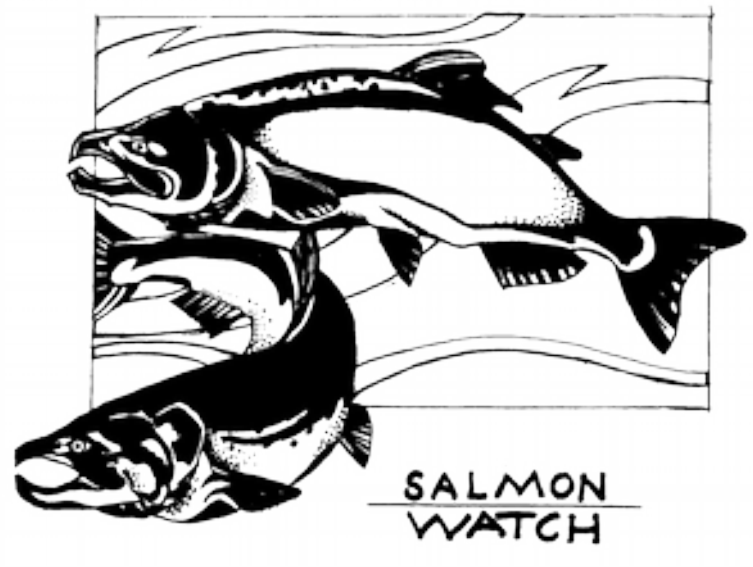


Illustration by Susan Schwarts, Hidden Valley High

UNIT 1. PREPARING STUDENTS FOR SALMON WATCH

INTRODUCTION:
Because Salmon Watch field trips are almost always in the fall, when school is just under way, we have designed the five lessons in Unit One to be activities that will provide a good base of knowledge and understanding and some pertinent skill development for participation in their field experience.

OBJECTIVES:
Students will know and understand:

- how to reestablish and fine-tune skills and senses for nature observation, exploration and appreciation.
- the interconnected, dynamic and complex nature of watersheds and the efforts under way to restore unhealthy systems.
- how to use and read topographic maps to gain a further understanding of the watershed site they are visiting.
- the general terms and process of the life cycle of the salmon.

SECTIONS:

A. Nature Awareness and Observation: Skills, Techniques, and Exercises
B. The Watershed Web of the Wild: Major Concepts and Terms
C. Watershed Mapping
D. Salmon Life Cycle – See The Journey of Wild Pacific Salmon in UNIT 4-Salmon

UNIT 1. PREPARING STUDENTS FOR SALMON WATCH

STUDENT HANDOUTS

A1	*A Celebration of Wild Fish*
A2	*The Importance of Wild Salmon*
A3	*Student Responsibilities for Salmon Watch*
A4	*Nature Awareness and Observation*
A5	*Pathways to Nature*
B1	*The Sacred Circle*
B2	*What is a Watershed?*
C1	*Using Maps*
C2	*Topo Map Section*
C3	*Topographic Mapping Symbols*

UNIT 1A. NATURE AWARENESS AND OBSERVATION: SKILLS, TECHNIQUES AND EXERCISES

TIME	LEVEL
60-90 minutes to review skills. Practice: on-going	All

BENCHMARKS	
Common Core-State Standards-ELA/Literacy	CCRA.R.1
Science & Engineering Practices	Planning and carrying out investigations. H.21.2

MATERIALS:

- STUDENT HANDOUT 1A-1: A Celebration of Wild Fish
- STUDENT HANDOUT 1A-2: The Importance of Wild Salmon
- STUDENT HANDOUT 1A-3: Student Responsibilities for Salmon Watch
- STUDENT HANDOUT 1A-4: Nature Awareness and Observation
- STUDENT HANDOUT 1A-5: Pathways to Nature

OBJECTIVES:

- To facilitate student understanding of the expectations and responsibilities of being involved in the Salmon Watch program.
- To facilitate an understanding of why wild salmon are magnificent and important fish.
- In preparation for nature observation and fieldwork, students will learn and practice skills and techniques that will:
  - re-invigorate senses.
  - increase awareness of surroundings.
  - hone observational skills for detecting wildlife.

PROCEDURE:

1. Read aloud the STUDENT HANDOUT 1A-1: *A Celebration of Wild Fish*. This legend will help to illustrate the historic legacy of wild salmon to this region. Assign STUDENT HANDOUT 1A-2: *The Importance of Wild Salmon.* This is an excellent essay, which begins to reveal to students the magnificence and importance of the fish they are about to study.

2. Following the legend, read the brief introduction in STUDENT HANDOUT 1A-3: T*he Freshwater Trust/Salmon Watch Mission and Vision*. This lays out the purpose, goals and objectives of the Freshwater Trust and the Salmon Watch program. Also, review with students their responsibilities as well as what the Freshwater Trust and the Salmon Watch staff will do for them in STUDENT HANDOUT A4: *Student Responsibilities for Salmon Watch*.

3. As a class, read aloud with students STUDENT HANDOUT 1A-5: *Nature Awareness and Observation*.

4. Using the PATHWAYS TO NATURE section as your guide, facilitate sensory skill building. It is best, if at all possible, to have students perform these skills in an outdoor, natural setting.

5. The culminating fun activities that requires students to use and hone their skills and techniques are THE RABBIT GAME and THE NATURE HUNT EXERCISE. Again, it is best, if at all possible to have students perform these skills in an outdoor, natural setting.

6. Hand out to students STUDENT HANDOUT 1A-6: *Pathways to Nature*. This handout reiterates, reminds and reinforces all that they have actively learned.

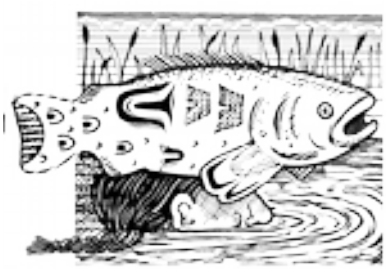
STUDENT HANDOUT 1A-1

Celebration of Wild Fish

A Legend

Long ago in the time before the time, when all beings were men and wore their skins as blankets, the earth became overly populated. It was then that the leaders gathered together and determined that in order to survive, they must divide themselves. Donning new blankets, they each in turn journeyed into new and different territories. So it was that man clothed himself in scales, feathers and fur and wandered into the sea, air and forest.

At this time the salmon mother gathered her five children to her and bid them journey far into the ocean. "Remember, once a year you must return to the home from whence you came," she cried, reminding them that in order to survive they must gather strength from the land along the rivers of their birth.



Now it is known that the five children established villages far out into the sea. Each year in the early spring, the salmon change from human form into salmon and those at the farthest edge of the ocean start their journey across the sea and up the rivers along the Pacific Northwest coast. Along the way they alert the Salmon People of the other villages who promise to follow at different times of the year. So it is that the Silver, Chinook, Chum, Sockeye and Coho journey to our rivers from early spring until late fall.

STUDENT HANDOUT 1A-2

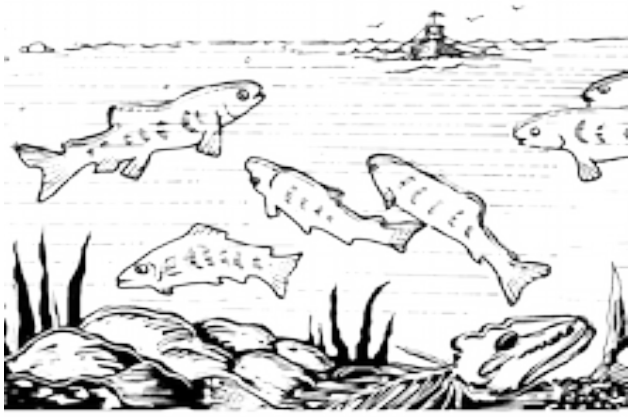
The Importance of Wild Salmon

Adapted from *Field Guide to the Pacific Salmon* by Robert Steelquist and an *Oregonian Special Report "River of Ghosts: Lessons of the Past"* by Brian T. Meehan

Our eyes follow the water downstream. Surely it is them.

Strange wakes appear on the river's lightly rippled surface - impulses of water that move against the flow of the current. The night's rain brought the river level up. This pulse signaled to the waiting salmon that it was time to enter from the sea. On the flood tide they entered and as tide slackened and the river current quickened, they began their ascent.

