

“SHARING WATER” CURRICULUM



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LESSON SUMMARY

This lesson, used in conjunction with the “Sharing Water” video, will provide background information on watersheds and water users. The lesson is broken into two parts. Students will be able to identify the boundaries of the Deschutes River Basin, as well as identify water users throughout Central Oregon who depend upon this precious resource. Students will discover the interconnections of users and discuss conservation strategies for each.

NGSS and CC Standards

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems.

MS-ESS2-4. Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity.

SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

RI.6.7 and RST.6 –8.7. Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

Essential Questions

- Who are the water users of Central Oregon and how are they connected?
- What responsibilities do water users have to protect water as a resource?

Objectives (By the end of this lesson students will be able to):

- Identify the boundaries of the Deschutes River Basin
- Identify water users throughout Central Oregon
- Discuss the importance of water as a resource and create conservation strategies
- Identify interconnections between water users

BACKGROUND INFORMATION

Managing water in the West can be complicated. The driest states in the union are all west of the Missouri River. On average, Central Oregon can expect a mere 10 – 15 inches of precipitation per year, categorizing this region as a desert. Despite Central Oregon's average rainfall, the Cascade Mountains to the west supply the region with the necessary water to support over 150,000 domestic users, countless farms and ranches, businesses, and local ecosystems.

Central Oregon is situated in the Deschutes River Basin, a vast watershed that extends over

Deschutes River Basin

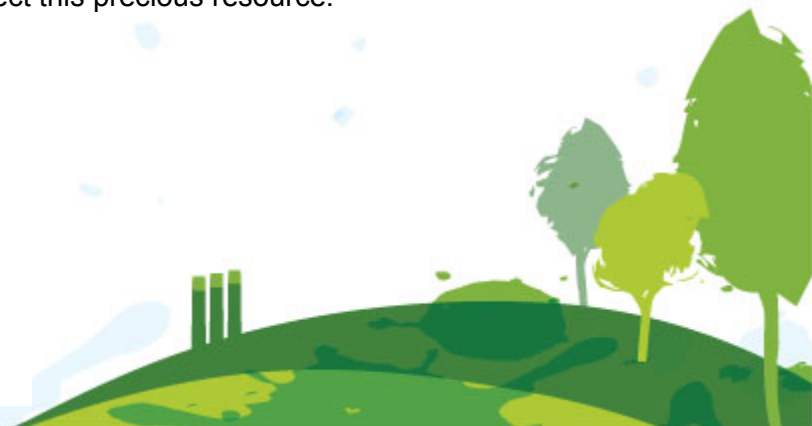


180 miles – from its southern tributaries south of La Pine to its mouth at the Columbia River. A **watershed** consists of land area that drains water into a particular stream, river, or lake. With the Cascade Mountains on the west, and the Ochoco Mountains to the east, all water that falls in the basin eventually drains to the Deschutes River. It then travels hundreds of miles to its mouth at the Columbia River, eventually reaching the Pacific Ocean near Astoria, Oregon.

A **water user** is anyone or thing that uses water. In Central Oregon this includes use by domestic users for drinking, bathing, washing, and recreation. Water users are also government agencies who utilize water for firefighting or city landscaping. Private use of water might include water use by industries, energy companies, or irrigation for agriculture. Our local ecosystems are a water user as well,

as they rely upon water to maintain the health of local plants, wildlife, and fisheries. Water use can be **consumptive**, meaning water is removed from the source, or **nonconsumptive** wherein the supply is not reduced -- such as the instreaming that occurs from recreation, fish, or navigation. Over the past hundred years, use of the Deschutes River has changed dramatically. Growing populations, industries, and agriculture have changed consumption amounts. At the same time, conservation efforts are attempting to increase the amount of water left instream for fish and wildlife.

Managing overconsumption by water users can be a difficult task. Often, it takes conservation efforts on behalf of each individual user to protect this precious resource.



