Stream Sense

A Guide to Streamside Etiquette

City of Bellingham
Public Works Department
Environmental Resources
2221 Pacific Street
Bellingham, WA 98226

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by a grant from
PUGET SOUND
WATER QUALITY
ACTION TEAM

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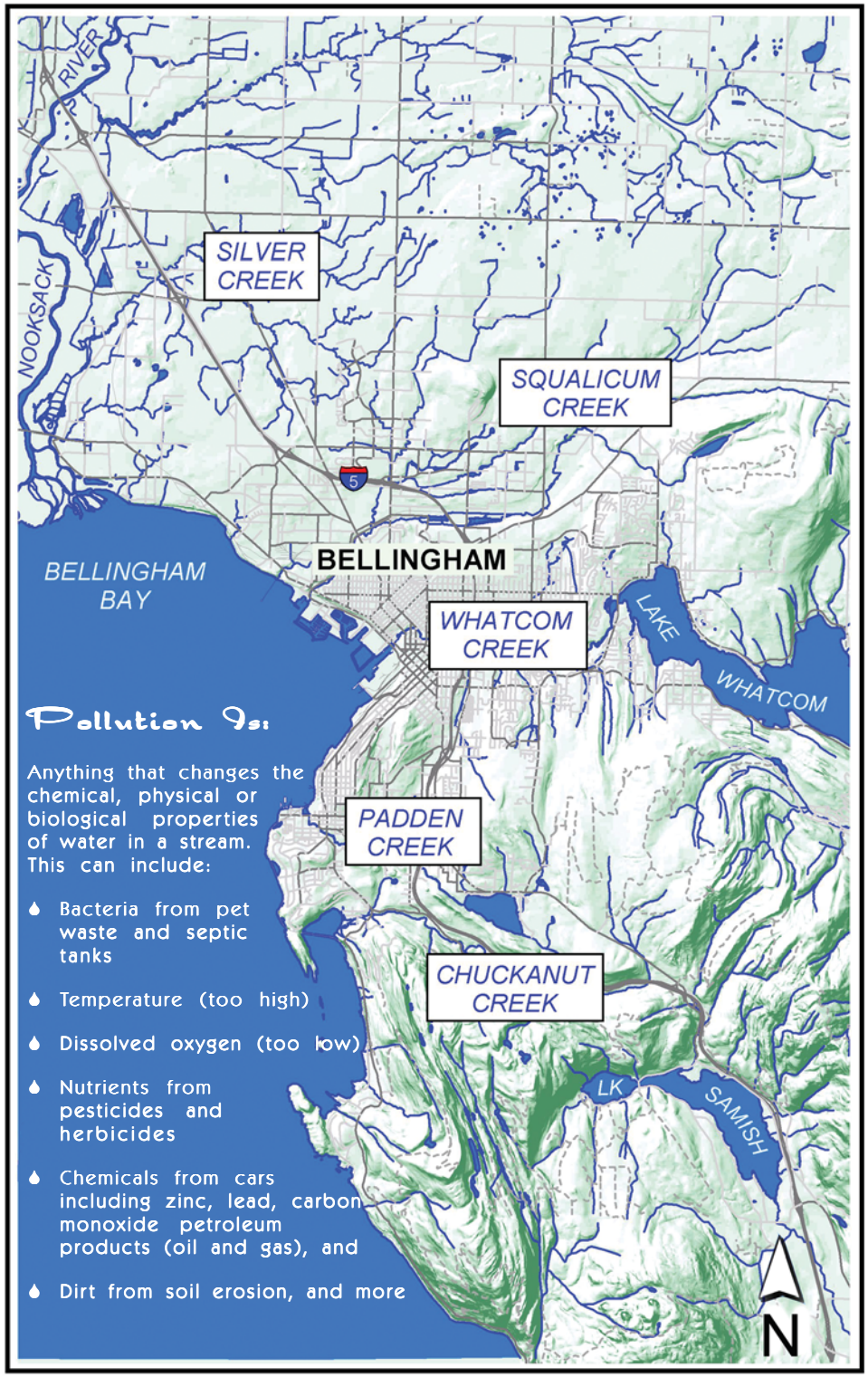


Pollution 9s:

Anything that changes the chemical, physical or biological properties of water in a stream. This can include:

- Bacteria from pet waste and septic tanks
- Temperature (too high)
- Dissolved oxygen (too low)
- Nutrients from pesticides and herbicides
- Chemicals from cars including zinc, lead, carbon monoxide petroleum products (oil and gas), and
- Dirt from soil erosion, and more

to help, there are lots
lunteer opportunities.

Plants

WSU Master Gardeners, 360-676-6736
www.whatcom.wsu.edu/ag/comhort/ipm

Whatcom Horticultural Society, 360-738-6833
http://home.earthlink.net/~cedarcroft/whatcomhs