They reach our pool three hours later —about 200 salmon. Around us they loll to the surface, rolling sideways. In the green depths of the pool beneath the logjam, they form a single body –that of a great fish that wrestles in the current, its head upstream, its tapering body following. Beneath us they pass, spreading under the bank, on the edge of the current's thrust.



Along the North Pacific's shore, this scene is reenacted on many tides, on many rivers, each month between August and January, as various stocks of salmon conclude their tours of the ocean by returning to the streams of their origin. The return marks one of nature's grandest spectacles, an event in a sequence of events around which the lives of the salmon, the humans, the bears and eagles that await them, even the forests revolve. We humans repair our nets and tie our flies. Other predators time their migrations inshore to water's edge, they're gathering to feed, and even the bearing of their

offspring to this meter. For the forest, it means the return of nutrients that have drained off the land—nitrates and phosphates swept away in freshets, coming to rest on the continental shelf of the ocean, then stirred by currents and made alive again in plankton, small fish, and the salmon that carry them inland.

Salmon accomplish their magic with their bodies throughout their life cycle. They undergo massive physiological changes as they smolt and migrate from fresh water to salt water. It is akin to a tadpole turning into a frog and crawling up on land. The methods by which salmon use to navigate their way home are still one of nature's great mysteries. It may be the angle of the sunlight as it penetrates the seawater, or from water temperatures, tides or currents, magnetic fields or their keen sense of smell. The best guess seems to be their basic instincts are imprinted in their genes through millennia of evolution.

So unlikely is the survival of a single returning salmon that Nature compensates heavily. Of the other 3,000 to 7,000 eggs in a nest, only one spawning pair, on average, will make it back. little water at hatching can wipe out great swarms of young fish life. Bigger fish, bears, seals…all take their share of salmon. Nature allows for these natural events.

The death of salmon completes one of nature's most awesome cycles and circles. Homeward-bound salmon generally stop eating after they enter fresh water; a spring chinook will live nine months on oils stored in its body. Salmon burn themselves up in a deluge of sex hormones that wreck their immune systems, open them to fungal infections and harden their arteries. The magnificent struggle through countless obstacles and predators is truly magnificent and unparalleled.

Pacific Rim peoples share a long tradition of "salmon watching" the rivers for the great return. The First-Salmon Ceremony evolved among the cultures of salmon-eating people. At Celilo, the great falls on the Columbia River now submerged behind The Dalles Dam, native fishers awaited the first salmon with great anticipation.

When it had been caught, fishing stopped until a ceremony was organized. The fisherman would take the fish to the shaman, who would cut it lengthwise and remove the backbone and head. It would be baked in a hole in the ground lined with chokecherry leaves and covered with mats. Everyone would be invited to taste the fish; prayers would be said.

Following the ceremony, fishing would resume, its success or failure determined by the respect shown the salmon during the ceremony. Thus, homage was paid to the returning ones, those who brought with them their fat flesh and its promise of sustenance, and along with it a sense that the world was working, as it should.

Summer chinook once braided a silver chain between desert and sea. The fish mined the Pacific's bounty and carried it home 1,200 miles.

Their migration demonstrated nature's genius. From 100-pound "June Hogs" to 10-pound desert chinook, the Columbia produced more king salmon than any river in the world. Early gill-net fishermen couldn't tailor the mesh size of their nets to match the variety of Columbia Chinook. Some were as small as a 5-pound pink salmon; other as large as a man.

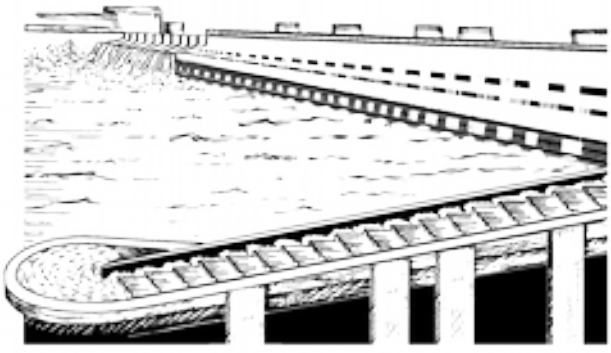
Studies have estimated the native harvest at 18 million pounds a year, about 40 percent at the peak commercial catch of Columbia chinook in 1883.

In one October day in 1805, Lewis and Clark passed 29 Indian villages on the Columbia. Salmon were drying in every one.

"The number of dead salmon on the shores and floating in the river is incredible to see," Capt. William Clark wrote in his journal. "The water of this river is clear, and a salmon may be seen at a depth of 15 or 20 feet."

In 1889, British writer Rudyard Kipling exclaimed: "I have lived!" "The American Continent may now sink under the sea, for I have taken the best that it yields, and the best was neither dollars, love nor real estate." For Kipling, America's best was a 12-pound steelhead he caught on a fly on Oregon's Clackamas River.

Salmon have roamed the Northwest since prehistory. Smilodonichthys (smilo-don-ICK-this), the "saber- toothed salmon," lived 10 million years ago and grew to 8 feet. Fossils of the prehistoric fish have been found near Madras, but its fearsome looks are deceiving: the fish ate plankton and saved its 11/2-inch fangs for spawning battles.



In the Pacific, steelhead trout, coho, chinook, chum, pink and sockeye emerged as the evolutionary clock ticked. The fish's famed spawn-and-die characteristic – a specialization that emerged with the coho—is the product of more evolution, not less. It frees salmon to make the long migration from sea to spawning ground, because they don't have to save anything for the return trip.

The evolution of the Pacific salmon shows us remarkable things about the fit between organisms and their environment. Salmon evolved in the cool waters of the temperate north and have distributed themselves for centuries in an environment of change. Salmon survived 1,000-foot-high floods that roared down the Columbia from prehistoric Lake Missoula in western Montana when ice dams cracked on the Clark Fork River. The floods washed more water in a single event than all the rivers of the world and dug the Columbia Gorge.

The fish survived the Ice Age in the Columbia, Yukon and Sacramento Rivers and recolonized western North America when the glaciers retreated. They sustained a native economy for thousands of years and coped with lava flows and floods.

Yet we humans have not only transformed the land, the rivers, and the estuaries that salmon evolved in; we have also transformed the fish themselves. Most serious, we have quickened the pace of change, brought up the tempo with which evolution itself must struggle to keep step.

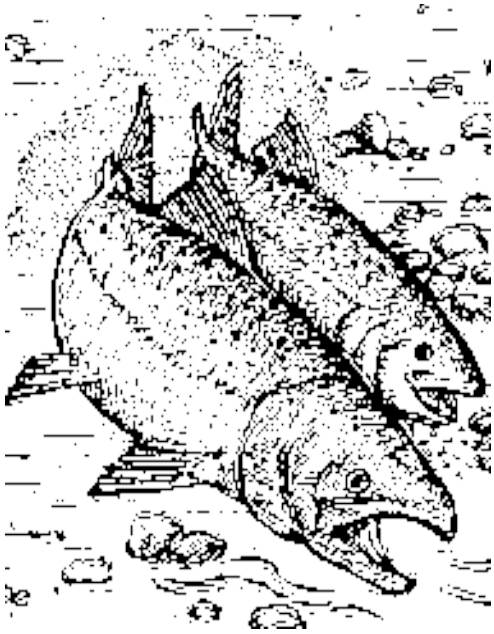
It seems almost inconceivable, that humans could lay on this fish a more rigorous habitat problem than occurred during the Ice Age, but we have done it.

We are at a crossroads with these amazing fish. The debts of the past have come due. In less than two centuries, we have shoved to the brink a creature that survived the Ice Age.

The mighty salmon has ruled the Columbia Basin and the Northwest for thousands of years, surviving the harshest whims of nature. It nurtured the bodies and souls of native people for centuries. Its range defined our boundaries; its image inspires our art. Its icon is our regional signature. But there is more at stake than fish. From bald eagles devouring salmon carcasses in Cascade headwaters to the slate gray chop of the Gulf of Alaska, Pacific salmon are the silver thread that weaves through every part of this grand tapestry of fir, sage and sky we call the Northwest.

STUDENT HANDOUT 1A-3

Student responsibilities for Salmon Watch



BEFORE THE TRIP

- Have all permission slips signed and turned in.
- Know objectives of field trip and basic concepts of watersheds and salmon.
- Have snacks, a lunch and something to drink.
- Have layered clothing and rain gear (see list in Unit 3).
- Bring equipment that will improve the trip (see list in Unit 3).

