



SALMON AND PIPER'S CREEK WATERSHED

2015

*A Resource Guide for
Carkeek Park Salmon Stewards*

CREDITS

Information in this guide was compiled by Seattle Parks and Recreation Environmental Education and Outdoor Learning Staff and Intern.

Last edited: December 2015

Photo by Catherine Anstett.



Seattle Parks and Recreation
Environmental Education & Outdoor Learning
3801 Discovery Park Blvd.
Seattle, WA 98199

Reproduction of this book is for educational purposes only.

Other reproduction is prohibited.

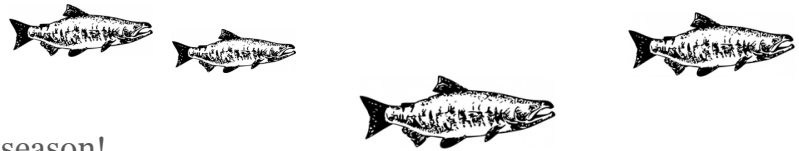
TABLE OF CONTENTS

Contents (click on title to go to page)

Dear Salmon Stewards _____	1
Program Goals _____	2
What is a watershed? _____	3
Piper’s Creek Watershed _____	4
Carkeek Park & Piper’s Creek _____	5
A Word on Chum & Piper’s Creek _____	8
Challenges of Managing an Urban Watershed _____	9
Why Salmon? _____	10
Culture _____	10
Ecology _____	12
Chum Life Cycle Timeline _____	13
Economy _____	16
Threats to Salmon Survival _____	17
What Can I Do to Help Salmon? _____	17
Program Logistics _____	20
Volunteer Roles _____	20
Test Your Knowledge _____	20

INTRODUCTION

Dear Salmon Stewards,



Thank you for volunteering this season!

You play a key role in keeping the connection between people, salmon, and our watersheds alive. From November to December, hundreds of people visit Carkeek Park and are surprised, as well as curious, to see salmon swimming up Pipers Creek.

Salmon are as iconic to the Pacific Northwest as our evergreen forests and have been for the past millennia. Indigenous peoples knew the richness of the salmon's return and to this day, continue to respect and honor their homecoming. Once abundant to the point of making water appear as if it were boiling, salmon runs are slowly being restored; Carkeek Park is one of the few places left to view salmon in an urban setting.

This resource guide is to help reinforce and expand on what you learned during your initial training. We hope you will find the following materials interesting and engaging, even if it is just for your own knowledge. Interpretation techniques and methods are included in a separate guide.

Thanks again for taking an important step towards encouraging people to take care of our waterways, restore our shorelines and maintain healthy salmon runs. With everyone's effort, we will continue to make Seattle a better place, for salmon and for people.

With gratitude,



Seattle Parks & Recreation &
Seattle Public Utilities Staff

**Left: Salmon Stewards, Arielle and
Desi, greet visitors at Carkeek Park.**

SALMON STEWARD EXPECTATIONS

Program Goals

As Salmon Stewards, we hope you will gain a strong understanding of the following concepts so as to inform the public in an effective and engaging way.

1. **Urban Water Quality & Watersheds**
 - a. Watersheds & stormwater best management practices
 - b. Drainage in Seattle today as compared to the hydrology of Seattle hundreds of years ago
 - c. Ways individuals influence water quality and salmon even if they live far away from a creek
 2. **Salmon Biology & Ecology**
 - a. The salmon life cycle
 - b. Different salmon species & habitat needs
 3. **Program Logistics**
 - a. How the Salmon Stewards program works
 - b. What to expect of the program and during volunteer events, including: when and where to show up, what materials to bring, how to sign up for events and cancel, what to do in emergencies
 4. **Carkeek Park & Piper's Creek**
 - a. When and how Carkeek Park was established and what factors have affected or continue to affect Piper's Creek
 - b. Carkeek Park terrain and amenities (do go out and explore, with a map if needed)
-

SEATTLE WATERSHEDS

What is a Watershed?

A **watershed** is the area of land where all of the water that is under it or drains off of it goes into the same place. A watershed carries water "shed" from the land after rain falls and snow melts. Water – along with sediment and other materials such as run-off – is channeled into soil, groundwater, creeks, and other waterways that empty, eventually, into the ocean.



Figure 1. A map of all of Seattle's watersheds and their boundaries.

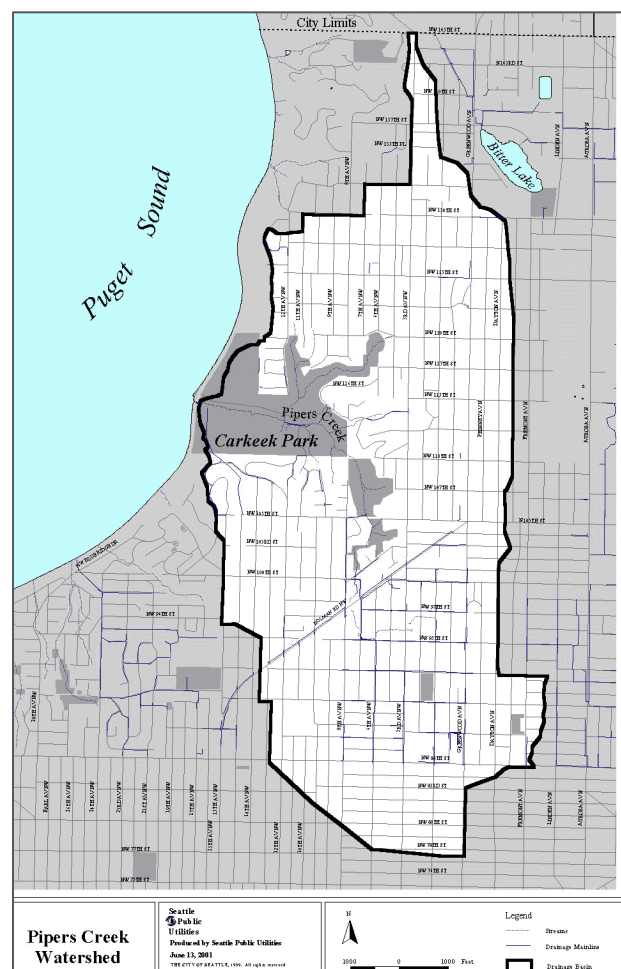


Figure 2. An image of the Pipers Creek watershed boundaries, courtesy of Seattle Public Utilities.