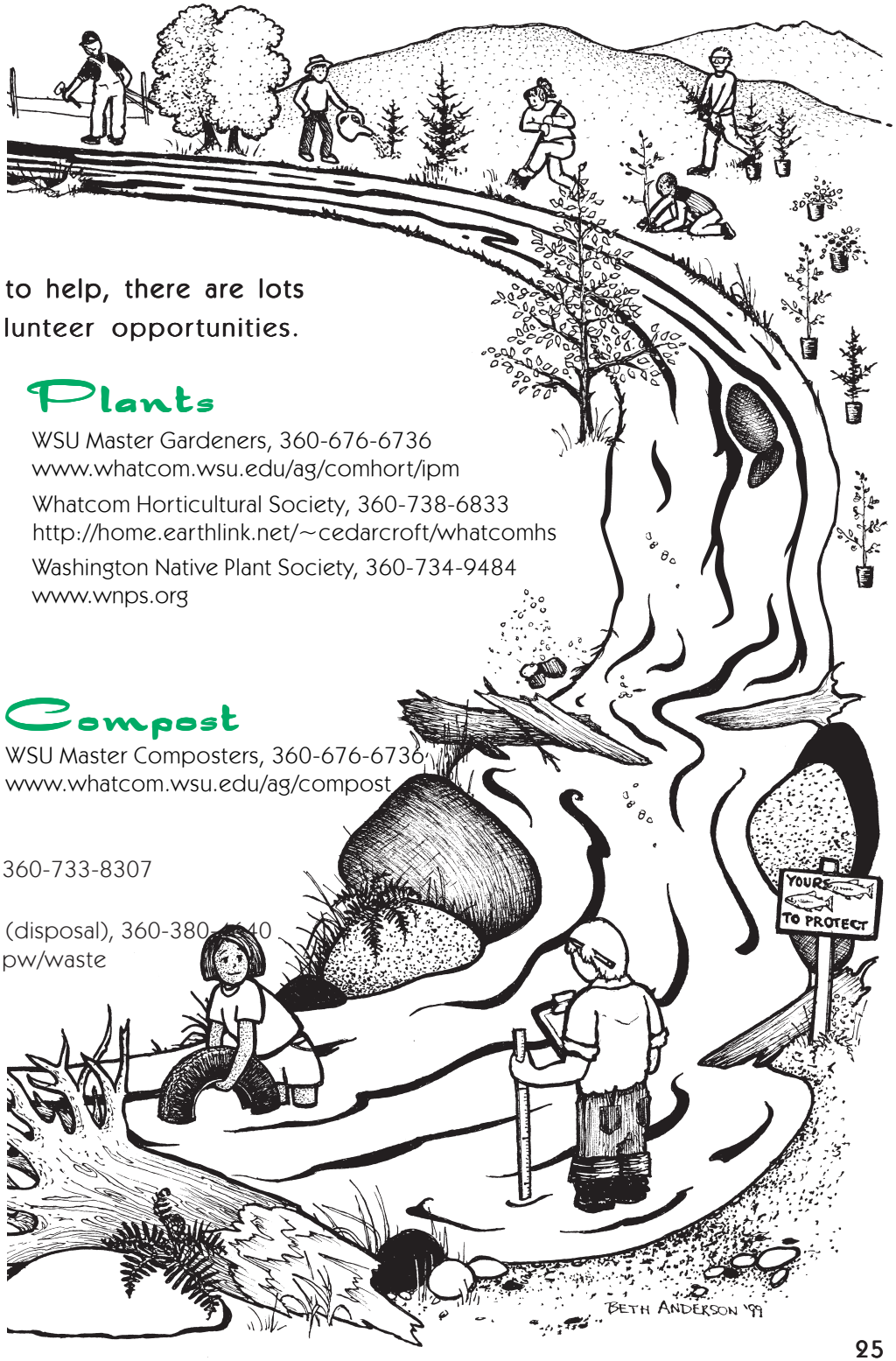
Washington Native Plant Society, 360-734-9484
www.wnps.org

Compost

WSU Master Composters, 360-676-6736
www.whatcom.wsu.edu/ag/compost

360-733-8307

(disposal), 360-380-[illegible]40
pw/waste



You can make a difference!

Whether you live next to a stream or want to volunteer of resources for learning about stream ecology and vo

Stream Restoration

Nooksack Salmon Enhancement Association, 360-715-0283
www.n-sea.org

Whatcom Conservation District, 360-354-2035
www.whatcomcd.org

Salmon Recovery

Environmental Resources Division, 360-676-6850
www.cob.org/cobweb/pw/er

Whatcom County Water Resources, 360-676-6876
www.co.whatcom.wa.us/waterres

Pests

Noxious Weed Board, 360-354-3990
www.co.whatcom.wa.us/pubwks/noxious

WSU Master Gardeners, 360-676-6736
www.whatcom.wsu.edu/ag/comhort/ipm

Toxics

RE Sources (alternatives),
www.re-sources.org

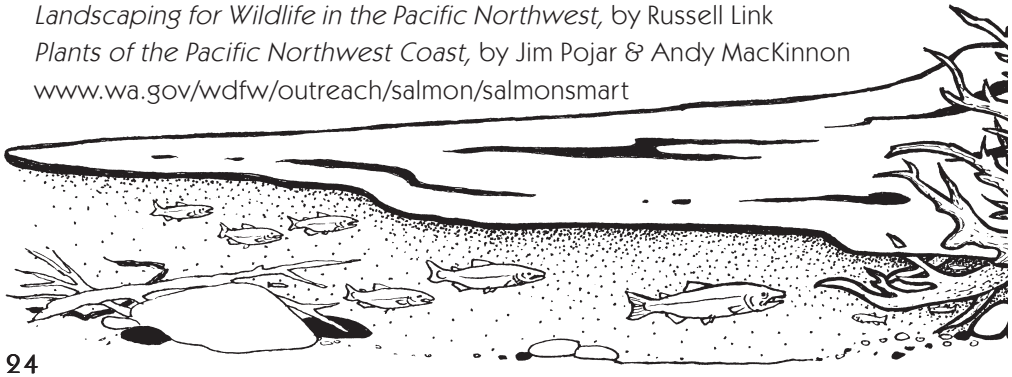
Disposal of Toxics Facility
www.cob.org/cobweb/

Other Resources

Landscaping for Wildlife in the Pacific Northwest, by Russell Link

Plants of the Pacific Northwest Coast, by Jim Pojar & Andy MacKinnon

www.wa.gov/wdfw/outreach/salmon/salmonsmart



Introduction

It Makes Good Sense

Take a moment and think about why you choose to live in Bellingham. People who live, work and play here appreciate the beauty of the natural environment. We all benefit by preserving and protecting our waterways and open spaces.

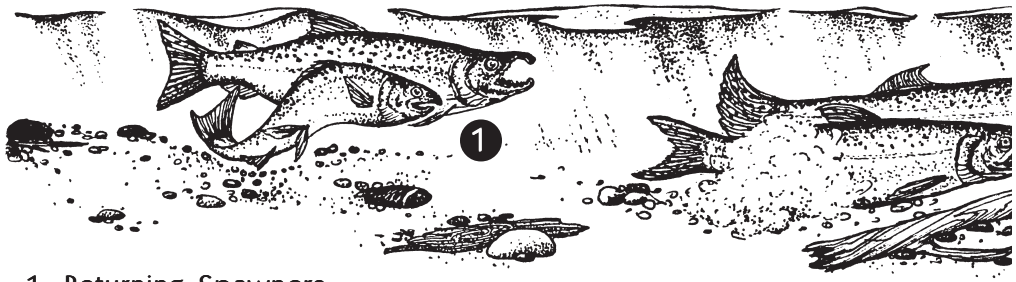
The word *environment* simply means your surroundings or the place in which you exist. Look closer. Our surroundings are made up of physical, chemical, biological and even cultural factors that together support our lives. We are one strand in the web of life. We depend on our environment spiritually, culturally and economically and our environment depends on us.