DURING THE TRIP

- Use techniques and skills for experiencing nature.
- Practice low impact walking and field work.
- Leave no trace of your visit.
- Bring sense of adventure and curiosity.
- Practice good data collection and field notes.

What you will likely experience on your field trip:

- Viewing spawning salmon
- In-stream aquatic organisms collection and study Water quality testing and data collection Surveying and inventorying plants and wildlife
- Assessment of the status and health of the watershed Examination of salmon biology and issues
- Interaction with fish, wildlife, forest, and angling experts

AFTER THE TRIP

- Use your data to analyze the health of the watershed you visited, create portfolio.
- Write and mail thank you letters to volunteers.
- Develop and execute an action plan for a community service- learning project.
- Present your community service- learning project to an audience.

STUDENT HANDOUT 1A-4

NATURE AWARENESS AND OBSERVATION

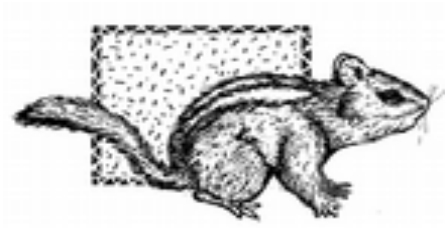
"For the 99 percent of the time we've been on Earth, we were hunter and gatherers, our lives dependent on knowing the fine, small details of our world. Deep inside, we still have a longing to be reconnected with the nature that shaped our imagination, our language, our song and dance, our sense of the divine." Janine M. Benyus

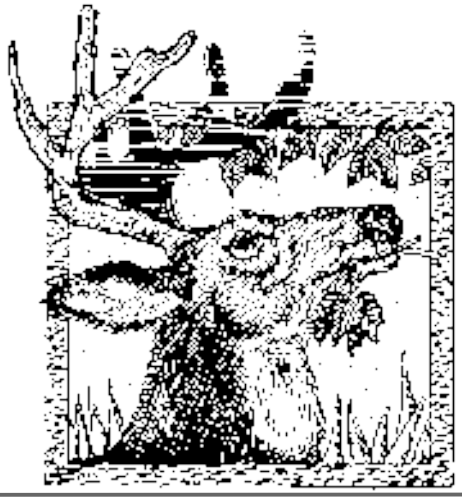
Since we are no longer hunter-gatherers, it is not as important for us to be so aware of and alert to nature. Our society does not place much value on nature awareness because modern conveniences have taken away its survival value. But we pay an unseen price for our comforts.

Living in a fast-paced, technology/industry-based society, we are more likely to spend much of our time in front of some type of screen, in a motor vehicle on asphalt byways or in a climate- controlled room than in the outdoors. In the course of a day, a barrage of unnatural sounds and sights bombards us, and regimentation, time and schedule drive our lives.

Given this disconnection from the wildness of the natural world, it is not easy for any of us to slow down long enough to truly appreciate the splendor of nature. These battered down and dulled senses need to be reinvigorated to explore the outdoor world. According to Tom Brown, "the connection [to nature] can be reestablished- in a large part simply by awaking and nourishing our innate awareness. With a few simple skills and some dedicated practice, any person can open his or her senses to the full richness of nature…."

You will be practicing some of these skills and techniques that will help exercise, and ultimately sharpen your senses. At first, you may feel a bit uncomfortable with these exercises, but quickly you find enjoyment, relaxation and fun. With sharpened senses you will be better able to appreciate nature and being outdoors and you will be a better monitor of the health of the watershed ecosystem in your community and at your Salmon Watch site.





These techniques and ideas have been adapted from Tom Brown's Field Guide to Nature and Survival for Children, by Tom Brown, Jr. with Judy Brown and The NatureMapping Observers Guide.

STUDENT HANDOUT 1A-5

PATHWAYS TO NATURE

TECHNIQUES FOR LEARNING RELAXATION, & PATIENCE

The first skill to acquire to experience nature is to learn the art of quieting, relaxation, or, as Tom Brown puts it, "the sacred silence." When the mind is tense, all functions are impaired, perceptions obscured, and the ability to keenly observe is hampered. But when the mind is at peace, we function better, learn better, and one's sensory awareness is more heightened and keen. It is not necessary to sit to relax. Relaxation can be dynamic and moving. It is best, if at all possible, to perform these skills in an outdoor, natural setting.

WHEN ENTERING NATURE, PRACTICE THE FOLLOWING:

Clear your mind of all the clutter that has accumulated during the process of daily living. This mental purification actually occurs quite naturally during an extended stay in the wilderness.

Slow Down and escape the "time trap" of modern life. Walk and move at a snail's pace. A slower pace makes it easier for your eyes to pick up the swoosh of a salmon's fin, the flick of a deer's tail or the claw marks of a bobcat.

Sit Down and stop altogether. Don't let speed and time rob you of the wonder and discovery. Nature will begin to unfold its secrets.

Be Quiet. It should be obvious that you will experience more in nature if you are silent. In nature, silence is the rule and noise is the exception. Most animals communicate more by gesture and touch than by sound. Since humans are the most lethal predator, the human voice almost always a danger signal that causes wildlife to run or hide.

TECHNIQUES FOR LEARNING TOTAL SENSORY AWARENESS

Get outside! When in nature try to reach out with your senses. Watch the landscape carefully, paying attention to colors, textures, shapes, shadows, and movement. Pay attention to scents and where those smells come from. Listen carefully to the various songs of nature, and touch and feel everything you can. Exercising your senses, you sharpen those senses, make them more vivid and inexorably effect a reversal of the dulling routines of society.

SENSORY EXERCISES

SIGHT

- Pick out color, texture, shape, shadow and movement on the landscape.
- Search the landscape for the less subtle colors and textures.
- Study details carefully.
- Look deeply at flowers, leaf shapes, grains of sand, and feathers.
- Observe closely the pattern of insects, spider webs, and other intricate things.
- Push your sight from near to far, and scan the landscape in ever-widening semicircles, from their feet to the horizon.
- If possible, use a magnifying glass to scan the ground looking intently at pebbles, plants, insects, etc.

HEARING

- Listen to the purity of sounds.
- Listen near and far, and pinpoint as best you can the exact position of what you hear.
- Listen to the wind in the trees, the shrubs, and the grasses, and pick out the variations in the tone of each.
- Listen to the music of insect wings, the gurgling of water, and the trembling of sounds.
- Listen to the symphony of nature as a whole, and then separate each part, until you know the origin and instrument of each sound.
- Focus hearing by cupping you hands around your ears, making a shape like a deer's ear. By doing this, you can hear in one direction and pick up sounds that would normally escape.

BIRDING and HEARING

- Listen closely to what the birds are saying.
- Are they making long and musical sounds? If so, they are singing and all is well with them.
- Are they making a short, choppy, and hard to locate sound? This is called a call or alarm call. Birds use alarm calls to warn other birds and animals of approaching danger.

TOUCH

- Lie on the ground. Use your sense of touch to feel the earth, the atmosphere, the cool and warm places, and the damp and dry places.
- Touch everything through exploration, the rough bark on trees, the flowers, feathers, tracks, water, insects, and plants of all types.

SMELL

- Smell the ground at various locations and see if you can tell the difference in each area.
- Smell animal dens, runs, and trails to see if you can detect the smell of that animal in the landscape.
- Smell what is ordinarily not smelled, like leaves, the bark of trees, oncoming storms, or rocks.

SPLATTER VISION

This technique was used by Native Americans to spot game, and is also used by most animals to spot danger. Simply looking toward the horizon and allowing your vision to "spread out" does it. In other words, instead of focusing on a single object, allow the eyes to soften and take in everything in a wide half-sphere. The effect is a little like putting a wide-angle lens on a camera. Suddenly your field of vision is greatly increased.

The secret of making splatter vision work is to slip in and out of it at frequent intervals. Soon this shifting of focus will become habitual. You'll start out with splatter vision, detect movement, focus on it, and then move back into splatter vision all in a second or two. In time you will be able to process a great many things without even coming out of splatter vision.

<u>The technique</u>

- Put your arms straight out to the sides at shoulder level.
- Point you fingers forward and wiggle them.
- By looking straight ahead – get so that you can see both hands
- Think of seeing out of the corners of your eyes.
- Try to pick up the things that are passing on the outermost fringes—trees, bushes, logs, etc. Then notice that, without moving your head or your eyes, you can be aware of almost anything in your field of vision just by choosing to see it. If a bird blinks, a blade of grass moves, a flying bug --- you now can see it!