Seattle is the meeting place of two watersheds, the **Green-Duwamish Watershed** and the **Cedar River Watershed**. The Green-Duwamish is located in West Seattle and extends northwest towards Golden Gardens. The remaining part of Seattle is in the

SEATTLE WATERSHEDS

Cedar River Watershed. Both are part of the larger watershed system of Puget Sound.

The five main streams in the city have their own sub-watersheds: Piper's in northwest Seattle, Longfellow in West Seattle, Fauntleroy in West Seattle, Taylor Creek in south Seattle, and Thornton in northeast Seattle (see Figure 1).

Piper's Creek Watershed

Piper's Creek watershed covers 1,604 acres, or 2.5 square miles, in northwest Seattle (see Figure 2). It is the third largest watershed in the city, and is just under one quarter the size of the largest watershed, Thornton Creek. The Piper's Creek channel is roughly 2 miles in length, with an additional 3 miles in tributaries, including one major tributary – the joining point of Venema Creek and Mohlendorph Creek – and 13 minor tributaries.



View of the railroad, beach, and the Puget Sound at Carkeek Park.



Aerial view of the mouth of Piper's Creek (WA Department of Ecology).

The headwaters of Piper's Creek originate on an upland plateau. The creek enters Carkeek Park as it drops down into a steep ravine, eventually emptying into the Puget Sound through a culvert underneath the railroad tracks along Carkeek Park's shoreline.

The Piper's Creek watershed was a heavily forested drainage. Today, nearly 90% of the watershed has been developed into residential and commercial areas and street rights-of-way.

Carkeek Park & Piper's Creek

History can be fascinating, if told through a skilled storyteller. Enjoy the following selected excerpts from Sherry Stripling's article on the history of Carkeek Park, first published in the Seattle Times on August 15, 2004 (but still relevant today).

Carkeek Park, celebrating its 75th birthday, has seen some hard times



Nancy Malmgren has devoted her adult life to Carkeek Park and Piper's Creek Watershed (Photo: Dean Wong, Ballard News Tribune, 2006).

Anyone associated with Carkeek's evolution knows Nancy Malmgren's name. She's a visionary, a catalyst — to the reluctant, a thorn — who helped make government a partner in trying to reverse Carkeek's fate as a downstream dump for urban runoff.

Carkeek at the start of the 20th Century was the utopian home of the artistic back-to-the earth Piper family. Before that it was a day encampment for Native Americans, including the Shilshole Band of the Duwamish, who did not get their wish when they named what became Piper's Creek "Kwaateb," meaning "leave it alone."

For 39 years, Malmgren typed missives that helped lead to the return of spawning salmon in Carkeek Park. When they did, in 1987, it was a spiritual boost for all who wanted to save nature inside the city but weren't sure it could be done.

A contentious start

Carkeek is the park that almost wasn't.

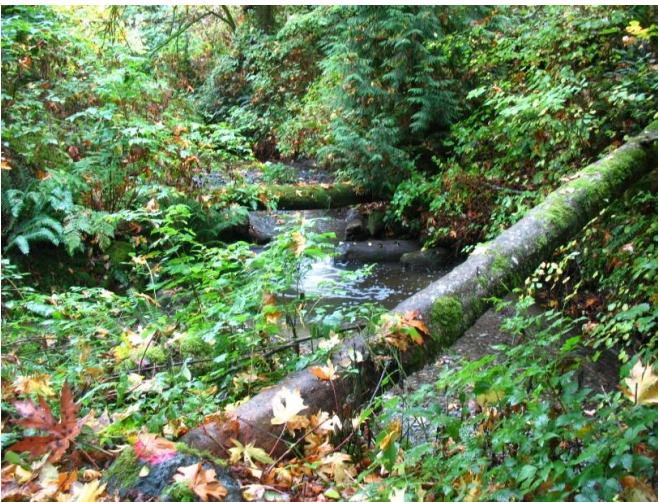
"Carkeek started with dissent and it continues with dissent," Malmgren, 75, said. "But eventually things get mushed out."

URBAN WATERSHEDS

Three quarters of a century ago, Seattle Park Board members threatened to quit if the city pursued purchase of the land for Carkeek. Their lament was familiar: They didn't have enough money to maintain the parks they already had.

The City Council was in a quandary. Pioneer builder Morgan J. Carkeek donated land for the original Carkeek Park on Lake Washington in 1918, but that was condemned in 1926 to become the Naval Air Station at Sand Point. He then offered \$25,000 for a new park, and, after much debate and hard feelings, the city put up \$100,000, which meant the Pipers would be displaced — and not for the first time, either.

Andrew W. Piper, an artist and a socialist member of the Seattle City Council, was a confectionist and baker by trade.



Creek at Carkeek Park (Photo: cascadiadaily.com)
use Piper's Creek as a cooler.