Take a moment to think about your typical day.

- Do you drive to work or school? Are you using your automobile in the most efficient manner possible?
- Do you fertilize your lawn? If so, are you using slow-release fertilizer that has less impact on neighboring streams?
- Do you walk your dog regularly? If so, do you pick up its waste so that it doesn't get "flushed" down storm drains that empty into our urban streams?
- Do you spend your free time swimming, fishing or playing in streams? Do you think about the salmon and how you may be disturbing them or eroding the bank?
- Do you work near our streams? If so, do you think about how you might be impacting them?

These are some of the questions we need to ask ourselves as we go about our daily lives. How can we be better stewards of our environment?

This booklet serves two purposes. One is teaching about Bellingham's urban streams and their inhabitants, including Pacific Northwest Salmon. The second is to raise awareness about how individual actions can and do affect the quality of our surroundings. ***Stream Sense*** suggests ways each of us can do our part to protect and preserve the health of our streams for ourselves and for future generations.



1. Returning Spawners

- Adult salmon return to the stream of their birth to spawn. About 90% of returning spawning salmon return to within 100 yards of where they started life.
- Spawning salmon stop feeding before they enter fresh water and rely on stored fat and muscle to power them upstream.
- Returning Spawners must navigate many obstacles to spawning including predators, fishers, dams, culverts and low water levels.

2. Spawning Adults

- Females build nests (redds) with their tails, digging up gravel.
- Females lay between 300 and 1000 eggs in a redd, depending on species.
- Males compete for the chance to fertilize the eggs.
- Adults die after spawning, adding nutrients to the water from their decaying carcasses.
- Steelhead and sea-run cutthroat do not die after spawning and can return to the sea to come back and spawn again.

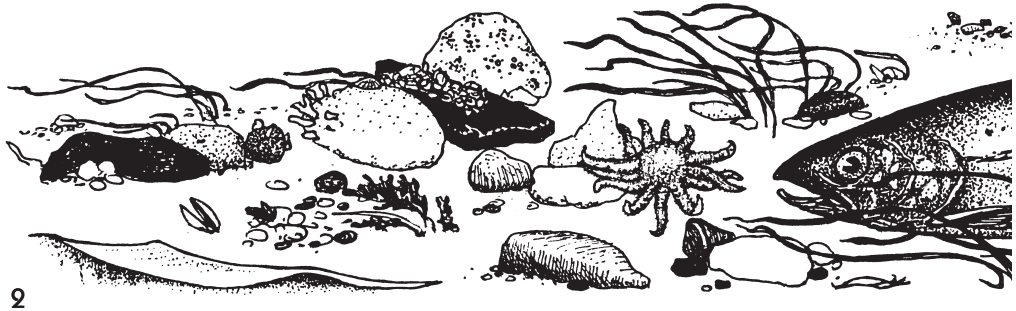
Salmon Life Cycle

6. Smolt

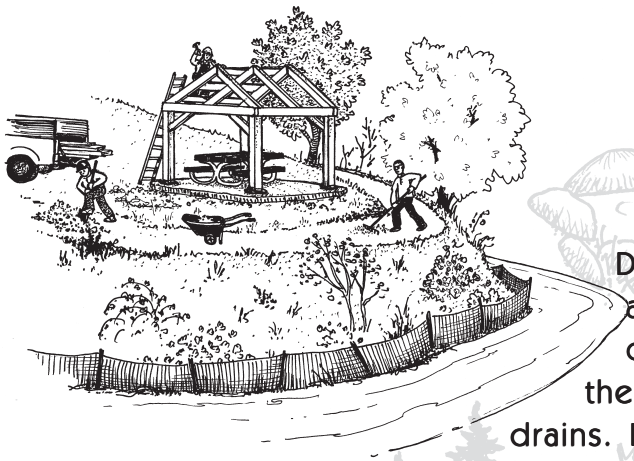
- "Smolt" is a term used to describe the physical changes of a juvenile salmonid as it prepares to leave fresh water and enter salt water.
- Smolt usually go to sea between one and two years of age, depending on species (chinook, coho).
- Some species go directly to the sea as fry (pink, chum).
- Smolt grow large and become silvery to match the ocean's color and their tails lengthen and become more deeply forked.

7. Ocean Phase

- Salmonids spend one to seven years in the ocean, depending on species.
- At sea, salmon consume large quantities of food and grow rapidly, building up strength and storing fat for their return to fresh water.



Work



Do not discharge anything other than clean stormwater to the ground and storm drains. Do not dump liquid waste down the storm drain.

- Use soil erosion techniques if the bare ground is temporarily exposed. Use permanent soil erosion techniques if remodeling clears buildings that will not be replaced.
- Protect soil piles from weather damage.
- Keep the work site clean and orderly, and remove debris.
- Properly store materials used in repair and remodeling, such as paints and solvents, to prevent weather damage and vandalism.
- Maintain good housekeeping practices for management and disposal of waste, discharges, and spills. Provide spill-response training for personnel who handle hazardous material.
- Inform on-site contractors of required practices for management of wastes and discharges. Provide appropriate provisions in contracts of enforce these policies.
- Protect nearby storm drains to minimize possibility of inadvertent disposal of residual paint or liquid.
- Advise concrete drivers of the proper place to wash trucks.