When in nature

- Look at more than just the trail ahead.
- Look beyond the prominent features of the landscape and pick out what is normally unseen.
- Move your eyes so that they can draw their attention to things that they would otherwise miss.
- Keep your senses active, keep them moving, and keep showing them exciting things so that they will want to keep their eyes moving.

MOVING IN NATURE

Learning how to move in nature is very important in order to fully observe your surroundings. There are proper techniques of moving much like learning dance or an oriental art form such as t'ai chi. With the technologization of walking surfaces, heavy footwear with big heels, and the fast pace of modern life, humankind's walk has become sloppy, damaging, and weak.

THE FOX WALK

Learning from our sly four-legged friends, we can learn to effectively move through nature using the following techniques:

- Stop talking.
- Ease down your pace into slow motion.
- Shorten your stride.
- Lightly touch your foot on the ground before the weight of your body is committed.
- Place only the outside edge of your foot on the ground.
- Gently roll your foot down (inwardly) flat.
- Slowly move your weight forward in a flowing motion.
- Center your gravity at the center of your hips.
- Do not look at the ground.

Walkers should be able to feel exactly what they are stepping on. If you feel a twig that might snap, you now have the ability to pick your foot and place it in a new spot without looking down.

When you feel confident as a fox walker, take off your shoes and socks. Notice that when fox walking barefoot, even on sharp stones, you will not hit the heel, but will walk, quite naturally. Also, notice your ability, with the fox walk, to freeze easily.

THE RABBIT GAME
Form a circle with one person in the center pretending to be a **rabbit**. When the rabbit looks at you **freeze!** When the rabbit is not looking at you, **Fox Walk** toward it. See who can reach the rabbit first. Try two rabbits. This is the same way to sneak up on a real animal.

Practice the fox walk at home. See if you can sneak up on a cat or dog without scaring them.
Practice the fox walk outside. See if you can approach beetles, bugs, birds, frogs, chipmunks, squirrels, deer or anything else. In time your fox walking skills will allow you to observe more and more wildlife.

THE NATURE HUNT EXERCISE
To hone total sensory awareness, splatter vision, and the fox walk engage students in a non-competitive exercise similar to a traditional Easter egg hunt. Hide several small things that have some sort of an odor, and are out of character for the landscape, like hot dogs, or candies or perfumed stuffed animals. Explain to students that this is an exercise that requires use of all the skills that have been learned. The more items that one is able to find, shows that the person has the necessary skills to be an excellent nature observer. You may also give students style credit for the best fox walk, use of “deer ears,” etc. Make sure to relate and enforce the following two rules.

- Silence. We are learning techniques to view wildlife. If any noise is detected, especially talking, you are disqualified (you’ve scared the animals and they’ve run off!)

- Low impact. If any impact is detected like a broken branch, a moved rock, or a deep footprint, you are also disqualified.

OTHER CONSIDERATIONS FOR NATURE OBSERVATION

- Think camouflage. It is important not to wear a solid color. Dress in a check or a plaid and darker-patterned clothing, to help break up the outline of the body.

- Wash before hand with a natural, non-perfumed soap and/or shampoo.

- Do not wear perfumes, colognes or scented deodorants.

- Be aware of which way the wind is blowing and try to be upwind from where you think wildlife may be observed.

UNIT 1B. THE WATERSHED WEB OF THE WILD

TIME	LEVEL
60-90 minutes	All

BENCHMARKS	
Next Generation Science Standards	MS-LS2-3 MS-LS2.B MS-LS2.C MS-ESS3.C HS-LS2.C
Science & Engineering Practices	Developing and Using Models

MATERIALS:

- STUDENT HANDOUT 1B-1: The Sacred Circle
- STUDENT HANDOUT 1B-2: What is a Watershed?
- Two large balls of string
- Scissors
- **A large space to conduct the activity**

INTRODUCTION:

This activity brings students out of their seats and introduces them to a host of important concepts and ideas that are central to preparing them for their Salmon Watch field experience.

First, as students form a circle, they learn about the symbolic significance of the circle in Native American culture.

Second, students engage in actively creating a symbolic, pristine watershed and learn how it functions as an interconnected, multifaceted, dynamic and complex web.

Then, students witness and feel what happens to this watershed when parts of this dynamic system are impacted or damaged. Tension in the web is felt throughout and every part is affected.

So as not to leave students “bummed out” or without hope by this experience, students learn about real actions by students, community members, agencies, organizations and governments currently in motion in Oregon to restore the health and viability of watersheds.

OBJECTIVES:

Students will know and understand:

- the significance of the circle in many Native American cultures.
- the significant parts of a watershed ecosystem.
- the concepts of an indicator species and biodiversity.
- the roles that parts of the watershed have to the health of the watershed and ultimately to the salmon and the stream.
- the interconnectedness of all parts within a watershed.
- the various elements that can have an impact on a watershed.
- the elements of restoration in Oregon's watersheds.

PROCEDURE:

PART I. The background

1. Have students read the brief introduction, STUDENT HANDOUT B2: What is a watershed?

2. Cut out the WATERSHED PARTS and WATERSHED ROLES sections on the following pages and randomly hand to each student a section representing a piece of the watershed web.

3. Explain that they now represent that watershed part in this activity and that they must be able to articulate the role of their part of the watershed with regard to the health of the watershed, the salmon and the stream.

PART II. The watershed web of the wild

4. Have students, with information in hand, form a large circle. When in the large circle, read aloud with students STUDENT HANDOUT B1: The Sacred Circle to understand the importance of circle, cycles and hoops in Native American culture.

5. Have the student that received the Pacific Salmon part stand in the middle of the circle and hand him or her a ball of string. The Pacific salmon student must announce loudly, "I REPRESENT THE PACIFIC SALMON. PART OF MY ROLE IN THE WATERSHED IS……" They then must hold on to the string and gently toss the ball to any student in the circle.

6. The next student, let's say, represents the macroinvertebrates in the stream. The macroinvertebrates student announces loudly whom they represent and what their role in the watershed is. They next must hold on to the string and gently toss the ball to anyone they wish in the circle. Continue this process until all students have participated.

7. Once the web is complete, finish by sending the ball of string back to the Pacific salmon representative in the middle, thus symbolizing the interconnectedness of all parts of the watershed with the salmon as the indicator species at the center of the watershed ecosystem. As the facilitator, at this point be sure to stress the concepts of interconnectedness within ecosystems and watersheds, biodiversity and indicator species.

PART III. The tension and break of the web

8. Begin to examine some of the different destructive forces that can occur within this intact watershed if not properly managed. Use the WATERSHED IMPACTS chart as a guide for some potential problems. For example, announce that within this watershed there have been some poor logging practices (i.e. removing all trees to the edge of the stream thereby increasing soil erosion). The person that represents the live alder tree, then takes a step back, creating tension on the web for all to feel—especially the salmon.. You can also choose different parts of the watershed, like the small mammals. What would happen to the watershed, if there suddenly were no small mammals? Have the small mammals representative take a step back.

9. Continue announcing things that cause tension in the web of life in the watershed, and continue having individual students taking a step back until the string breaks or chaos ensues. Have everyone sit down, still in the circle. Announce that the salmon is near death (for effect, have the salmon representative writhe and cough if you wish).

PART IV. The restoration

10. Now that the web (the watershed) is in poor health, clear out the old string, and lead a discussion about possible methods to restore the impacted watershed.

11. Use the document called Restoration Efforts, which describes examples of actions within Oregon to restore watersheds. This would also be a great time to get the class brainstorming about possible community service learning projects in their watershed that help enhance or restore the watershed.

WATERSHED PART	WATERSHED ROLE
I represent cold, clean free-flowing water in the stream.	Part of my role in the watershed is to provide habitat for fish, aquatic insects, beavers, and a host of other wildlife.
I represent root wads in the stream.	Part of my role in the watershed is to provide shade and cover, as well as resting and rearing areas for salmon.
I represent wood in the stream.	Part of my role in the watershed is to provide shade, cover and trap gravels, as well as resting and rearing areas for salmon.
I represent clean, porous gravel in the stream.	Part of my role in the watershed is to provide the essential material for female salmon to dig nests called redds to lay their eggs.
I represent the stream side or riparian grasses and shrubs.	Part of my role in the watershed is to provide cover, in addition to shade, for temperature regulation. In autumn my leaves drop into the stream and eventually provide food for aquatic insects that are then eaten by salmon.