PART I: WATERSHEDS AND WATER USERS (80 MINUTES)

Materials:

- “How do you connect with water” photos
- Tape
- Whiteboard or chart paper
- PowerPoint presentation for “Sharing Water.”
- Access to internet/projector/speakers
- Video “Sharing Water,” <https://www.youtube.com/watch?v=N8ml63XWTGU&t=3s>
- Video “What is a watershed?” <https://www.youtube.com/watch?v=QOrVotzBNto>
- Student copies of Deschutes River Basin map (1 per student)
- Teacher copy of Deschutes River Basin map
- Student colored pencils, markers, or highlighters for map (six different colors for each student)
- Water user profile sheet (1 per small group of 2-3 students)
- Tokens (counters, pennies, beads, etc.)
- Water user profile chart (1)

1. How do you connect with water? (5 minutes)

- Hang up the “How do you connect with water?” photos around the room
- Pose the question to your class, “how do you connect with water?”
- Ask students to silently observe each photo, looking for one photo that best represents their personal connection to water
- After 2 – 3 minutes, ask students to converse with the other students at their photo. “What drew them to the photo? How does it represent their use of water?”
- Have students share out from each group



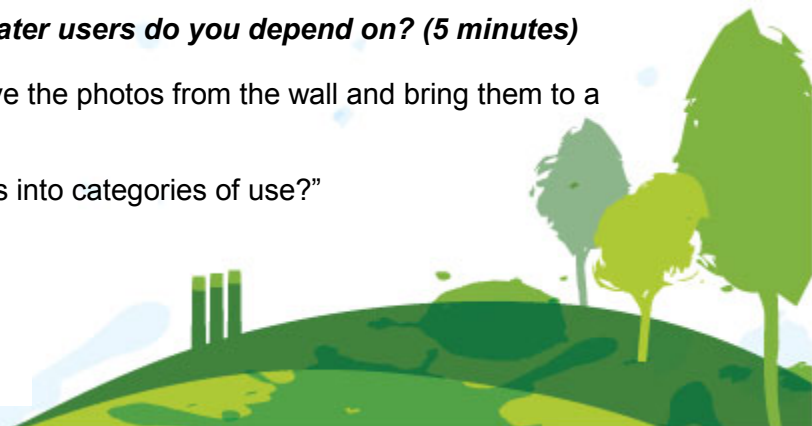
IRRIGATION



FIRE FIGHTING

2. What kind of water user are you? What water users do you depend on? (5 minutes)

- Have a few student volunteers to remove the photos from the wall and bring them to a whiteboard or chart paper.
- Ask, “Can we group any of these photos into categories of use?”



- You can physically move the photos into labeled categories on the whiteboard, or begin a list of categories.
- Potential categories students may come up with: recreation, municipality (city or town), cultural/spiritual, domestic, energy, ecosystem, and agriculture.
- Ask, “Can we draw a line of connection between any of these water users? Do they rely upon each other for goods and services?” Potential connections might include hydroelectric power plant → domestic/home use, or agriculture → domestic, municipality → recreation.
- Ask, “Are any of the connections potentially harmful to others?” Connections might include hydroelectric → ecosystem, or agriculture → ecosystem.
- Ask, “What would our lives look like if any of these water users disappeared, or if their water use was restricted?”

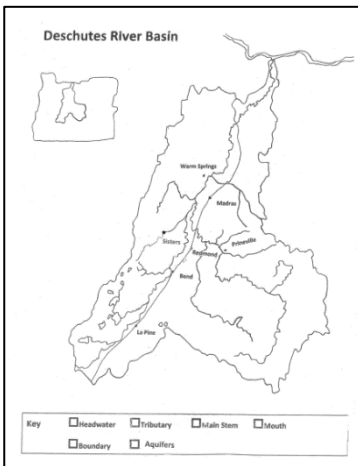
3. “Sharing Water” video (10 minutes)

- Utilizing a projector and speakers, share the “Sharing Water” video via the YouTube link.

<https://www.youtube.com/watch?v=N8ml63XWTGU&t=3s>



4. What is a watershed? (20 minutes)



- “Our water needs are met by the Deschutes River Basin, a vast watershed whose main river flows south to north, over 180 miles to its mouth at the Columbia River.”