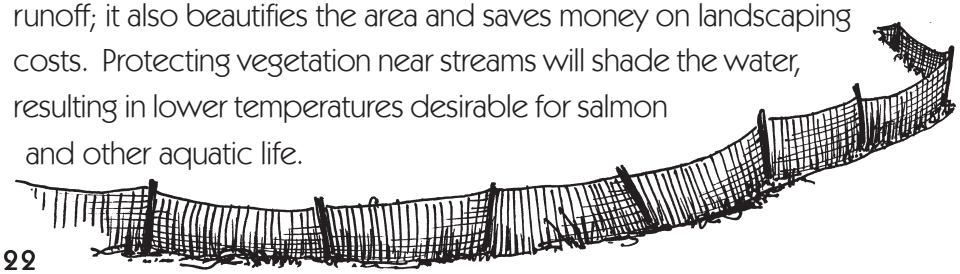
Work

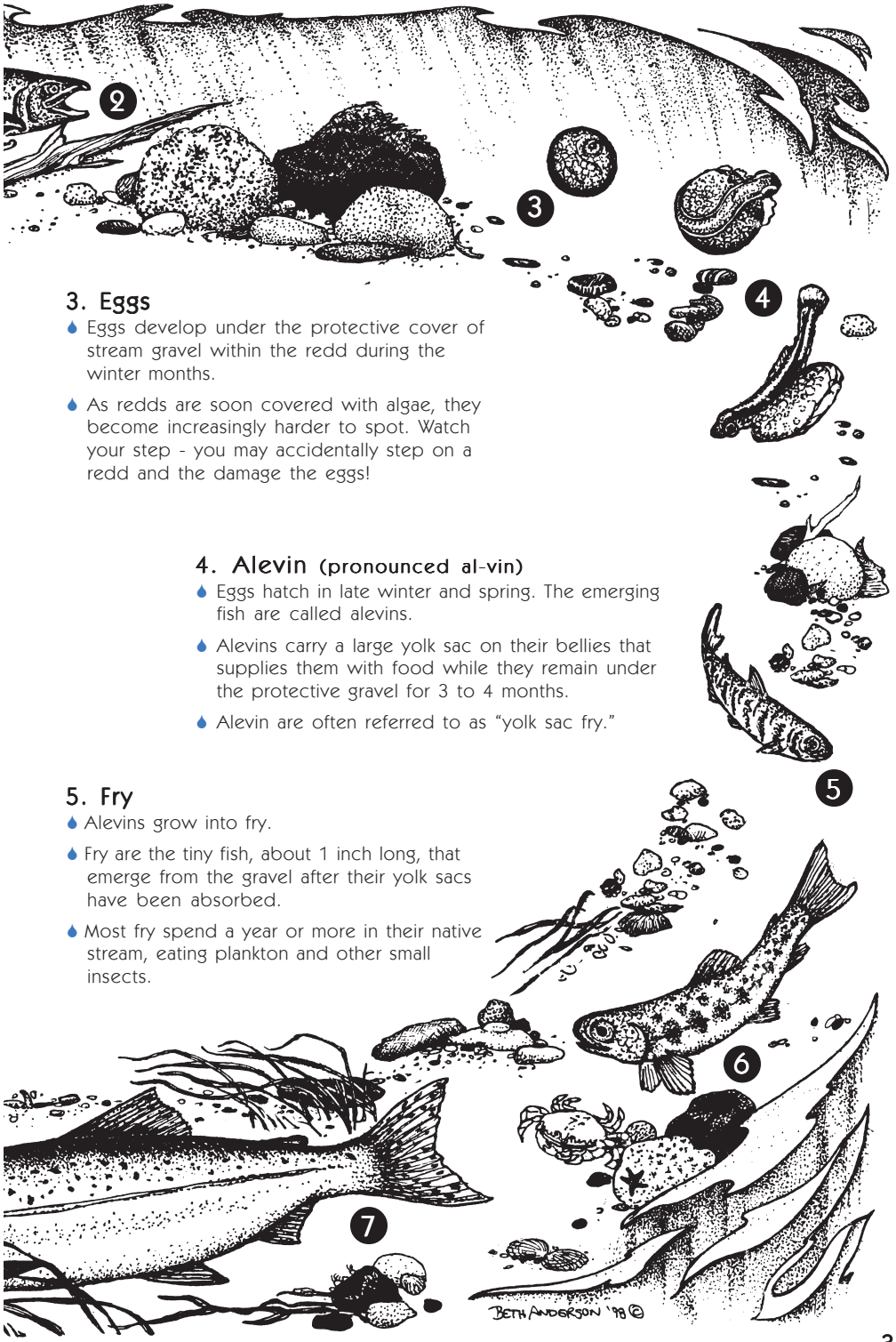
The Washington State Department of Ecology's Stormwater Management Manual for Western Washington lists over forty Best Management Practices (BMPs) that have been developed to prevent stormwater pollution caused by construction activities. The decision to use a certain BMP depends on the conditions at a given site.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is probably the most cost-effective means of controlling erosion during construction. When ground cover is removed, a site becomes vulnerable to erosion. The use of construction procedures that limit land clearing, provide properly timed installation of erosion and sedimentation controls, and quickly restore protective cover can greatly reduce the erosion potential of a site.

A well-established vegetative cover is one of the most effective means of reducing erosion. Limiting the extent of clearing operations can minimize exposed soils and resulting erosion. In particular, leave natural plant cover intact on steep slopes, in wooded areas, and by the water. Before beginning land-disturbing activities, clearly mark and fence vegetation to be saved, and leave trees undisturbed to the drip-line.

Preserving natural vegetation not only reduces soil erosion and stormwater runoff; it also beautifies the area and saves money on landscaping costs. Protecting vegetation near streams will shade the water, resulting in lower temperatures desirable for salmon and other aquatic life.





3. Eggs

- Eggs develop under the protective cover of stream gravel within the redd during the winter months.
- As redds are soon covered with algae, they become increasingly harder to spot. Watch your step - you may accidentally step on a redd and the damage the eggs!

4. Alevin (pronounced al-vin)

- Eggs hatch in late winter and spring. The emerging fish are called alevins.
- Alevins carry a large yolk sac on their bellies that supplies them with food while they remain under the protective gravel for 3 to 4 months.
- Alevin are often referred to as "yolk sac fry."

5. Fry

- Alevins grow into fry.
- Fry are the tiny fish, about 1 inch long, that emerge from the gravel after their yolk sacs have been absorbed.
- Most fry spend a year or more in their native stream, eating plankton and other small insects.

Silver Creek

Watershed Area:
10,123 acres
Headwaters:
Bear Creek
Drains To:
Bellingham Bay
Land Uses:
agriculture, industry, residential
Salmon Present:
coho, cutthroat

People Pressures

As Bellingham expands to the north and west, buildings and parking lots are replacing meadows and wetlands. But these undeveloped areas north of Whatcom Community College are more than apartment buildings waiting to happen: they are the headwaters of Silver Creek.