WATERSHED PART	WATERSHED ROLE
I represent deciduous trees like maples, madrones, oaks and ashes.	Part of my role in the watershed is to provide food and habitat for numerous wildlife species, and shade to cool streams for salmon. I also produce oxygen, stabilize the soil from erosion, and replenish soil nutrients.
I represent coniferous trees like firs, hemlocks, pines, spruces and cedars.	Part of my role in the watershed is to provide food and habitat for numerous wildlife species, and shade to cool streams for salmon. I also produce oxygen, stabilize the soil from erosion, and replenish soil nutrients.
I represent shrubs like salal, Indian plum, vine maple, and red huckleberry.	Part of my role in the watershed is to provide food and habitat for numerous wildlife species, and shade to cool streams for salmon. I also produce oxygen, stabilize the soil from erosion, and replenish soil nutrients.
I represent herbaceous plants like stream violets, Douglas' asters, large-leaved lupine and common red paintbrush.	Part of my role in the watershed is to provide food for wildlife and insects, stabilize the soil from erosion, and replenish soil with nutrients.

WATERSHED PART	WATERSHED ROLE
I represent wetland plants like cattails, wapato, yellow pond lilies and water plantain.	Part of my role in the watershed is to provide habitat for an incredible number of wildlife, fish and insects. I also filter sediment and pollution for streams and provide a buffer against flooding.
I represent macroinvertebrates or aquatic insects like stonelfy, caddisfly, and mayfly nymphs.	Part of my role in the watershed is to be the major food source for fish in streams and other aquatic and terrestrial life (birds). I am also a key indicator in determining pollution levels in streams.
I represent Pacific wild salmon.	Part of my role in the watershed after spawning and death is to provide nutrients for millions of tiny aquatic animals required to sustain hundreds of thousands of hatching salmon. I am a critical part of the food chain, eaten by such animals as bears, bad eagles, gulls and harbor seals. I am also a key indicator species in determining the heath of Pacific NW watershed.
I represent water microbes like algae, detritus, diatoms and copepods.	Part of my role in the watershed is to be food for salmon fry and macroinvertebrates like mayflies, which are consumed by young salmon.

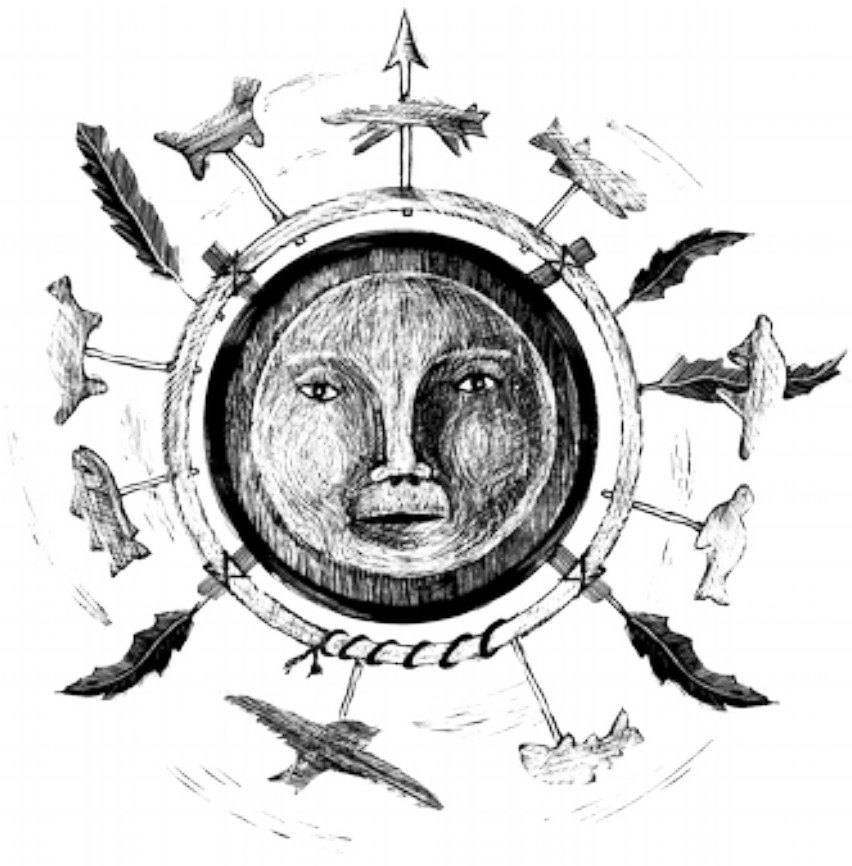
WATERSHED PART	WATERSHED ROLE
I represent waterfowl birds like grebes, herons, swans and ducks.	Part of my role in the watershed is to be critical indicators of the biodiversity and health of the watershed ecosystems.
I represent perching or songbirds like kingfishers, sparrows, robins and warblers.	Part of my role in the watershed is to eat fruits and berries from tress and plants and deposit seeds throughout the watershed.
I represent birds of prey or raptors like eagles, hawks, falcons, owls and ospreys.	Part of my role in the watershed is to help maintain the natural balance of the ecosystem by eating a variety of small animals and fish.
I represent small mammals like shrews, bats, rabbits, chipmunks, bobcats, skunk and porcupine.	Part of my role in the watershed is to invigorate the soil for plants and to be a food source for larger animals like mountain lions and birds of prey.
I represent large mammals like bear, deer, elk, mountain lion and humans.	I occupy the highest level on the food chain. I help maintain the natural balance of the ecosystem by eating a variety of small animals, fish and plants.

WATERSHED PART	WATERSHED ROLE
I represent reptiles like turtles, lizards and snakes.	Part of my role in the watershed is to be a food source for such wildlife as hawks, and help maintain the balance of the ecosystem by consuming insects and adding nutrients to the soil.
I represent amphibians like salamanders, newts, toads and frogs.	Part of my role in the watershed is maintaining the balance of the ecosystem by consuming insects and adding nutrients to the soil.
I represent beetles, worms, centipedes and millipedes.	Part of my role in the watershed is to create high soil nutrient quality through constant consumption of woody and plant materials on the forest floor.

HOW CAN THE FOLLOWING IMPACT SALMON & WATERSHED HEALTH
Over fishing
Logging practices
Agricultural pesticides
Dams
In-stream gravel mining
Agricultural irrigation
Road building and runoff
Housing and commercial development
Global warming
Acid rain
Road culverts
Livestock grazing
Household toxic wastes
Floods
Indsutrial pollution
Exotic plants and animals intrusion
El nino/El Nina
Volcanic eruption
Erosion
Overpopulation
Wetland fill

STUDENT HANDOUT 1B-1

The Sacred Circle



…Everything the Indian does is in a circle, and that is because the power of the world always works in circles, and everything tries to be round. In the old days all our power came to us from the sacred hoop of the nation and so long as the hoop was unbroken
the people flourished.

The flowering tree was the living center of the hoop, and the circle of the four quarters nourished it.

The east gave peace and light, the south gave warmth, the west gave rain and the north with its cold and mighty wind gave strength and endurance. This knowledge came to us from the outer world with our religion.

Everything the power of the world does is done in a circle.

The sky is round and I have heard that the earth is round like a ball and so are all the stars.

The wind, in its greatest power, whirls.

Birds make their nest in circles, for theirs is the same religion as ours.

The sun comes forth and goes down again in a circle. The moon does the same and both are round.