- Ask, “What do we know about watersheds?”
- Share the brief introduction video on watersheds via the YouTube link

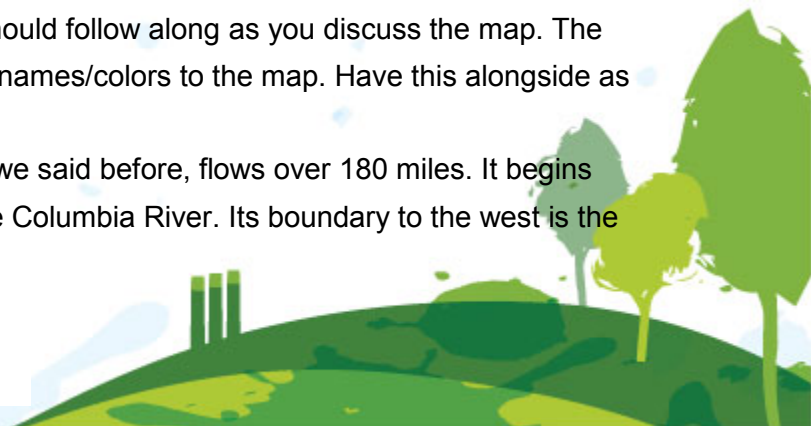
<https://www.youtube.com/watch?v=QOrVotzBNto>

- Pass out a copy of the Deschutes River Basin map to each student. Students will also need colored pencils, markers, or highlighters.

- Place a student copy under the document camera to walk

students through the steps. Students should follow along as you discuss the map. The teacher copy will guide you as you add names/colors to the map. Have this alongside as you work on the student copy.

1. The Deschutes River Basin, as we said before, flows over 180 miles. It begins south of La Pine and ends at the Columbia River. Its boundary to the west is the



Cascade Mountains. Its boundary to the east is the Ochoco Mountains. Color in the boundary for the Deschutes River Basin.

2. Using a pencil or pen, **write in “Cascade Mountains”** to the West of the Deschutes River Basin boundary. Explain to students that all of the water in our watershed relies on snowmelt from our mountains. The Cascade Mountains receive 80 – 100 inches of precipitation per year, whereas the basin floor only receives 10. Some of this snow melts into surface water streams, which flow into larger rivers. Some water soaks into the ground, and bubbles up later as spring water. Both surface and groundwater supply smaller streams and rivers, which we call tributaries.
3. **Label the tributaries with their respective names.** All of the rivers and creeks should be labeled except for the Deschutes River.
4. Tributaries flow into the main stem of a river. The main river that runs through the Deschutes River Basin is aptly named, the Deschutes River. **Label and color the main stem of the Deschutes River.**
5. The headwaters of a river or creek are its origin. For the Deschutes River, the headwaters are Little Lava Lake, just SW of La Pine. **Color in the headwaters.**
6. The Deschutes River Basin flows over 180 miles to where it meets the Columbia River. We call this the “mouth” of the river. **Color in the mouth.**
7. Some of the water that falls on the Cascades or Ochocos also infiltrates (or sinks) into the ground and becomes groundwater. Groundwater resides in aquifers, a layer of water-saturated earth. Central Oregonians receive the majority of their drinking water from an aquifer, utilizing wells to pump water to the surface of the Earth.
8. This groundwater from aquifers is part of the Deschutes River Basin watershed. Some of it discharges into rivers and streams through springs. The Metolius River’s headwaters are a giant spring. The river bubbles out of the ground at a rate of 50,000 gallons per minute. The entire Deschutes Aquifer discharges at a point near Lake Billy Chinook. **Using a new color, cross-hatch the boundary of the aquifers that reside in the Deschutes River Basin.**
9. Ask, “what other things in nature resemble the patterns of a watershed?” Answers might include: veins/circulatory system in animals, veins in a leaf, or the roots in plants. A watershed directly parallels these examples. It delivers life-creating water to ecosystems and people, just as veins deliver blood, or roots deliver water and nutrients to a plant. It is essential to human life.

5. Water users (40 minutes)

- Having outlined the geographic area of the Deschutes River Basin, take a deeper look at the water users who utilize it.
- As a whole class, brainstorm a list of all water users in Central Oregon. Students may brainstorm first in pairs or small groups before the whole group discussion.
- Leaving the following categories on the board can help with the brainstorm process: agriculture, business, recreation, municipality, rural, energy, ecosystem, and tribal communities.
- Once your list is assembled, divide students into small groups. Each group will sign up for a water user. Utilizing the water user profile sheet, students will highlight how that water user depends upon water for their goods/services, as well as how others depend upon the goods and services their water user provides.
- Give students 10 – 15 minutes to complete the water user profile. **BE SURE TO SAVE THESE AT THE END OF THE LESSON FOR PART II**
- Ask the small groups to post their water user profile around the room.
- Give each small group 3 tokens. The tokens can be pennies, counters, small pieces of paper, as long as they are the same object for each group.
- Tell the groups that tokens represent water rights (legal access to a certain amount of water). Small groups will need to decide which water users they feel are important enough to be allocated water.
- Once all tokens have been distributed, reconvene the whole class. Using the water user profile chart, tally how many tokens each water user received.
- In the end, the class will reconvene with chart paper to discuss how many beads were given to each.