Silver Creek's path takes it westward, all the way to the Nooksack estuary. But Silver Creek is born here–in Bellingham–and we must do all we can to give it a healthy beginning.

Salmon Nicknames

Chinook:	king, tyee, blackmouth, spring
Coho:	silver, hooknose, blueback
Chum:	dog, calico, keta
Steelhead:	rainbow trout, steelie, half-pounder, metalhead
Cutthroat Trout:	sea trout, sea-run cutthroat, red-throat, harvest Trout

Recreation

The Pacific Northwest offers a wide range of outdoor activities, many of which take place in and around water. But recreation activities can have a negative impact on urban streams. Some activities damage crucial riparian vegetation, while others disturb spawning salmon. Even if you don't see adult salmon in the stream, there could be redds of salmon eggs that are easily crushed or juvenile salmon that are struggling to survive.

The outdoors is for everyone. Taking care of urban streams and their residents will help ensure their continued existence and our continued enjoyment.

Recreation

Tread lightly when walking near streams. Native trees, shrubs and plants provide important habitat and help stabilize the stream bank. Disturbing an exposed slope will cause soil to erode and wash into the creek. This erosion can destroy instream habitat for fish and other aquatic life.

Avoid walking in the stream. Salmon spawn in gravel, so if you need to walk in the stream stay on larger rocks and boulders. If you encounter spawning salmon move away as quietly as possible.

- Keep pets out of streams and pick up your pet's waste.
- Leave naturally occurring debris in the stream. Branches, rocks and dead vegetation provide food and cover for fish. Large woody debris slows the water in the stream, creating pools for fish to rest and feed.
- Bring your own wood for campfires, where permitted. Do not take logs and driftwood from in and around streams.
- **STAY ON THE TRAILS** whether you're walking or biking.
- Know and obey fishing rules. Consult the current fishing regulation pamphlet published by the Washington Department of Fish and Wildlife. These rules vary from stream to stream.
- Report anyone you see who is fishing illegally or disturbing spawning salmon.

Silver

Stream Cuisine

Benthic macroinvertebrates are aquatic insects that spend part of their life cycle in fresh water. These insects lack backbones. This includes the larval stages of many insects, aquatic worms, snails, clams and crustaceans. These are what salmon eat. Macroinvertebrates are classified into four categories based on their feeding habits.

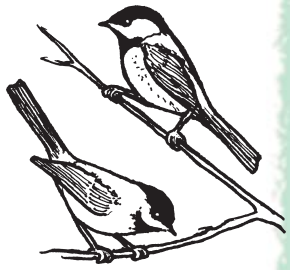
- **Shredders** - feed on large pieces of decaying organic matter such as leaves, twigs and dead animal tissue.
- **Scrapers** - also called grazers, feed on algae growing on rocks and wood.
- **Collectors** - gather and filter fine particles of organic matter.
- **Predators** - capture and consume other macroinvertebrates.

Padden Creek

Watershed Area:
3,862 acres
Headwaters:
Lake Padden
Drains To:
Bellingham Bay
Land Uses:
residential, forestry
commercial, parks
Salmon Present:
chinook, coho, chum
steelhead, cutthroat

People Pressures

Portions of 8 neighborhoods lie within the Padden Creek watershed. These neighborhoods include South Hill, W.W.U., Sehome, Fairhaven, Happy Valley, Samish, Edgemoor and South. Padden Creek is relatively healthy, showing low pollutant levels and good riparian cover.



Did you know?

Chum salmon are sometimes called "dog salmon" because they develop large "canine" teeth during spawning.

Steelhead can return to spawn up to 9 times before they die.

Female chinook can produce up to 14,000 eggs.

Research - Education

Research and education activities help us appreciate and understand the beauty, complexity and value of our urban streams. As important as this is, it is essential to keep in mind that these activities can have a detrimental effect on the streams themselves.

The City of Bellingham Public Works Department provides water quality test kits for loan to groups interested in learning about our local streams. The kits include simple tests for temperature, flow, pH, and dissolved oxygen. Kick nets, gathering trays, forceps and magnifying instruments are also available to groups that want to survey stream bugs (page 24/25). -

Research and Education

Research:

- Contact local governments and organizations working on stream ecology for specific information regarding your stream and study area. These agencies may be able to inform you about regulations pertaining to your study area, and assist you in coordinating your research with other studies (page 24/25).
- Familarize your study team with local species of concern, sensitive areas and sensitive times of the year. Try to avoid conducting your research in those areas and at those times.
- Design your research so as to minimize the amount of time spent in the stream, the amount of disturbance to the stream bed and the distruction of riparian vegetation.
- **Avoid salmon and their redds!** Plan to access the stream only when specific data are needed.

Education:

- Achieve a balance between classroom and outdoor activities. Hands-on activities provide valuable experience, but the stream pays the price. In the classroom, show slides or videos featuring local streams.
- Minimize erosion along the stream by designating a location for learning activities to take place; encourage participants to step lightly.
- Collect as few samples as possible. Although a single activity may not cause damage, repeating the same activities with many different groups can greatly reduce a stream's population of flora and fauna.
- During your activity, stress the importance of reducing impacts on the stream including water usage, pollutants, foot traffic, and litter.

Given a little forethought, research and education programs can be planned to minimize stream disturbance.