Piper lost his shop in the Great Seattle Fire of 1889 and eventually fell on hard times. The large family moved from their downtown home on Boren Avenue to homestead at a spent lumber camp in what became Piper's Canyon (now a popular access to Carkeek from the southeast by way of the Eddie McAbee entrance).

The Pipers had no plumbing. A spring ran under the cookhouse and the family opened a door in the floor to

Which brings us to water quality.

Carkeek Park is the heart of a watershed with more than 17,000 residents. Except for the 216-acre park, the land is mostly covered by impermeable surfaces — pavement, roofs.

My parents moved into a new development in 1954 on Eighth Avenue Northwest, above the south edge of the park. Like the rest of their neighbors, they used pesticides and fertilizers with nowhere to run but through the ditches to Carkeek.

URBAN WATERSHEDS

A few years ago, new neighbors moved in, ripped up lawn and replaced it with loam and native plants. I tsk-tsked when they planted over their open ditch, saying, "Oh, the city's not going to like that!"

Turns out the city is doing the same thing. Seattle Public Utilities has created pilot projects of natural drainage systems, big vegetated swales on streets above Carkeek. Instead of zooming rainwater that carries pet waste, motor oil and pesticides into culverts and Carkeek's creeks, the new systems mimic the forest duff. Plants and gravel slow the water and catch the yuk in the runoff.

Witness to history

Boyhood memories and hope for future

Walt Venema, 86, remembers fishing the creeks for cutthroat trout with his brother, Harry Jr. ("Jerry") after the boys moved in nearby in 1919. They used "bent pins, angle worms and No. 50 thread — and boy did we ever catch them."

In 1927, the boys chased what is believed to be the last spawning salmon — or at least the last that anyone is credited with seeing — from Piper's Creek through a culvert to Venema Creek (officially named later for their late father). A few years later, the deteriorating water quality reached the Venema house, making the family sick.

Venema Creek today is the cleaner of the two creeks because it runs by more residences, fewer parking lots. Hundreds of school kids raise chum fingerlings. After the fish spend two weeks in an imprint pond, where they get the taste and smell of Venema Creek, they fight their way back to Carkeek Park three to four years later to spawn, delighting the children who released them.

All is not perfect. You still wouldn't want to stick your hand in either creek and then plunge it into a bag of potato chips. Trees in the forest are aging and need new growth and protection from invasive plants. But because of the work started by the Carkeek Watershed Community Action Project 25 years ago, many people are working to bring change.

Read the full article [here](#).

URBAN WATERSHEDS

A Word on Chum & Piper's Creek

Chum salmon (*Oncorhynchus keta*), also called “dog salmon” or “keta,” are the **second largest species** of salmon with Chinook being the largest. Chum comes from the Chinook Jargon term *tzum*, meaning "spotted" or "marked." *Keta*, which means “fish,” comes from the Nanai people of Kamchatka in eastern Russia, indicating the importance of the species to indigenous people around the Pacific Rim.



Historically, Piper's Creek supported **coho, chum, steelhead, and cutthroat trout** runs. However, the last wild salmon pair was seen in 1929.

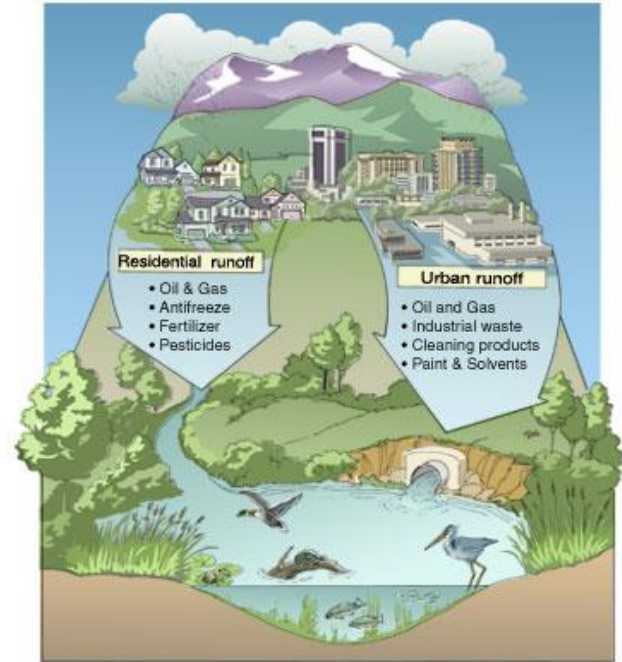
Volunteers with the Carkeek Watershed Community Action Project (CWCAP) have been working to restore the creek since 1979. After attempting to restore the coho population, CWCAP in partnership with the Washington Department of Fish & Wildlife (WDFW) selected chum as a more viable species to restore. That is because of all Pacific salmon, young chum have the shortest residency in fresh water before traveling downstream to salt water. Therefore, they have a shorter exposure to the pollutants from urban runoff.

The **Suquamish Tribe's Grover's Creek Hatchery** provide chum as eyed eggs for the Salmon in the Classroom programs and as fingerlings for release into Piper's Creek. The chum fingerlings are first introduced into the Les Malmgren imprinting pond near Venema Creek. The young chum are held in the pond and fed between 3-4 days to imprint them with the "smell" of the creek system and help them to return as adults to spawn. To increase their survival rate, the fingerlings are released at night and at high tide to avoid predators and to help them reach the security of the deeper off-shore waters of the Puget Sound and eel grass beds south of Carkeek Park.