Discussion Questions:

1. “What do our results suggest we value as a classroom?”
2. “Are there any water users that did not receive tokens? How might this affect other water users?” (For instance, if a fly fisherman did not receive a token, this impacts the local economy of domestic users. It might also impact whether or not ecosystems are protected through legislation, as it could result in fewer votes to protect waterways and fisheries.)



3. “What do you think should happen when a particular water user negatively impacts water quality or consumes too much?”
4. “Is one water user more important than all the others?” “What values or attitudes shape that belief?” “Would our values be different if we were primarily an agricultural area?” “What if our economy relied heavily on recreation?”
5. “When decisions about water allocation have to be made, do you think it’s possible to please every water user in our region?”
6. “What responsibilities do water users have if they are given water?”







Tubing



Fishing





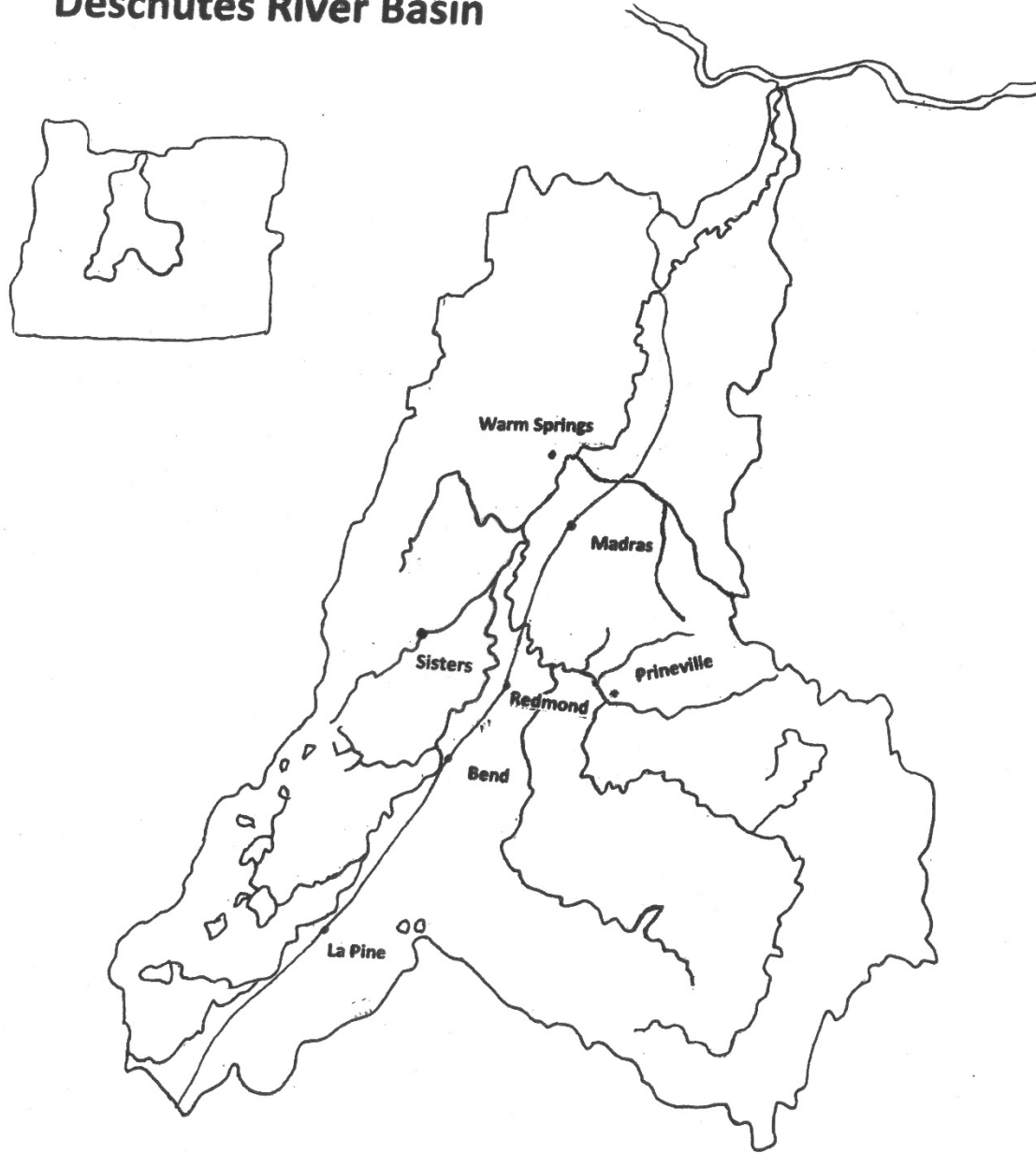


River



Pool

Deschutes River Basin



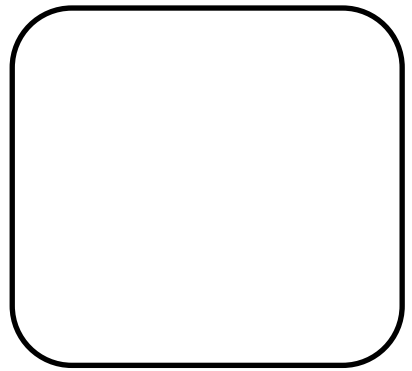
Key	<input type="checkbox"/> Headwater	<input type="checkbox"/> Tributary	<input type="checkbox"/> Main Stem	<input type="checkbox"/> Mouth
	<input type="checkbox"/> Boundary	<input type="checkbox"/> Aquifers		

Deschutes River Basin



Key			
	Headwater		Tributary
	Main Stem		Mouth
	Boundary		Aquifers

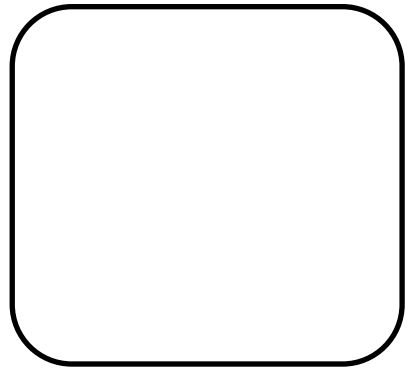
Water User: _____



I use water in the following ways: _____

Other water users depend upon me for: _____

Water User: _____



I use water in the following ways: _____

Other water users depend upon me for: _____

PART II: WATER CONSERVATION (60 MINUTES)

Materials:

- Globe or map
- 100 objects (pennies, beads, counting tiles, etc.)
- PowerPoint “Sharing Water”
- Water user profile sheets from part I
- Water user conservation strategy sheet (1 per group of 2 – 3 students)