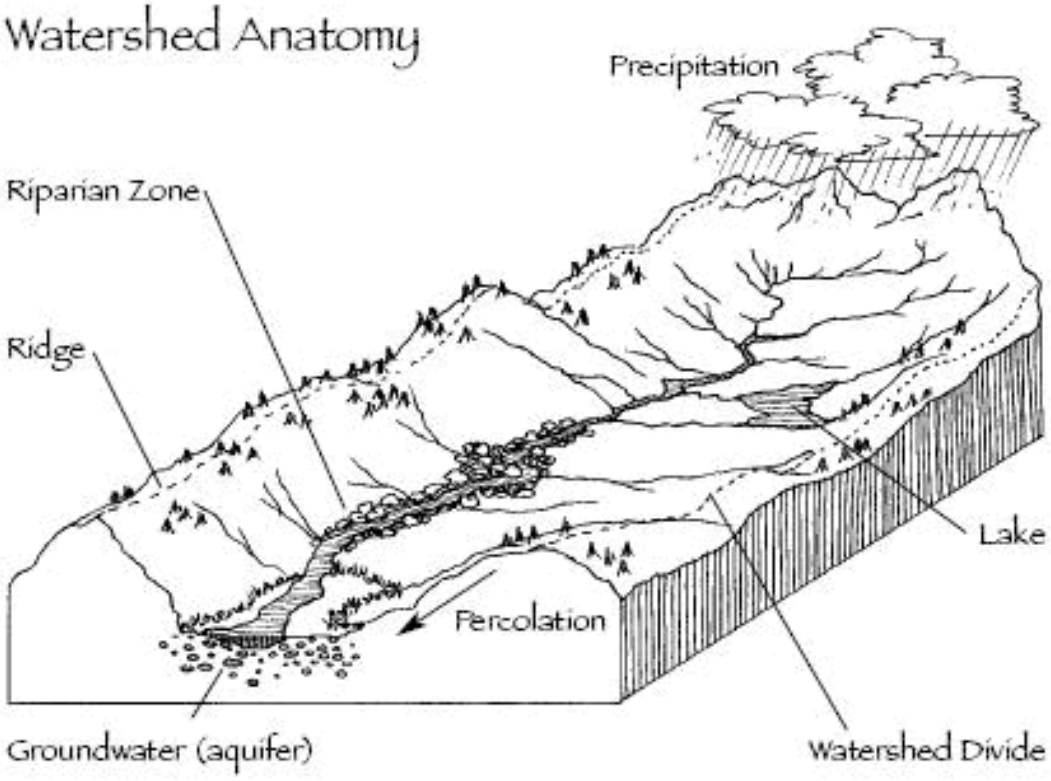
Even the seasons form a great circle in their changing and always come back again to where they were.

- Black Elk
Oglala Sioux Tribe
1863-1950

STUDENT HANDOUT B2

What is a Watershed?

All land on earth is in a watershed. Not everyone lives by a stream, but we all live in a watershed-the ultimate source of every stream. A watershed is an area of land that collects (captures) rainfall and snow melt which later flows into a stream. Many small watersheds make up the larger watershed or major rivers. Watersheds act as reservoirs storing rainwater in soil, leaves, grasses, trees and other vegetation, slowly releasing it into a river or stream throughout the year.



A watershed includes the entire area-visible and invisible-drained by a particular creek or river. The visible area is the landscape on which rain and snow fall; surface water runs off hillsides into streams and rivers or collects in lakes or in shallow depressions-marshes, swamps, bogs, sloughs, and so forth-collectively called wetlands.

The larger, invisible portion of the watershed lies beneath the surface, within the soils and rock that act like a giant sponge. There, rainwater that has infiltrated the duff or topsoil collects as groundwater above deep impermeable layers of rock or clay.

Watersheds range in size from the smallest coastal stream to huge river systems such as the Columbia, Frazer, or even the enormous Mississippi system, which drains the entire central portion of the United States.

Rivers, hillsides, mountaintops, and flood formed bottomlands are all part of one system. All are integrated with each other. Hillside shape controls the energy expenditure rate of water flow. All life in the watershed interact with and modify the energy flow through the system. So it follows that the shape of the watershed is a function of what lives there. The combination of climatic conditions, soil types, topography, vegetative cover, and drainage system define the particular character of each watershed.

Rivers do not stop at state lines. The effects of natural and human processes in a watershed are focused at its outlet, wherever it may be, even if it crosses another state or country's borders. Each watershed is a part of a larger watershed whose downstream portion may suffer from upstream influences.

Everyone who lives or works in the same watershed is interconnected, in an intimate and tangible way, with every instream animal and every other person or animal that depends on the watershed's streams and groundwater for drinking or waste removal, or for industrial processes, hydroelectric power, or irrigation. We are intimately connected, in fact, with every animal, plant, and grain of mineral in our entire watershed.

(text adapted from Adopt-a-Stream Handbook & Stream Scene)
(image courtesy of National Environmental Education Foundation)

UNIT 1C. USING TOPOGRAPHIC MAPS
WHERE IN THE WORLD ... ARE YOU?

TIME	LEVEL
60-90 minutes	All

BENCHMARKS	
Next Generation Science Standards	MS-LS1.D
Science & Engineering Practices	Developing and Using Models

MATERIALS:

- Topographic maps of your local area, county and or state and a map which shows your field trip site. U.S. Geological Survey (USGS) 7.5-minute maps are optimal, but any map showing township, range and section will do. Use a map at either a 1:100,000 or 1:24,000 scale of the area you're visiting. Maps at a 1:100,000 scale show less detail, but a larger area; maps at a 1:24,000 scale show a smaller area in more detail. Both scales are helpful in determining your site location. For approximately $3-$5, maps generally can be purchased at your local outdoor store, bookstore, Forest Service or BLM office.

- Overhead transparency sheets and pens
- Tracing paper
- STUDENT HANDOUT 1C-1: Using Maps
- STUDENT HANDOUT 1C-2: TOPO MAP SECTION
- STUDENT HANDOUT 1C-3: Topographic Mapping Symbols

OBJECTIVES:

Students will:

1. become familiar with topographic maps.
2. be able to use maps to identify the location of sites using township, range and section.
3. be able to read the elevation of sites through an understanding of contour lines.
4. be able to identify watersheds and stream flow through topo maps.

PROCEDURE:

- Give each student a copy of STUDENT HANDOUTS C1 and C2.

- As a class, follow along through the materials that explain how to use topographic maps, and how to determine township, range and section (TRS).

- Now that students have some knowledge of maps and map reading, divide the class into small groups. Give each group a topographic map of the local area (you can make copies of topo maps, but be sure that copies include the map's edges that have the TRS degrees).

- Ask students to locate familiar landmarks such as their school or roads. Have students locate local streams.
- Ask students to look at the contour lines on their maps. Note that some of them are thicker than others.
- Select one of these thicker lines and follow it. Somewhere along the line there will be a number, written in the direction of and in place of the line. This is the elevation of the line. Elevation is the height-in feet or meters above sea level of a particular point or line. Every point on that line is at the same elevation.

Other points about contour lines to go over with students:

- A contour line never goes up or down hill.
- Contour lines never cross each other.
- The vertical distance between contour lines is called the contour interval. The contour interval used varies from map to map.
- By locating the closest labeled contour line and then counting lines, one can determine the elevation of a point.
- The closer together the contour lines, the steeper the slope.
- When contour lines cross a stream they form a "V" that points upstream.
- Ask students to locate the highest points (ridgelines) between two streams, thus locating the boundaries of watersheds.
- Have students use the "Topographic Map Symbols" handout to identify land uses in the watershed.
- Finally, choose three or four labeled locations on the map. Have students identify the TRS. Also, choose three or four TRS coordinates and have them write what is located there.
- Practice and review is the key to preparing students for mapping their location.

STUDENT HANDOUT C1. USING MAPS

Contour lines…quads…elevation…true north. Welcome to the world of topographic maps.

Topographic maps, also called “topo” maps, are the least expensive means for determining your location. For a few dollars, U.S. Geological Survey (USGS) topo maps are optimal for Salmon Watch. Like most maps, they show a portion of Earth’s surface by reducing it to a practical size with various symbols representing feature in the mapped area. Unlike typical two-dimensional maps, topographic maps add a representation of the vertical dimension through the use of contour lines.

Each contour line represents a particular elevation above mean sea level. Although other types of maps may show the hills and valleys of the mapped area, the contour lines on topo maps provide much more detail and accuracy. To one who does not understand the markings, lines, and symbols on a topo map, it may well look like some two year old had fun with a light brown pencil. But to a person with a bit of training, these squiggly lines provide a wonderful view of the countryside.

Global Positioning System Receiver

One of the most accurate methods for determining site location is a Global Positioning System (GPS) receiver. This handy device picks up signals from satellites orbiting the Earth and instantly displays the latitude and longitude (and altitude, if desired) of your location.

Location Methods

There are two primary methods used to determining site location:

- Township, range and section (TRS), or
- Latitude and longitude (Lat/Long)

The former can be determined by using maps; the latter by maps or GPS receivers. If you don’t have access to a GPS receiver, you’ll need to use a topo map.