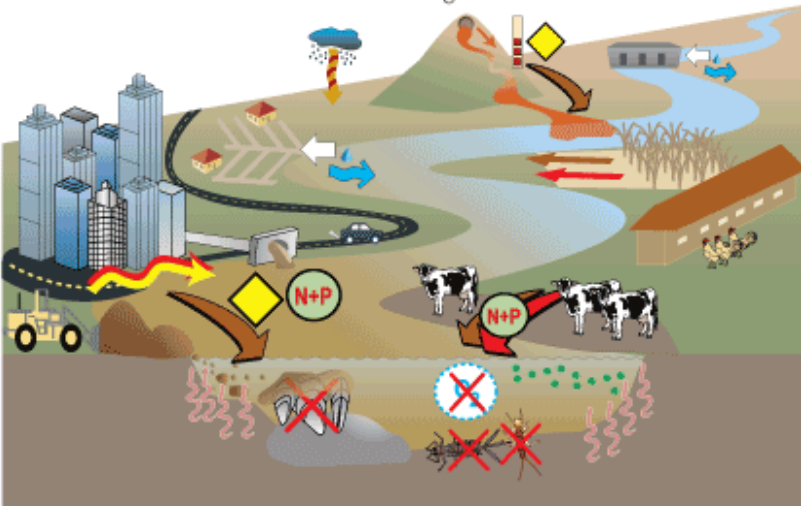
URBAN WATERSHEDS

Challenges of Managing an Urban Watershed

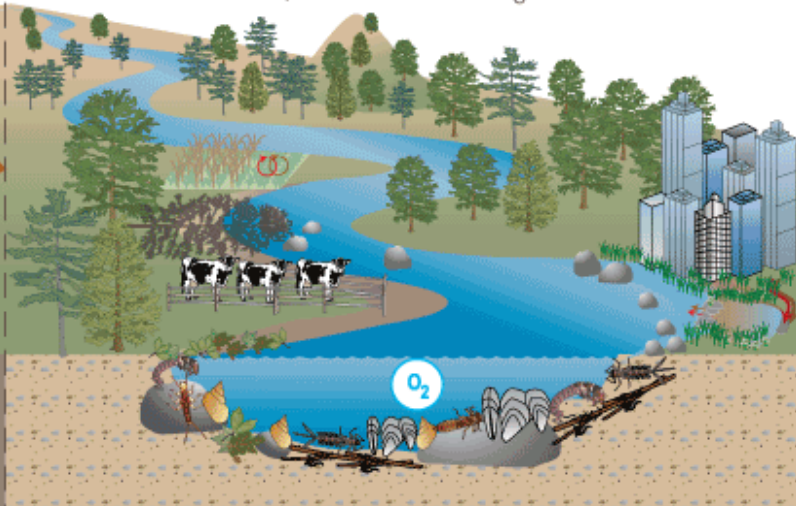
There are many challenges to maintaining a healthy, urban watershed. See the two graphics on this page that detail common pollutants of watersheds, indicators of water quality, and actions people can take to improve water quality.



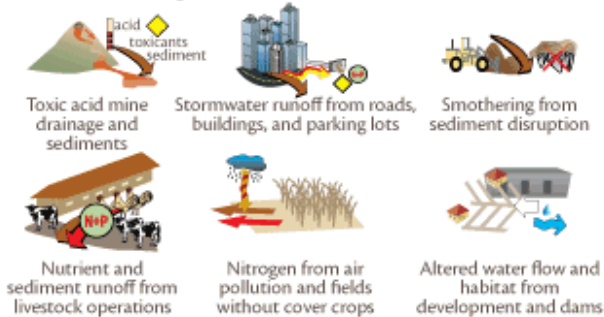
Unhealthy Streams:
Land-based activities can increase nutrients, toxicants, and sediments entering streams



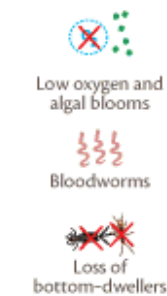
Healthy Streams:
Well-managed land-based activities will reduce the amount of nutrients, toxicants, and sediments entering streams



Factors that degrade streams:



Unhealthy streams include:



Factors that protect streams:



Healthy streams include:



IMPORTANCE OF SALMON

Why Salmon?

Wild Pacific salmon are an integral part of the Pacific Northwest's cultural, ecological, and economic identity and legacy.

The cultures, intertribal interactions, fishing technologies, and very religions of the Pacific Northwest tribes were all impacted and influenced by salmon. Salmon also play a key role in returning ocean nutrients to the rivers and streams where they were born, feeding wildlife and even the forests with their bodies. These fish have been an important part of the economies of the region for thousands of years, from the ancient indigenous trade routes to modern commercial fishing (adapted from critfc.org).

Culture



Photo: [Richard Walker](#), [Indian Country Today Media Network](#)

Adam Charles, holding his paddle, asks for permission for the Port Gamble S'Klallam canoe family to come ashore during [Salmon Homecoming](#), on the Seattle waterfront.

Salmon have long held spiritual significance for Pacific Northwest tribes. The annual migrations of salmon out to and back from the ocean provide a steady pulse, and

IMPORTANCE OF SALMON

structure to support rituals and ceremonies. Salmon are also iconic figures in art, performance, and dance. [Explore the ways](#) in which salmon are significant to Columbia River Basin Tribes.

Why are salmon important to you?

Why are salmon important to your friends? Your family? To the visitors of Carkeek Park? Find out how people relate to salmon or perhaps another iconic animal or source of food. You may be surprised how much people, especially children, know.



Billy Frank Jr. Nisqually environmental leader & activist who led efforts to gain fishing treaty rights, on the Nisqually River. (Photo: Ann Yow / The Seattle Times, 1983)

IMPORTANCE OF SALMON

Ecology

Anadromous species like salmon are fish that migrate from the ocean back to freshwater to spawn, creating an ecological link between fresh water and marine ecosystems. Each fish dies shortly after spawning, and the nutrients locked in its flesh return to the ecosystem, nourishing animals up and down the food chain with high-energy oils and rejuvenating the soil with nitrogen and phosphorus from the sea. These kinds of connections to many ecosystems make the salmon a **keystone species**.