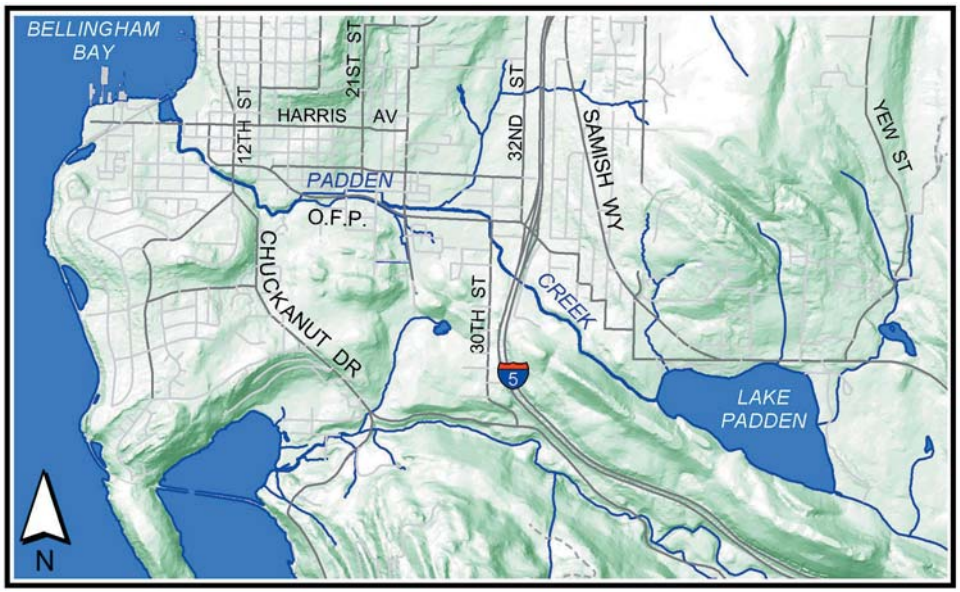
Padden

Trees, Please

- Shade helps control seasonal stream-temperature fluctuation.
- Roots of trees on the bank bind soil particles together to slow bank erosion
- Dead trees fall into creeks and create pools where salmon can rest and feed. Tree leaves fall into the stream providing food for macroinvertebrates (stream bugs), to eat.
- Trees and shrubs provide a buffer area that filters pollutants and soil particles out of the water before it enters the stream.

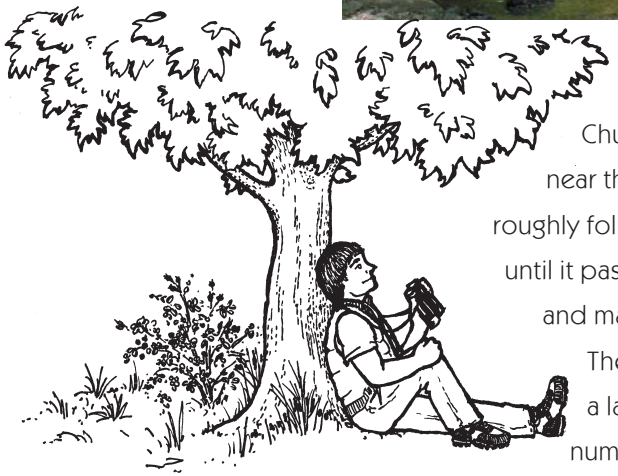
Some plants are not native and can literally choke a stream to death if not controlled. These include:

Himalayan Blackberry	Nightshade	Japanese Knotweed
Reed Canary Grass	Morning-Glory	Purple Loosestrife



Chuckanut Creek

Watershed Area:
4,711 acres
Headwaters:
Hoag's Pond
Drains To:
Bellingham Bay
Land Uses:
forestry, residential
commercial, parks
Salmon Present:
coho, chum,
steelhead, cutthroat



People Pressures

Chuckanut Creek enters the city near the Old Samish Highway, roughly following the course of the road until it passes under Chuckanut Drive and makes its way to Chuckanut Bay. The delta of Chuckanut Creek is a large mud flat containing high numbers of mussels and Dungeness Crab. The delta is almost entirely cut off from the rest of Chuckanut Bay by a railroad track. The railroad limits the exchange of fresh and salt water critical to the salmon life cycle.

Riparian Zone: Relating to or located on the bank of a natural watercourse.
Benefits: A riparian zone provides shade, streambank stabilization, large woody debris and sediment control.

Streamside Homeowners and Businesses

The stream flowing alongside your property is a valuable amenity. You can make the most of your location next to a stream by helping to keep it healthy. Through proper care of stream banks and riparian vegetation, you can enhance your property, prevent erosion problems, preserve water quality and contribute to the survival of fish and wildlife.

Did you find the redd?

The redd is inside the red circle. You can tell because the algae has been scraped off the rocks by the female salmon during spawning.

Streamside Homeowners and Businesses

Dump No Waste

Drains to Stream

An important first step is to properly dispose of products and pollutants instead of allowing them to enter a storm drain or stream.

- *Motor oil and antifreeze*
  Automotive products are extremely toxic to fish. Recycle motor oil and antifreeze through your local collection program. Use cat litter or other absorbent materials to remove spills from paved areas (page 25/26).

- *Paints and solvents*
  Take paint products to a hazardous waste facility. Do not clean brushes near a storm drain or stream.

- *Washing the car*
  Wash your car on grass or gravel or at a commercial car wash. Avoid hosing down paved surfaces.

- *Pet waste*
  Control pet access to streams and vegetation. Dog and cat feces decrease water quality and cause human health problems.

You and your neighbors share responsibility for the health of your stream, both for people's enjoyment and for the wildlife that depend on this fragile waterway.

Chuckanut

Salmon Need Water

Salmon need clean, cold, clear, and consistent water at all stages of their lives:

- Adults - need enough water that is 57°F or cooler, to manipulate past rocks, riffles and other obstacles for spawning.
- Eggs & Alevins - need enough streamflow, below 53°F, to wash through the gravel and provide oxygen.
- Juveniles - need enough water that is below 53°F for feeding and refuge, and higher flows during migration out to sea.

Water temperatures above 60°F are harmful to salmon, making them more susceptible to stress and disease. Higher water temperatures deplete the amount of dissolved oxygen in the water creating a life-threatening environment for salmon.

