History: Relate significant events and eras in United States and world history to past and present issues and developments.

CCG – Historical Skills: Interpret and reconstruct chronological relationships

Benchmark SS.08.HS.01 Represent and interpret data and chronological relationships from history, using timelines and narratives.

CCG – Understand, recognize, and interpret change and continuity over time.

Benchmark SS.08.HS.03 Identify and give examples of chronological patterns and recognize them in related events over time.

CCG – State & Local History: Understand and interpret the history of the state of Oregon.

Benchmark SS.08.HS.07 Understand how various groups of people were affected by events and developments in Oregon state history.

Social Science Analysis: Design and implement strategies to analyze issues, explain perspectives, and resolve issues using the social sciences.

CCG – Define and clarify an issue so that its dimensions are well understood.

Benchmark SS.08.SA.01 Clarify key aspects of an event, issue, or problem through inquiry and research.

CCG – Acquire and organize materials from primary and secondary sources.

Benchmark SS.08.SA.02 Gather, interpret, use, and document information from multiple sources, distinguishing facts from opinions and recognizing points of view.

CCG – Identify and analyze an issue.

Benchmark SS.08.SA.04 Examine the various characteristics, causes, and effects of an event, issue, or problem.

CCG – Select a course of action to resolve an issue.

Benchmark SS.08.SA.05 Consider two or more outcomes, responses, or solutions; identify their strengths and weaknesses; then conclude and justify which is the best

The study of Science promotes scientific literacy where students can explore natural events using rational and systematic observation, identification, description, experimental investigation, and theoretical explanation. These scientific concepts and processes provide students with decision-making skills needed for informed participation in civic and economic affairs.

Physical Science: Understand structures and properties of matter and changes that occur in the physical world.

Life Science: Understand structure, functions, and interactions of living organisms and the environment

CCG – Diversity/Interdependence: Understand the relationships among living things and between living things and their environments.

Benchmark SC.08.LS.04 Identify and describe the factors that influence or change the balance of populations in their environment
Benchmark SC.08.LS.04.02 Identify populations of organisms within an ecosystem by the function that they serve
Benchmark SC.08.LS.04.04 Explain the importance of niche to an organism's ability to avoid direct competition for resources.
Benchmark SC.08.LS.05.02 Describe how animal and plant structures adapt to environmental change.

Earth and Space Science: Understand physical properties of the Earth, and how those properties change.

CCG – The Dynamic Earth: Understand the properties and limited availability of the materials which make up the Earth.

Benchmark SC.08.ES.01 Recognize that Earth materials are limited, and explore strategies for addressing this problem
Benchmark SC.08.ES.01.01 Identify ways in which various resources can be recycled and reused

CCG – Understand changes occurring within the lithosphere, hydrosphere, and atmosphere of the Earth.

Benchmark SC.08.ES.02 Explain the water cycle and its relationship to weather and climatic patterns.
Benchmark SC.08.ES.02.01 Explain the water cycle.
Benchmark SC.08.ES.02.05 Explain how geography affect climate.
Benchmark SC.08.ES.03.02 Identify the processes that result in different kinds of landforms.
Benchmark SC.08.ES.03.03 Identify factors affecting water flow, soil erosion, and deposition.

Scientific Inquiry: Use interrelated processes to pose questions and investigate the physical and living world.

CCG – Forming the Question/Hypothesis: Formulate and express scientific questions or hypotheses to be investigated.

Benchmark SC.08.SI.01 Based on observations and scientific concepts, ask questions or form hypotheses that can be explored through scientific investigations.

CCG – Collecting and Presenting Data: Conduct procedures to collect, organize, and display scientific data.

Benchmark SC.08.SI.03 Collect, organize, and display sufficient data to support analysis

The Arts: Learning in and through the arts prepares students for a life enriched through engagement in the creative process, an appreciation of aesthetics and an understanding of the relationships between the arts and society. Arts literacy enhances a student's communication, analytical thinking, problem solving and multi-cultural awareness.