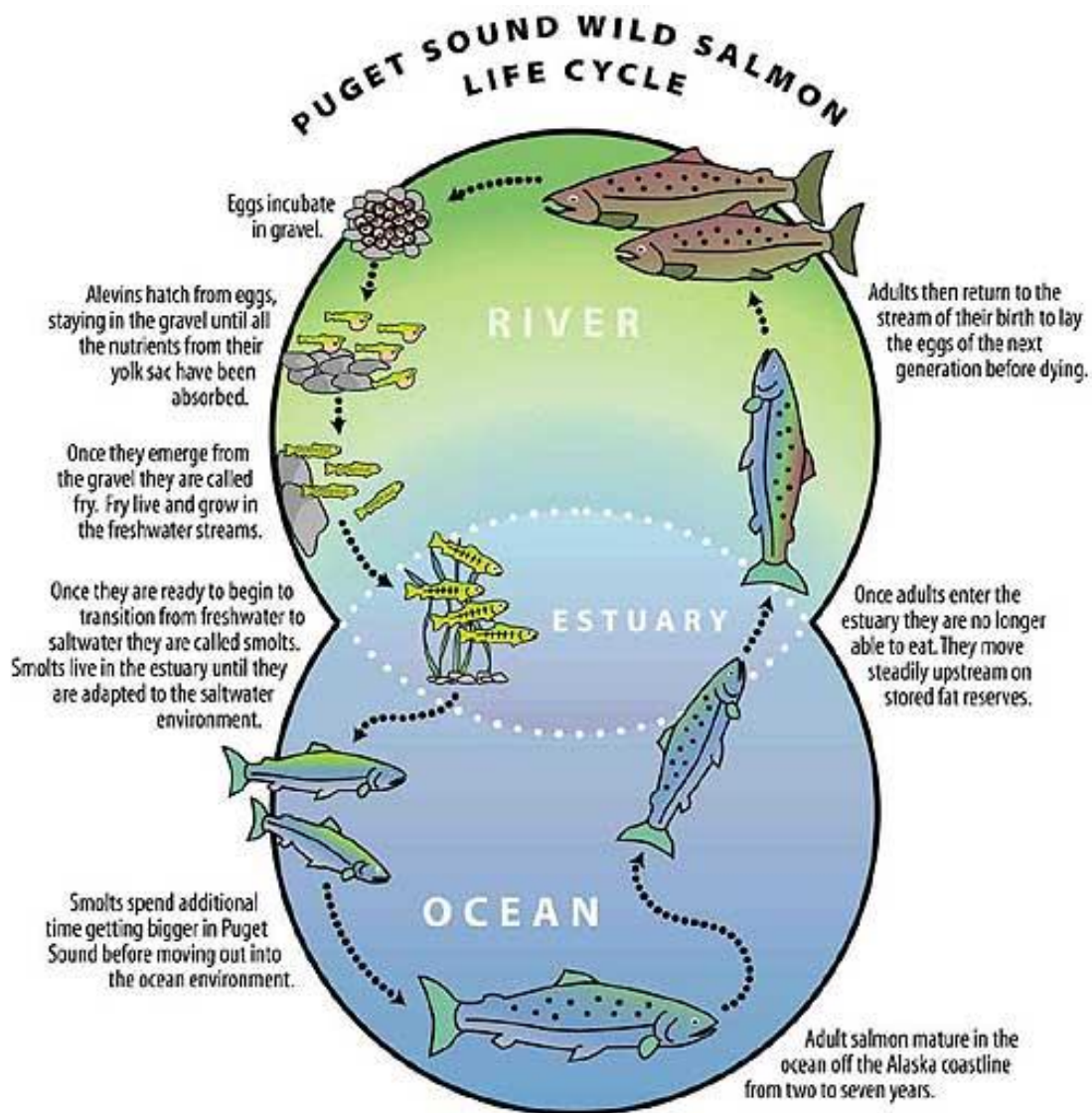


Illustration created by the GIS and Visual Communications Unit,
King County Department of Natural Resources

IMPORTANCE OF SALMON

Chum Life Cycle Timeline (adapted from [WDFW](#))

YEAR ONE

November – March **Incubation**



- Female chum deposit eggs in the stream gravel during the November - December spawning season.
- The chum embryos develop within the eggs and hatch after approximately **four months**.
- After about a **month and a half**, the *alevins* emerge from the stream bottom as 1 to 1½ inch long fry.

February – July



Migration to Sea

- The majority of newly emerged *fry* immediately begin downstream migration to marine waters.
- When the fry first enter saltwater they assemble in small schools and reside close to shore to avoid predators.
- As the young fish grow, they gradually move to deeper waters and migrate towards open ocean waters.

May – December



Ocean Growth

- Juvenile chum migrate generally northward along the Washington and British Columbia coastlines.
- Their ultimate destination is the Gulf of Alaska, where they will feed and grow for the next **2 to 3 years**.
- The rate of mortality drops as the fish increase in size. Predation is the primary impact on survival.

YEARS THREE TO FIVE

January – December



Ocean Growth

- The fish that will mature and spawn at age 3 begin their migration back to Washington waters.
- Chum that will mature in coming years as 4- and 5-year old fish continue to feed and grow in the ocean.

September – November

Return to Stream

- As the 3-year old chum salmon return to coastal waters some fall prey to predators.

IMPORTANCE OF SALMON



- Recreational, commercial, and tribal fishers manage the returning chum populations. Assuming a healthy population, the harvest rate will be about 65%.