Squalicum Creek

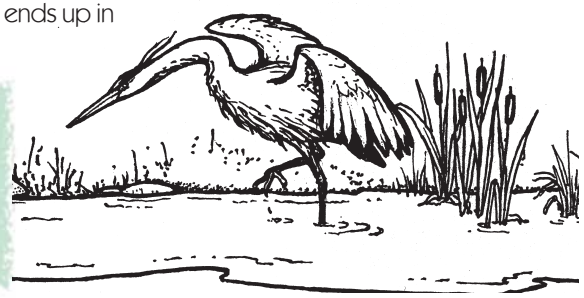
Watershed Area:
15,097 acres
Headwaters:
Squalicum Lake,
Emerald Lake,
Baker Creek
Drains To:
Bellingham Bay
Land Uses:
agriculture, parks,
residential, forestry,
commercial,

Salmon Present: chinook, coho, chum, steelhead, cutthroat Trout

People Pressures

Squalicum Creek travels south and west from Squalicum Mountain until it enters Sunset Pond, just north of Sunset Square shopping center. The creek has unobstructed passage under Interstate 5, and then enters Bug Lake, which is directly north of St. Joseph Hospital. Having passed through Cornwall Park, it roughly follows Squalicum Way to the Port of Bellingham, where it enters Bellingham Bay. It receives runoff from parking lots at Bellis Fair Mall, Meridian Shopping Center, and the Albertson Center, to name just a few. The resulting pollution from stormwater runoff is devastating to fish returning to spawn. Spring Creek and Baker Creek are tributaries of Squalicum Creek. These creeks run through some of Bellingham's most heavily developed areas including the Cordata area, Bellis Fair Mall, and Meridian Shopping Center. Since buildings, pavement and asphalt cover most of these watersheds, rainwater that runs off from this area carries high amounts of pollution that eventually ends up in Squalicum Creek.

Salmon Sizes
chinook: up to135 lbs
coho: up to 31 lbs
chum: up to 40 lbs
steelhead: up to 40 lbs
cutthroat: up to 6 lbs



Stream-Friendly Recipes

Most commercial household cleaners and outdoor gardening chemicals contain toxic ingredients. The following less-toxic alternatives will reduce the harmful effects of chemicals to our lakes, streams and Bellingham Bay.

Fertilizer

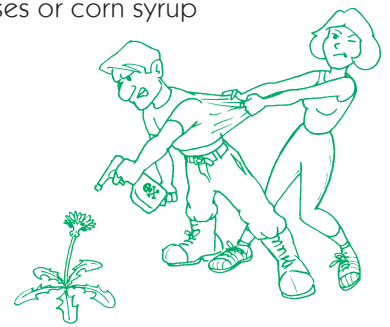
Mix in a 20-gallon, hose-end sprayer. Use every three weeks in the morning within two days of mowing.

- 1 can beer
- 1 cup ammonia
- 1/2 cup dish soap (no chlorine or phosphorus)
- 1/2 cup lawn food
- 1/2 cup molasses or corn syrup

Weed Control

Mix in a hand pump sprayer. Use only on dry days, Spray only on weeds.

- 1 cup dish soap (phosphorus free)
- 1 cup ammonia
- 4 Tbls instant tea



Insect Control

Mix in a 20-gallon, hose-end sprayer. Best when applied after 7 p.m. Use on all plants.

- 1 cup dish soap (phosphorus free)
- 1/2 cup chewing tobacco tea
  (make by brewing 3 fingers per gallon of water)
- 2 Tbls witch hazel
- 4 Tbls instant tea

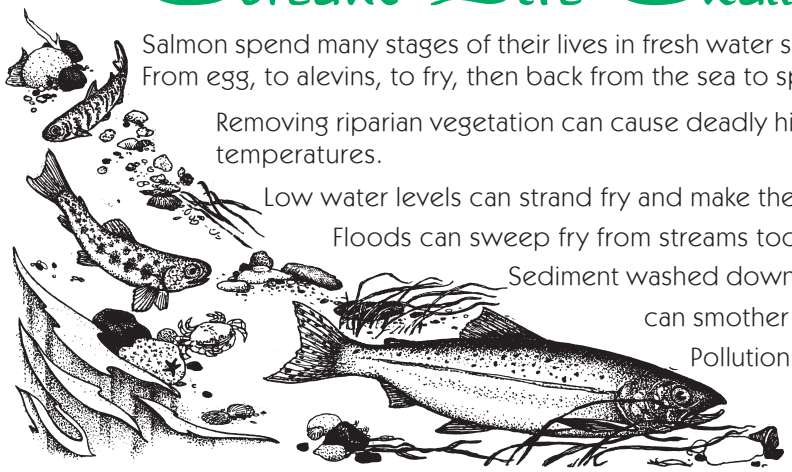
All-Purpose Cleaner

- 1 qt warm water
- 1 tsp liquid soap
- 1 tsp borax
- 1/2 cup vinegar

Kitchen and Bathroom Disinfectant

After using all-purpose cleaner above for kitchen cutting boards and bathroom fixtures, use a white distilled vinegar spray followed by a 3% peroxide spray and wipe clean.

Stream Life Challenges



Salmon spend many stages of their lives in fresh water streams. From egg, to alevins, to fry, then back from the sea to spawn and die.

Removing riparian vegetation can cause deadly high water temperatures.

Low water levels can strand fry and make them easy prey.

Floods can sweep fry from streams too early.

Sediment washed down stream can smother eggs.

Pollution can kill salmon.

(see page 1)

It's best to stay out of streams

		J	F	M	A	M	J	J	A	S	O	N	D
Chinook	Spawning												
(*O.tshawytscha*)	Intragravel Development												
	Juvenile Outmigration												
Coho	Spawning												
(*O.kisutch*)	Intragravel Development												
	Juvenile Outmigration												
Chum	Spawning												
(*O.keta*)	Intragravel Development												
	Juvenile Outmigration												
Steelhead	Spawning												
(*O.mykiss*)	Intragravel Development												
	Juvenile Outmigration												
Cutthroat	Spawning												
(*O.clarki*)	Intragravel Development												
	Juvenile Outmigration												