1. How much? (5 minutes)

1. Begin with a quick look at a globe or world map.
2. Ask students to point out lakes, rivers, and oceans. Explain that these are called surface waters. Ask students to differentiate which are saltwater and which are fresh.
3. Utilizing 100 objects (pennies, beads, counting tiles, etc.), explain that the pieces represent all of the water on earth (100%).
4. Two of the objects will be set aside to represent water that is stored as ice in glaciers, or at the poles (2%).
5. Ask what the remaining 97 objects represent. They represent the water that’s in the ocean, 97% of all the water on earth
6. Pull one object to the side to represent all of the freshwater that is available for plants, animals, and people (1% of all water on Earth).
7. Cover up all but a tiny sliver of the one object. Of this 1%, only .007% of freshwater on earth is clean enough or accessible for human consumption.
8. Ask, “What does this mean for us?” Possible answers could include conservation methods.

2. The state of our basin (10 minutes)

- Utilizing the PowerPoint, “Sharing Water,” explore a visual timeline of the Deschutes River Basin from the 1800s till today.

3. Water user conservation (20 minutes)

- As a whole class, revisit who the major water users are in Central Oregon.
- Introduce the terms “consumptive” and “non-consumptive” uses of water.
- Students will try to break water users into the two categories. For example, recreation is non-consumptive, whereas agriculture is consumptive.
- Utilizing the small groups from part I, as well as the water user profile sheets created in

part I, students will be given a new water user.

- Give each small group a copy of the “water user conservation strategy” sheet. This sheet provides the group with a prompt to describe 3—5 conservation strategies their particular water user can use.
- Allow groups 15 – 20 minutes to complete their strategy sheet.