**November –
December**



Spawning

- Most chum spawning occurs during November and December. The spawning process (see below) averages about **10 days** from start to finish.
- Females select preferred sites for spawning and begin building a nest or *redd* by displacing gravel with her body and tail. Males compete with one another for access to the female.
- Fertilized eggs are deposited in multiple pockets within the redd over a span of several days.
- When the redd is complete the female will guard the site until she weakens and dies. Males continue to compete for mates until they die.

Salmon are food for many predators (including humans), as well as for scavengers and decomposers. See the following table for some examples.

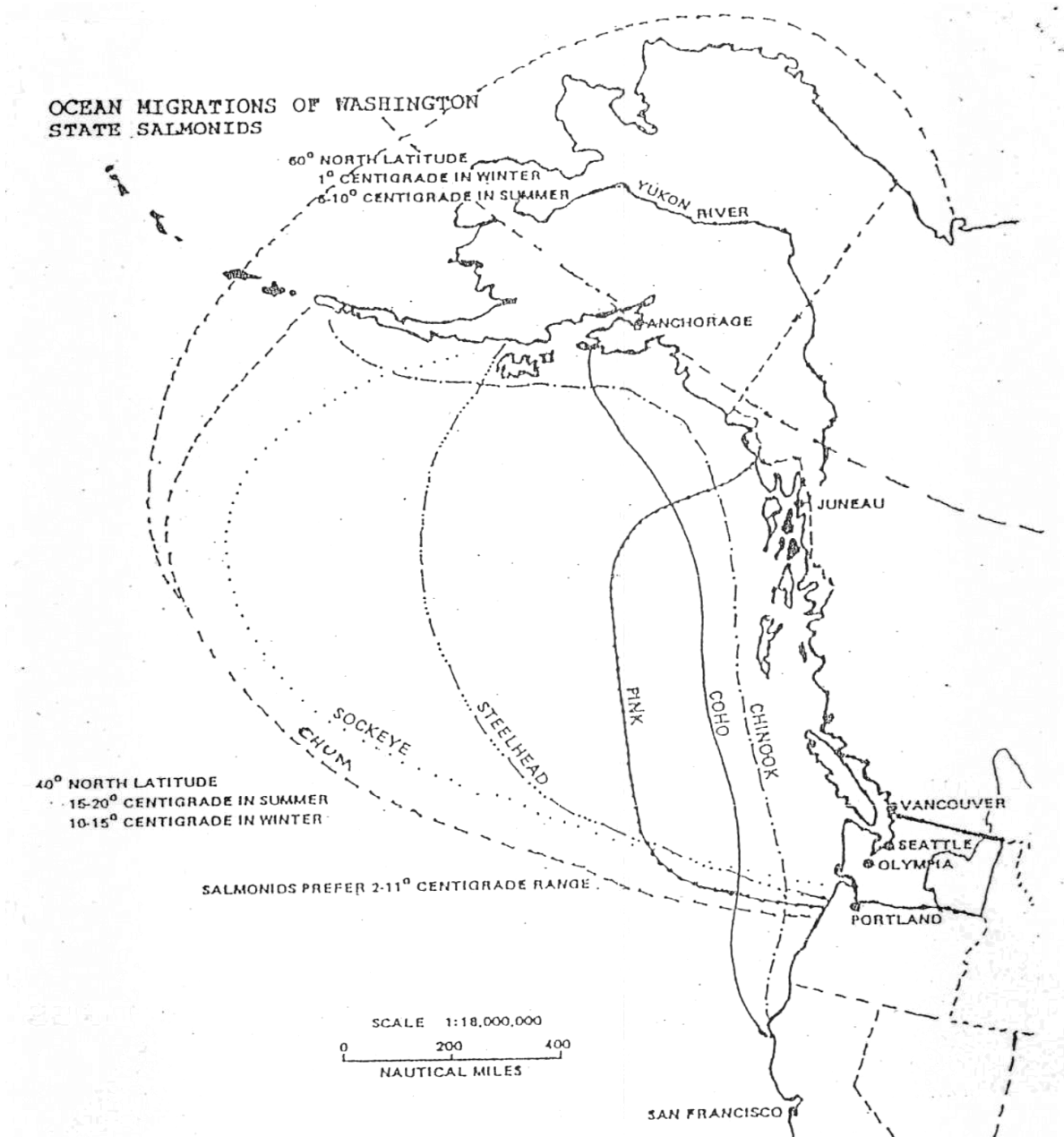
EXAMPLES OF ANIMALS THAT FEED ON SALMON IN VARIOUS ECOSYSTEMS

Ocean	Estuaries	Freshwater
sharks	river otters	*bears
fish	sea lions	*raccoons
seals	bears	*eagles
sea lions	birds	*sport fishers
dolphins		**ravens
orcas		**coyotes
sport & commercial fishers		**trout
		**juvenile salmon
		**insects
		**+gulls
		+ducks
		+wading birds

* as live adult salmon, ** as dead adult salmon, + as eggs, fry, and alevin

IMPORTANCE OF SALMON

Salmon utilize a variety of different habitats during their lives—stream, river, estuary, ocean—and if any of these systems is compromised, the survival of the species is jeopardized. However, even among distinct runs of salmon, some fish will have different survival strategies, migrating earlier or later, faster or slower. Depending on fluctuating river conditions, one year the early migrators may be more successful, and the next year the lingerers might see greater survival. In this way we are reminded that complexity and diversity are important.



IMPORTANCE OF SALMON

Economy

As European and Asian settlement began in the West, salmon grew to be an important **food source and economic resource** for more people in addition to Pacific Northwest indigenous tribes.