Create Present and Perform: Apply ideas, techniques and processes in the arts.

CCG - Create, present and perform works of art.

Benchmark AR.08.CP.02 Describe the creative process used, and the effects of the choices made, when combining ideas, techniques, and problem solving to produce one's work.

List of Local Partners and Project Opportunities

The following service-learning project resource lists were compiled to assist teachers and students in designing projects. Schools are encouraged to partner with one or more of these organizations for projects in the local watershed to help with technical and material support. A partner may also be able to enhance the learning component of their projects to meet your needs. It's a good idea to alert your local watershed council coordinator of the project you and your students are planning. To find out which watershed your school belongs or if you have any questions, please contact the *Healthy Waters Insititute* and assistance will be provided.

CENTRAL OREGON

Local Watershed Councils

Upper Deschutes Watershed Council
Contact: Kolleen Yake
541-382-6103 x33
kyake@restorethedeschutes.org
Upper Deschutes Watershed Council
700 NW Hill St., Bend, OR 97701
At the Upper Deschutes Watershed Council we believe that a clean, healthy Deschutes River is at the heart of our community. Our projects in habitat restoration and education provide tangible changes on the landscape to create a future of healthy rivers, clean water and outstanding natural values. Contact the watershed council for available projects.

Area-Wide Resources

Deschutes Basin Land Trust
Contact: Amanda Egertson
541-330-0017
amanda@deschuteslandtrust.org
www.deschuteslandtrust.org
760 NW Harriman, Suite 100, Bend, OR 97701
The mission of the Deschutes Basin Land Trust is to protect special lands in the Deschutes basin for present and future generations by working cooperatively with landowners and communities. Contact Amanda for information on restoration opportunities in the Metolius basin.

ODFW—High Desert Region
Contact: Jennifer Luke
541-388-6363
jennifer.a.bock@state.or.us
61374 Parrell Rd., Bend, OR 97702
Contact Jennifer for information about restoration or monitoring projects in the Bend, Prineville, Redmond, and Sisters areas.

reSource
Contact: Tim Hester
541-388-3638
thester@resourceoregon.org
www.resourceoregon.org
740 NE 1st St., Bend, OR 97701
The mission of reSource is to create a sustainable future for Central Oregon by educating people about what sustainability means and how to put it into practice. Contact Tim for information on service learning projects.

USFS

Contact: Nate Dachtler
541-549-7725
ndachtler@fs.fed.us
P.O. Box 249, Sisters, OR 97759

Contact Nate for information about restoration or monitoring projects within the Metolius basin.

Wolftree

Contact: Jay Hopp (Education Director)
541-549-1459
www.beoutside.org
P.O. Box 204, Sisters, OR 97759

Contact Wolftree if you are interested in hearing more about local education opportunities or to participate in a hand-on service learning project.

City of Bend

Contact: Wendy Edde (Water Resource Education)
541-317-3000
wedde@ci.bend.or.us
575 NE 15th St., Bend, OR 97701

Contact the City of Bend for information on stormwater, stormdrains, stormdrain stenciling projects, wastewater management, or for a tour through the City of Bend's intake facility.

Deschutes River Conservancy

Contact: Kate Fitzpatrick (Program Manager)
541-382-4077
kate@deschutesrc.org
700 NW Hill St., Bend, OR 97702

Contact the Deschutes River Conservancy to learn more about water quantity issues and concerns in the Deschutes River and its tributaries.

List of Grants

The grant opportunities listed below typically have 2-4 page applications and are not especially competitive. Please use this preliminary list as a reference for future planning if deadlines have passed for this year. All of these opportunities should be renewed for another cycle.