4. Water user conservation strategy presentations (20 minutes)

Utilizing a gallery walk, allow students to view one another’s work.

1. Post each group’s work around the room, at eye level and spaced so that groups are 5 feet apart.
2. Group students into their small groups.
3. Allow each group to begin at one station. Give students 3 minutes to view the work.
4. Rotate: after the 3 minutes, allow the groups to rotate to the next station. Students read and discuss each poster.
5. Monitor: the teacher should monitor the stations to clarify and provide management support.

5. Conclusion (10 minutes)

Gather the whole group and pose the following discussion questions:

1. Why do people feel strongly about some users and not others?
2. What attitudes or beliefs shape our decisions about what we value?
3. What changes or factors might influence a different decision?
4. When decisions about water allocation affect a large group of water users, can you ever satisfy all the involved individuals?
5. What options do we have when there isn’t enough water to satisfy all water users?
6. What can you do as a domestic water user?

Water User Conservation Strategies

Water User: _____

I use water in the following ways: _____

Ways I can conserve water:

- | | |
|----------|----------|
| 1. _____ | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | |



SUPPORTING FIELD TRIPS & CLASSROOM PROGRAMS

Desert Waters - High Desert Museum, Bend, Oregon

September – June, Cost: Free

How do wildfires and other natural disasters affect watersheds? Through science inquiry and hands-on activities, students will discover where their water comes from and how natural disasters like fire affect their town, drinking water and agriculture.

<https://www.highdesertmuseum.org/free-field-trips/>

Hometown Waters - Upper Deschutes Watershed Council, Bend, Oregon

September - June, Cost: Free

UDWC coordinates place-based projects to educate the next generation of watershed stewards and inspire youth to connect to the natural world in unique ways. Through meaningful educational experiences, students develop hands-on knowledge of their local, “hometown” watershed.

<http://www.upperdeschuteswatershedcouncil.org/education/hometown-waters/>

Student Stewardship Projects — Upper Deschutes Watershed Council

September – June, Cost: Free

Through Student Stewardship Projects, UDWC seeks to cultivate student watershed stewards by integrating interdisciplinary studies (creative writing, art, and science) into meaningful hands-on restoration. Every year, hundreds of students from local schools participate in projects that are designed to elevate student motivation for learning about their watershed and provide them with restoration skills, experiences, and watershed knowledge.

<http://www.upperdeschuteswatershedcouncil.org/education/student-stewardship/>

Natural Resource Education Program – Discover Your Forest/Deschutes National Forest

October-June, Cost: Free

Students learn about natural resources and conservation issues with Forest Service natural resource specialists. Students participate in field-based science inquiry with the potential to participate in hands-on stewardship projects on Deschutes and Ochoco National Forests. Projects vary depending on location and season and are tailored to the needs of the school.

<http://discoveryourforest.org/school-programs/>

SUPPORTING FIELD TRIPS & CLASSROOM PROGRAMS

Our Water System: A Journey through Bend -- The Environmental Center, Bend, Oregon

October – June, Cost: Free

A classroom and field-based education program designed to educate middle and high school students about Bend's water sources, distribution, wastewater and stormwater management systems, and water conservation. Each lesson and corresponding field trip educates students about the system, as well as how to make choices that reduce their environmental impact at school and at home. Field trips are available to the Water Treatment Facility, Riverbend Park Stormwater Quest, and the Water Reclamation Facility.

<https://envirocenter.org/wp-content/uploads/City-Water-2016-2017.pdf>

Snow School — Discover Your Forest

December – May, Cost: Free

Traveling by snowshoe, students use field based and experiential approach in science inquiry to assess nival (snow world) environments; using snow tools, animal tracking and seasonal adaptation studies. Students address physical, life and earth science standards.

<http://discoveryourforest.org/school-programs/>

Pond Study — Sunriver Nature Center

September – June, Two-hour programs cost: \$180, maximum of 35 students.

Be a wetland scientist! Dip into the wet world of watersheds, ponds and other wetland areas through hands-on investigation and sampling techniques to learn about local pond ecosystems.