Township, Range and Section

On the following handout is a portion of a USGS map of Christmas Valley, Oregon (1:100,000 scale). We have identified a site, Doughnut Mountain (circled on the map), and drawn arrows from the Township and Range numbers in the margins to illustrate its location. To practice your skills at determining TRS, follow the sets below to determine the TRS of Doughnut Mountain.

Township Template

R

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

T T

R

Explanation: All states are divided into township grids of 36 square miles. Township numbers are found on the extreme right and left sides of a map; range numbers at the top and bottom. Each grid is further divided into 36, one square-mile sections, numbered in sequence and beginning in the top right-hand corner. Section 8 is highlighted here to indicate the section location of Doughnut Mountain.

Note: Some 1:24,000-scale maps use non-standard section numbers (i.e., numbers other than 1-36). In these cases, locate your township/range grid of 36 squares and assign the correct number to each of the 36 squares following the number sequence of the above grid.

Determining Township: A township is 36 square miles. Township numbers are printed in the margins on the extreme right and left sides of maps (in this example, we only show numbers for the right side of the map) and centered between two lines that delineate the township. Notice that the two horizontal lines are slightly darker in color than the surrounding lines.

Doughnut Mountain is located in Township 29 South, or T 29 S

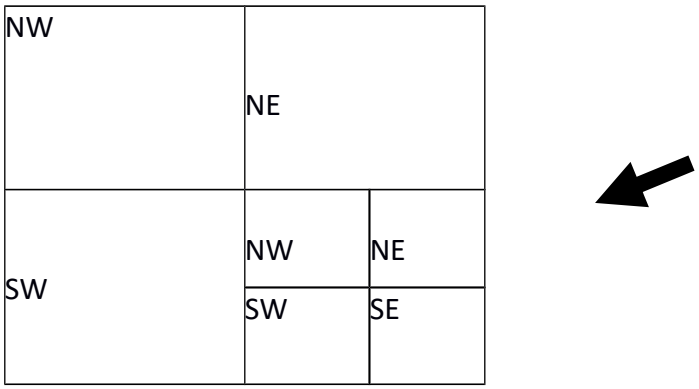
Determining Range: Range numbers are printed in the margins at the top and bottom of maps (in this example, we only show numbers for the bottom portion of the map), and are also centered between two slightly darker vertical lines that delineate the range.

Doughnut Mountain is located in Range 22 East, or R 22 E

Determining Section: A section is one square mile. There are 36 sections in each township. On most maps, only the four corner section numbers (1, 6, 31, 36) are printed within each township. The first row of section numbers (1-6) reads from right to left, the second row (7-12) reads from left to right, and so forth to section 36. You'll need to count across the grid in this sequence to find the section for Doughnut Mountain. (Refer to the Township template to help you determine the correct section number for Doughnut Mountain.)

Try to be accurate to within a quarter of a quarter mile. Well, what do we mean by “a quarter of a quarter mile”? Since a section is one square mile, divide the section into four equal quadrants (NE, SE, NW, SW) to get your location down to a quarter of a mile.

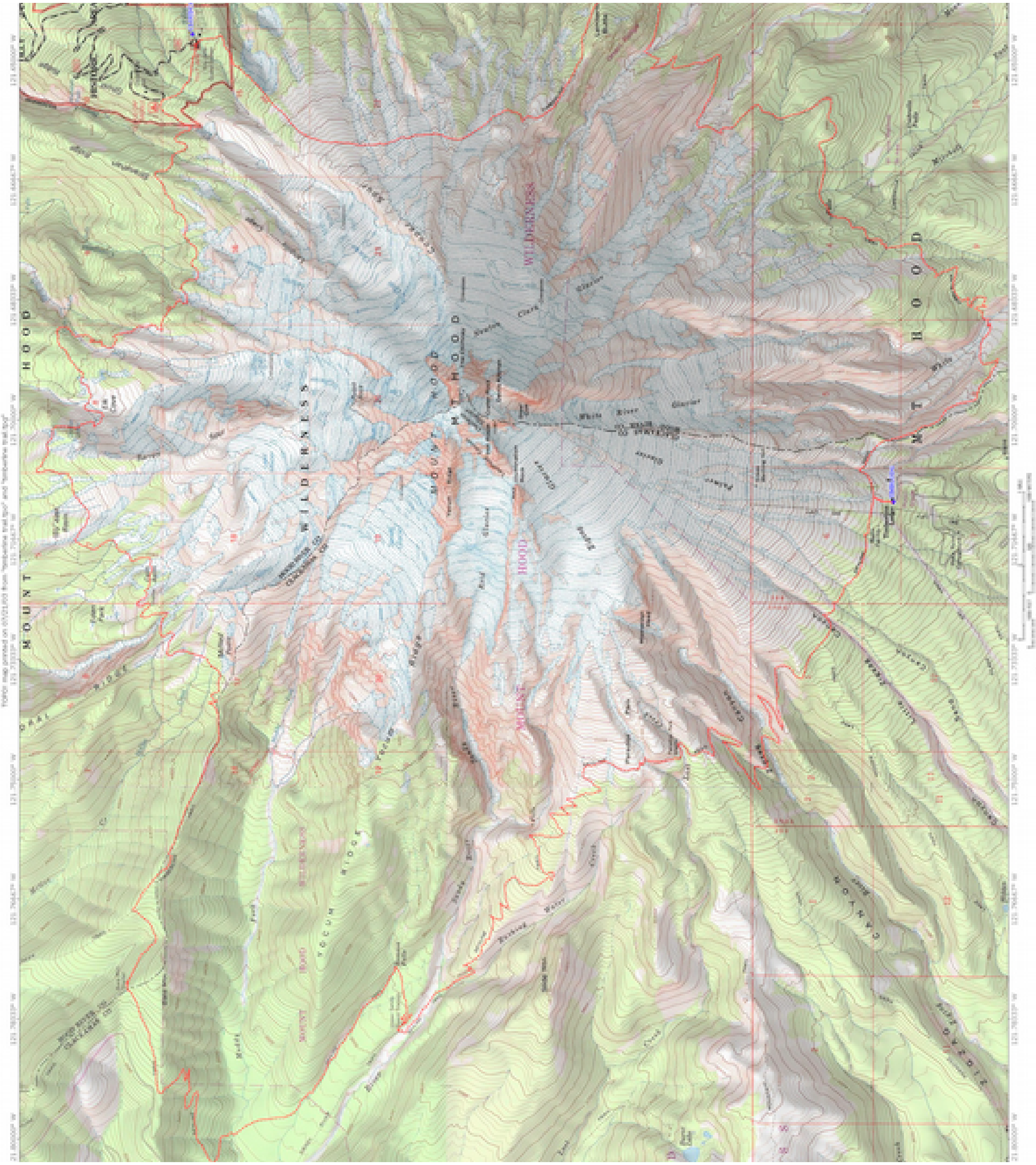
Then, to get it even smaller to a quarter of a quarter mile, divide the quadrant into four again. Thus, in the case of Doughnut Mountain, your site might be in the NE quarter of the SE quarter of Section 8, as shown by the dark square that follows:

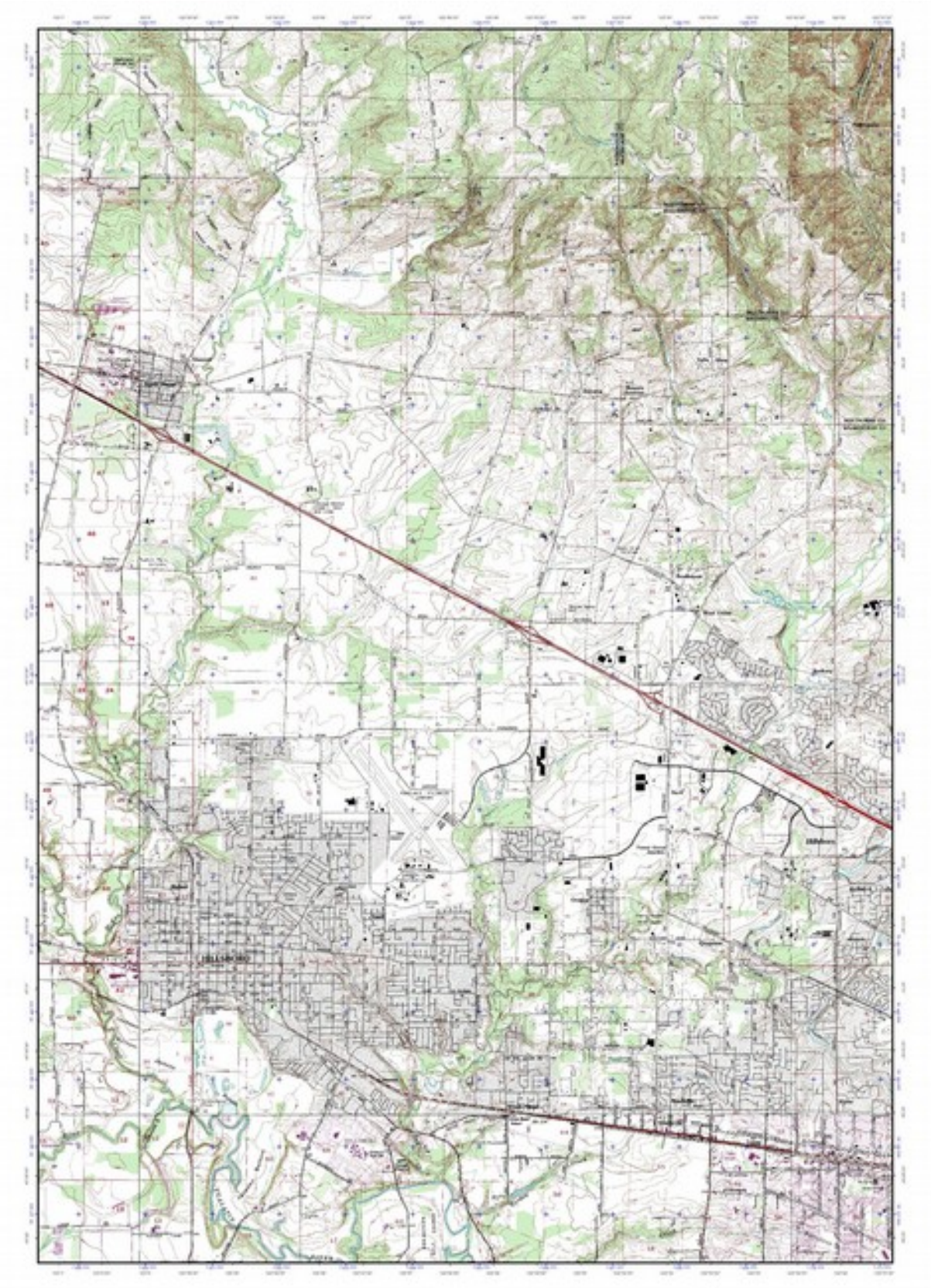


Putting It All Together: Standard recording procedure requires that the final location recording begin with the smallest area and work backwards.

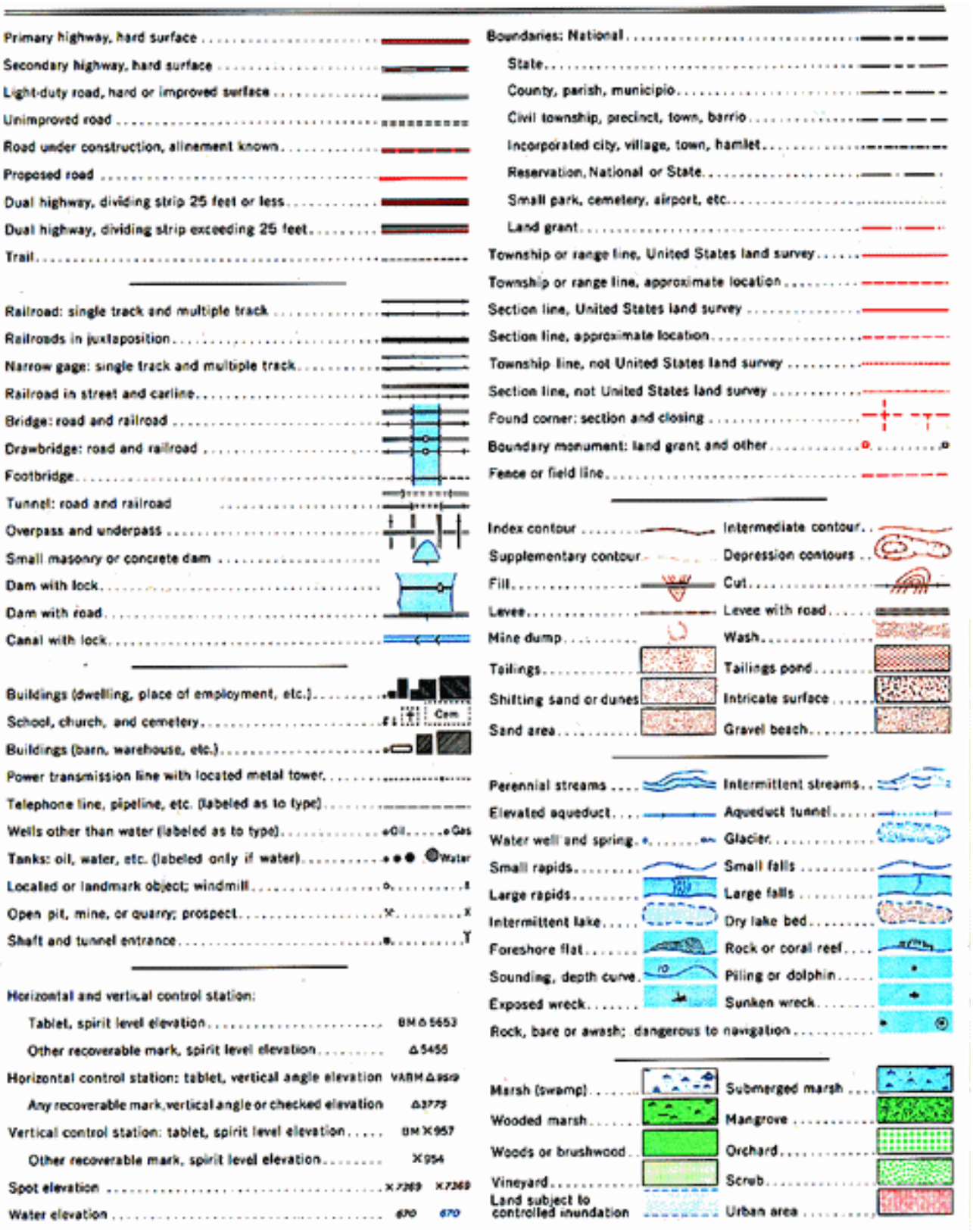
Thus, your final site identification for Doughnut Mountain should read:
NE !, SE !, S8, T29S, R22E

STUDENT HANDOUT C2. TOPO MAP





STUDENT HANDOUT C3. TOPOGRAPHIC MAPPING SYMBOLS



UNIT 1D. SALMON LIFE CYCLE

TIME	LEVEL
60-90 minutes	All

BENCHMARKS	
Disciplinary Core Ideas	MS-LS1-B MS-L2.A MS-LS2.C HS-LS2.C
Science & Engineering Practices	Developing and Using Models
Common Core Standards-ELA/Literacy	CCRA.R.1 CCRA.R.4
Common Core Standards-Math	HS.57 HS.63

MATERIALS:

Use The Journey of Pacific Wild Salmon STUDENT HANDOUT 4A-1 found in **UNIT 4: Salmon** to review the life cycle of salmon with your students. If you need a simpler life cycle activity, a short summary from *Stream Scene* has been included at the end of the above handout.

OBJECTIVES:

Students will:

- become familiar with the life cycle of the salmon.
- know and understand the key terms relating to the life cycle of the salmon.

VOCABULARY:

anadromous	fry	eggs	smolt	porous gravel
Salmonids	smoltification	alevins	parr marks	milt percolation
yolk sac	spawn	vitelline vein	redd	

If your students only have time to briefly review the life cycle of the salmon before their field trip, engage them in a discussion with the following questions.

- What conditions are necessary for successful salmon reproduction?
- What conditions are necessary for successful rearing of young salmon?
- What do salmon fry feed upon?
- What is smoltification and do salmon go through this process?
- What is the importance of stream flow to salmon migration?
- How long do salmon spend in the ocean and what do they feed upon?
- What natural and human factors impact salmon survival rates?
- How do salmon navigate back to their native streams?
- What do salmon feed upon when they enter fresh water?
- What is the process for salmon reproduction?