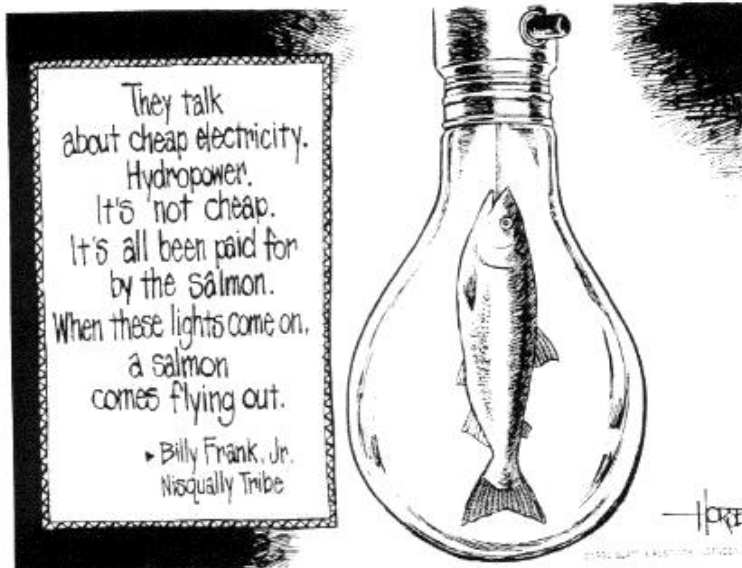


Commercial fishers lift a net full of pink & chum salmon in Chatham Strait, Alaska (photo: John Hyde / Juneau Empire).

The first salmon cannery began operating in 1864 on the banks of the Sacramento River, and dozens of operations had popped up on the Klamath, Columbia and more west coast rivers within decades. **Ocean trolling** for salmon began around the turn of the century, meaning that commercial fishermen could catch salmon in the prime of life, before they started losing fat and decomposing during the arduous swim upriver.

Advances in refrigeration technology made fresh fish accessible to new markets, and so the commercial fishery continued to thrive. In this way, entire port communities developed their foundations in commercial and recreational salmon fishing.

From the fishing boats to the ice plant to the truckers, to the bait shop to the local restaurants and grocers, the economy is dependent upon the abundance of this fish.



THREATS TO SALMON SURVIVAL

Threats to Salmon Survival

The biggest threats to salmon are the 4 Hs:

- **Habitat loss** and degradation. This problem is compounded because salmon utilize different types of habitat throughout their lives.
- **Hydroelectric dams** on migratory rivers
- **Over-harvest** of rare stocks
- Competition with **hatchery** fish.

Did you know that **copper from car brake pads negatively impact salmon?** Check out this [WSU article](#) to find out more (and consider replacing your brake pads if you own a car).

What happens to salmon when stormwater drains into a creek?

Find out by watching [these videos](#) of salmon in Seattle creeks after a heavy rainfall.

What Can I Do to Help Salmon?

1. Volunteer in the community to do projects that help salmon such as planting native plants along rivers and streams or removing invasive plants. Congratulations, you have done this first step as a Salmon Steward!

2. Limit your water use and leave more for salmon.

- Use as little water as possible for washing, cleaning, flushing, showering, etc.
- Water gardens and lawns in early morning and evening when more water is absorbed and less is wasted.
- Use native plants in landscaping, which require less water.
- Use a mulching lawn mower. Set lawnmower to 2-3" height to get deeper, healthier grass roots that will retain moisture.

3. Limit electric consumption. Electricity is produced at dams, which can block salmon migration. Limiting your electrical use decreases the demand for dam-generated electricity.

- Buy energy efficient electrical appliances.
-

THREATS TO SALMON SURVIVAL

4. **Limit pesticide use.** Fertilizers reduce good fish habitat by encouraging the growth of plants in water that then deplete oxygen for fish.

- Avoid use of weed killers. Pull weeds by hand. If you grow vegetables, space them strategically to cut down on time and effort spent weeding.
- Store chemicals in their original, sealed containers where there is no chance for them to leak into the soil or storm drains.
- Landscape with pest-resistant plants so you won't need bug and weed killers.
- Never pour left-over chemicals down drains. Find out where to dispose of them.
- Use slow release natural fertilizers.

5. **Watch chemicals used in cleaning solutions.** Phosphates used in many cleaning supplies encourage plant growth in water, which use the oxygen fish need.

- Use only low phosphate detergents for cleaning your house.
- Pump septic tank every 2-3 years. Inspect annually. Avoid flushing non-biodegradable items and toxics.
- Properly dispose of waste, especially oils, paints, antifreeze. If dumped in a storm drain, chemicals can go directly into rivers and lakes and can kill fish.
- Sweep driveways and sidewalks with a broom, not a hose. Washing sidewalks and driveways sends car pollutants into storm drains and then into rivers.
- Wash car on lawn so water won't drain to street or storm drains. Or go to a commercial car wash where waste water is recycled.