<http://www.sunrivenaturecenter.org/index.php/visit-the-nature-center/our-programs/school-programs>

Middle Deschutes Watershed Council

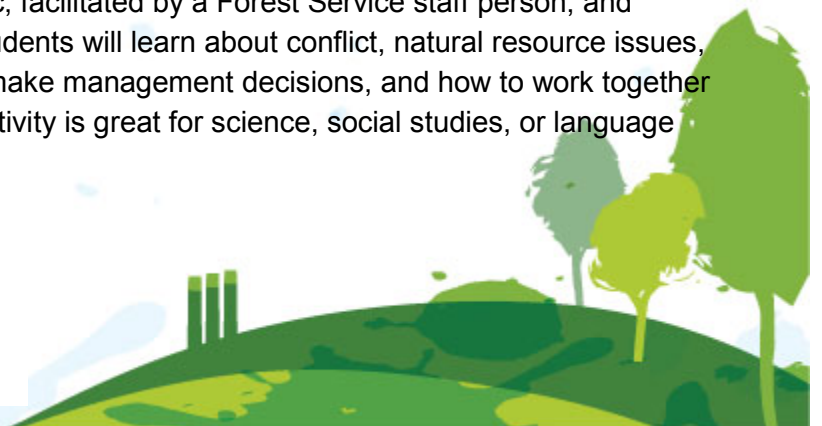
Crooked River Watershed Council

Natural Resource Issue Debate – Discover Your Forest/Deschutes National Forest

October – June, Cost: Free

Engaging debate about a natural resource topic, facilitated by a Forest Service staff person, and incorporating multiple diverse stakeholders. Students will learn about conflict, natural resource issues, strategies that government agencies utilize to make management decisions, and how to work together towards a collaborative solution. This 1 hour activity is great for science, social studies, or language arts classes.

<http://discoveryourforest.org/school-programs/>



SUPPORTING CURRICULUM

CFCO Curriculum Kits for Field Experiences in Central Oregon, Science Inquiry: Interconnections

Included in this packet are curriculum resources to support teachers in facilitating outdoor lessons. We recommend 4-5 hours in the field, to provide adequate time for in-depth exploration, questions, and reflection. Some lessons can also be taught independently in your school yard, neighborhood park, or other location. The curriculum kit was specifically developed for Skyliners Lodge, located 8 miles west of Bend on Skyliners Road.

<http://www.childrensforestco.org/programs/>

Life in a Pond Traveling Trunk — Sunriver Nature Center

Each trunk comes with a variety of touchable biofacts, educational activities, and a handy teacher's guide. Each trunk rental includes a 30 minute live animal presentation or naturalist led in-class activity. Give your classroom something they will remember forever!

<http://www.sunrivenaturecenter.org/index.php/visit-the-nature-center/our-programs/school-programs>

Aquatic Kit — Children's Forest of Central Oregon

This kit comes equipped with a variety of tools and resources to conduct investigations in the field. Materials include: dissolved Oxygen test kit (2); pH test kit (2); safety goggles (8); rubber gloves (8); water thermometer (2); Macroinvertebrate sampling equipment including: D-nets (4), plastic tubs (4), ice cube trays (4), pipettes (4), pocket microscopes (4), macroinvertebrate field guides (8); yard sticks(4); stop watch (2); chest waders (8, variety of sizes); rubber boots (8, variety of sizes).

<http://www.childrensforestco.org/resource-coop/>

SUPPORTING CURRICULUM

Streamwebs — Student Stewardship Network, in partnership with OSU

StreamWebs is a dynamic networking platform that links students with locally based hands-on watershed stewardship projects and provides a multimedia showcase for their project and data reports.

<http://streamwebs.org/>

Discover a Watershed: The Watershed Manager Educators Guide, Project WET

This downloadable guide contains 19 science-based, multidisciplinary activities that teach what a watershed is, how it works and why we must all consider ourselves watershed managers. Each activity adapts to local watersheds, contains e-links for further Internet research and is correlated to national science standards.

\$19.95, PDF E-Book <http://store.projectwet.org/educators-guides/watershed-manager-educators-guide-download.html>

Fresh Solutions Unit Progression -- California Academy of Sciences

In this Flipside Science unit, designed for a middle school audience, we'll explore environmental issues related to our water use. On this page you'll find five short videos and five associated lesson plans connected to the Next Generation Science Standards with an emphasis on engineering and design thinking.

<https://www.calacademy.org/educators/fresh-solutions-water-use-and-conservation>

Request a copy of this free curriculum/videos on a USB drive:

<https://www.surveymonkey.com/r/VGNRTM7>