NATIONAL

NEA Foundation for the Improvement of Education Award
Contact: 203-822-7840
Goal: Grants seek to fund participation in high-quality professional development such as summer institutes or action research. Grants also fund lesson study or mentoring experiences to improve teaching, curriculum, or student achievement.
Award: $2000-$5000

National Science Teachers Association NSTA Sylvia Shugrue for Elementary School Teachers
Contact: awards@nsta.org
www.nsta.org/dcat
Goal: For an elementary school teacher who implements an interdisciplinary, inquiry-based lesson plan.
Award: $1000

Office of Education (OED) NOAA Environmental Literacy Grants for Free-Choice Learning
Contact: Sarah Schoedinger
704-370-3528
Sarah.Schoedinger@noaa.gov
www.oesd.noaa.gov/funding_opps.html
Goal: The priority is to create a more environmentally literate citizenry.
Deadline: see website for current deadline

Ecology and Environmental Science Teaching Award NABT and Vernier Software and Technology Foundation Award
Contact: www.nabt.org/sup/education/awards.asp
Goal: Award will be given to a teacher who has demonstrated an innovative approach in the teaching of ecology and environmental science.
Award: $1500

STATEWIDE

Diack Family Oregon Ecology Education Fund
Contact: 503-287-7974
www.diack-ecology.org
Goal: Assists in funding activities in Oregon which take children K-12 into the study of ecology in their fields, forests and waters to see personally what lives there and how it thrives. Funding primarily for long term field ecology studies program development, rather than one-day events. Does not cover substitute teachers or transportation.
Award: up to $1500

Learn & Serve America Youth In Action, Oregon Department of Education
Contact: 503-378-3584 x 369
Goal: This grant is designed specifically to remove barriers for service learning projects directly connected to the school curriculum. Barriers include transportation and plant materials. Projects must be student initiated, planned, and implemented and must provide opportunities to develop leadership and citizenship skills. Grants must be written by students and are reviewed by students. All applications that meet the grant criteria will be funded.
Award: up to $500
Deadline: usually mid-February and mid-March

Meyer Memorial Trust Teacher Initiatives Program
Contact: 503-228-5512
www.mmt.org/~mmt
Goal: Stimulating or facilitating more effective learning.
Award: up to $1500 for individual teachers, $5000 for teams
Deadline: February 1 each year

National Wildlife Federation Wild Seed Fund for Schoolyard Wildlife Habitats
Contact: Beth Stout
503-230-0421
stout@nwf.org
Goal: Creating or enhancing an existing schoolyard habitat
Award: one-time $150 plus $25 Fred Meyer gift certificate

The Oregon Parks Foundation
Contact: 503-297-6043
Goal: Land protection, community outdoor recreation and education programs, administrative expenses, publications, conferences and seminars, emergency funding, recognition and student internship in the context of providing for natural park settings and outdoor recreation and educational opportunities.
Award: $1500–5000

SOLV (Stop Oregon Litter & Vandalism) SOLV CUP projects
Contact: 1-800-322-3326
503-844-9571
Goal: Cleanups, prevention (recycling, signage), restoration (for those in need of social services), plantings, development (trail repair, brush removal)
Award: up to $250 plus free SOLV materials, does not cover transportation

Bibliography

Oregon Department of Fish and Wildlife. The Stream Scene: Watersheds, Wildlife and People. 2nd edition. Salem, Oregon. 1999

Monthly Means and Extremes 1971-2000. Wickiup Dam, OR. Retrieved December 4, 2007 from: http://www.ocs.oregonstate.edu/index.html.

Yake, K. 2003. Upper Deschutes Subbasin Assessment.

Murdoch T.B. & Cheo M. with O'Laughlin K. 1999. Streamkeeper's Field Guide: Watershed Inventory and Stream Monitoring Methods

Project Wet Curriculum and Activity Guide. 2003. The Watercourse and Council for Environmental Education (CEE), Bozeman, Montana.

Yake, K. 2003. Upper Deschutes Subbasin Assessment.

Earth Force 2007

Project Wet Curriculum and Activity Guide. 2003. The Watercourse and Council for Environmental Education (CEE), Bozeman, Montana.

State Standards: Common Curriculum Goals and Benchmarks

Oregon Department of Education. 2007-08 School Year. Oregon Standards. Retrieved December 4, 2007 from: www.ode.state.or.us/go/newspaper.