Squalicum

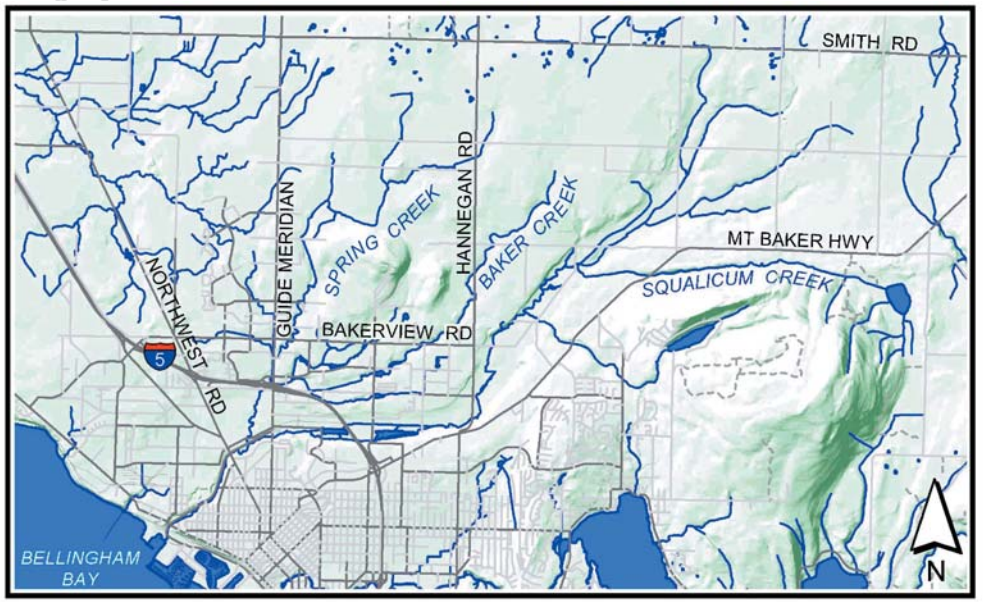
Redds Aren't Red

- The word *redd* refers to the egg nest of various fishes. Salmon build redds out of loose gravel and cobbles on the streambed. Redds are built by the adult female salmon who digs into the gravel with her tail, building the nest. She can take up to 24 hours to build her redd. Redds can be from 3 to 15 inches deep and can range from just a few square feet to over 100 square feet in size, depending on the species.

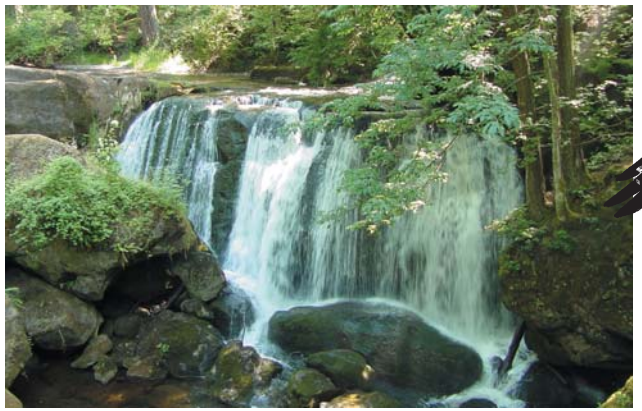
Can you find the redd in this picture?

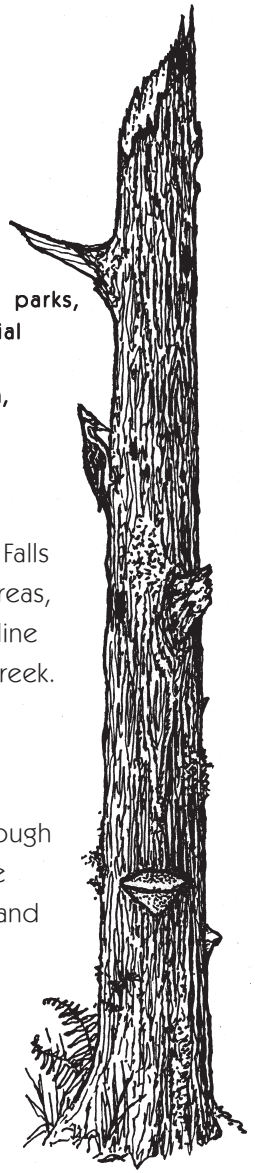
- Freshly dug redds are not easy to spot. They are most likely to be found in shallow stream areas where the gravel is loose. Look for a depression in the gravel followed by a mound of stones that are relatively free of algae and debris, and fine sand.

- **REDD ALERT:** Redds older than one week are hard to see. Once redds have been established in a stream for a period of time, the algae that had been removed from the stones during the digging process will grow back, covering the redd and making it hard to distinguish from the rest of the streambed.



Whatcom Creek





Watershed Area:
5,678 acres
Headwaters:
Lake Whatcom, Fever Creek, Lincoln Creek, Cemetery Creek
Drains To:
Bellingham Bay

Land Uses:
residential, forestry, parks, industrial, commercial
Salmon Present:
chinook, coho, chum, steelhead, cutthroat

People Pressures

Upper Whatcom Creek winds for 2.5 miles through Whatcom Falls Park, a 209-acre city park complete with play fields, picnic areas, and developed trails. The park was the site of the 1999 pipeline explosion, which significantly changed conditions along the creek. Although restoration efforts have reduced the effect of the explosion and fire, complete recovery will take time.
Below Woburn Street, the creek flows behind a strip of car dealerships, passes under Interstate 5, and makes its way through the city to the bay. Just before entering Bellingham Bay via the Whatcom Waterway, the creek passes through Maritime Park and the Holly Street landfill area.

Salmon belong to the genus *Oncorhynchus*. This is derived from the Greek *onchos* meaning "hooked" and *rhynchos* meaning "nose."

Whatcom

Nature's Tapestry

Healthy stream corridors benefit many different species, from humans to honeybees. Salmon are only one part of a whole system that makes up the riparian wildlife corridor. If even one of the strands in this complex web of streamside life is lost, all of us suffer, some in small ways and others in very big ways. The following list is only part of the picture, add to it the amazing diversity of vegetation and macroinvertebrates that characterizes a stream environment:

Birds

Mallard
Bald Eagle
Cedar Waxwing
Belted Kingfisher
Great Blue Heron
Northern Harrier
Downy Woodpecker
Black-capped Chickadee
Killdeer
Steller's Jay
Winter Wren
Western Tanager
Spotted Towhee
American Dipper
Northwestern Crow
Rufous Hummingbird

Reptiles / Amphibians

Pacific Treefrog
American Bullfrog
Rough-skinned Newt
Common Garter Snake
Pacific Giant Salamander
Northwestern Salamander

Insects / Arachnids

Red Ant
Wolf spider
Yellowjacket
Bald-faced Hornet
American Honeybee
Red Admiral Butterfly
Nine-spotted Ladybug

Mammals

Muskrat
Raccoon
Marsh Shrew
Spotted Skunk
American Beaver
Black-tailed Deer
Northern River Otter
Coyote
Red Fox
Norway Rat
Silver-haired Bat
Long-tailed Deer
Common Opossum
Eastern Cottontail Rabbit