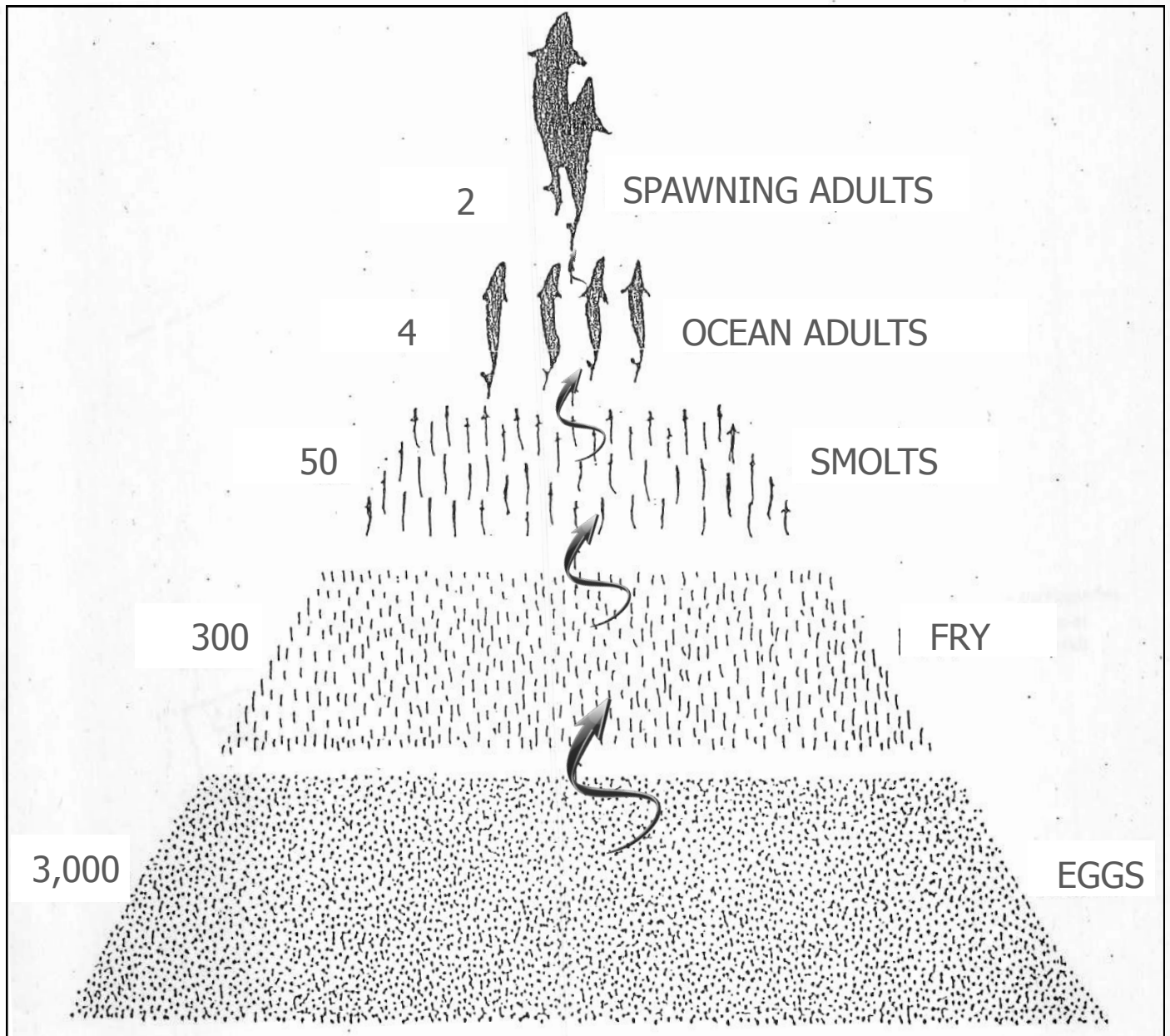
6. **Take care when living near water.**

- Scoop up all pet waste and flush it down the toilet. Pet waste is a major source of water pollution.
- Plant native plants along streams. The plants shade the water for salmon.
- Use natural ground cover or porous materials such as gravel or bark instead of asphalt and concrete for paths and driveways.
- Try to keep shorelines as natural as possible. Watch this short animated movie about the effects bulkheads have on fish.
- Ensure roof runoff soaks into the ground. Avoid piping to ravines or streams as it causes erosion.

Information was taken from the Washington Department of Fish and Wildlife's "Your Impact on Salmon/Fish a Self-Assessment."

THREATS TO SALMON SURVIVAL

Even with all the anticipated threats to survival – namely predators – salmon reproduce such that out of 3,000 eggs, only two adults will survive to replace the original spawning pair as illustrated below.



PROGRAM LOGISTICS

Program Logistics

Now that you know everything you could have imagined knowing about salmon and the Piper's Creek watershed, here is some important information on logistics.

- The Salmon Stewards program runs **every Saturday & Sunday** as soon as the chum start to return, usually from the beginning of **November – December**.
- Plan to **arrive at 10:45am** and **leave at 2:15pm** to account for set up & clean up. The program itself runs from 11am – 2pm.
- Meet at the **Nancy Malmgren Environmental Learning Center** (950 NW Carkeek Park Rd.) to sign in and later on debrief.
- All stewards are expected to attend training and volunteer for **at least 2 shifts**.
- If you need to cancel or change your shift, please give us **as advanced notice as possible** since we and park visitors are relying on you to show up. Contact Bill at bill.malatinsky@seattle.gov or call 206.684.5999.

Volunteer Roles

Feel free to rotate between the following roles and locations at anytime.

1. “A Closer Look at Salmon” Station Greeters (at least 2 volunteers)

You are the most visible of the stewards with tables, props, and signs. Expect to actively engage with visitors and share your knowledge with them (and vice-versa).

2. Creek Rovers (everyone else)

Feel free to rove along the creek solo or with another steward. Potential spots to station yourself, from east to west along Piper's Creek, include:

- **Pump station viewpoint** (moderate traffic)
 - **Viewpoint near the salmon station table** (high traffic)
 - **First footbridge** (high traffic)
 - **Any viewpoint where there is salmon activity** (moderate traffic)
 - **Overpass bridge** – slightly more difficult to access because of rocks
 - **Wetland** (low-moderate traffic) – gently remind visitors, no dogs allowed
 - **Beach** (low traffic) – encourage visitors to maintain a respectful viewing distance of 10-15 paces from stream bank as to not spook the salmon
-