Introduction to Salmon Biology

This section will provide information on the biology and life history of northwest salmon, starting with the natural life cycle of salmon and continuing with more specific information about species you may encounter on a Salmon Watch field trip.

Table 1: "Where Are The Salmon When?" provides a generalized life history pattern for Salmon, Steelhead and Trout in the Pacific Northwest. Some of the information included is timing of adult returns from the ocean, spawning location, a description of fresh water habitat and when juvenile migration to the ocean occurs.

Table 2: "Habitat Requirements for Salmonids in Northern Coastal Streams" includes specific habitat information for Fall Chinook, Spring Chinook, Coho, Chum, Winter Steelhead, Summer Steelhead and Sea Run Cutthroat Trout. Some of the habitat components listed are spawning location, substrate size, water depth and velocity, dissolved oxygen and water temperature.

This information is intended to support the volunteers leading the Salmon Biology teaching station in the field. It will also help bring together the data and observations of students as they start their stream assessments and evaluations of healthy salmon habitat.

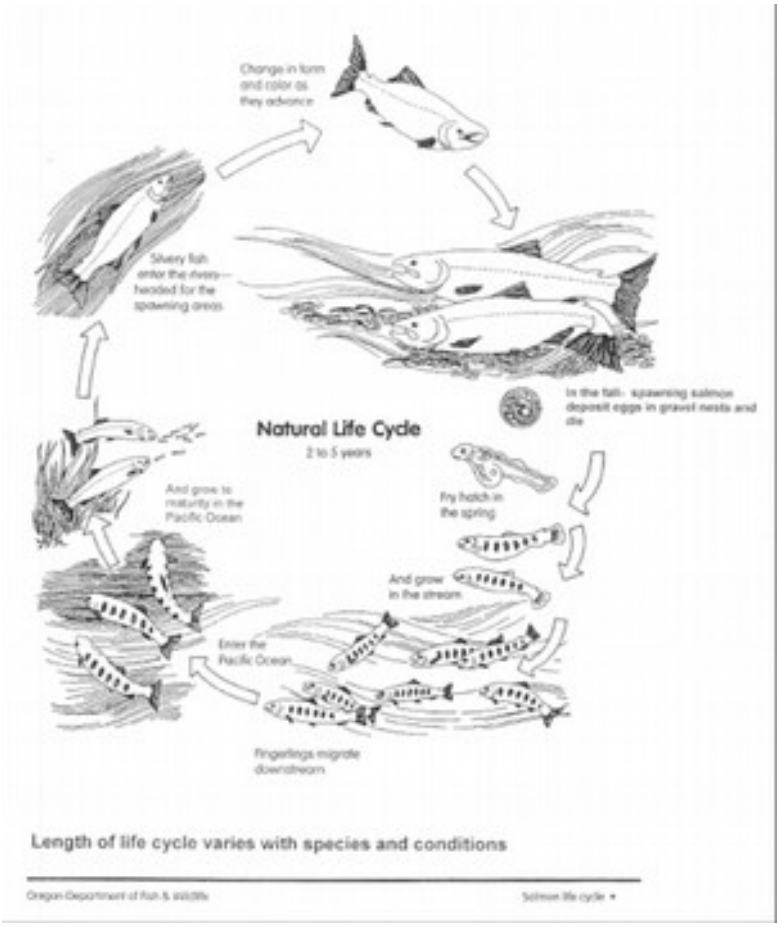

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Table 1. WHERE ARE THE SALMON, WHEN?

Generalized Life History Patterns of Salmon, Steelhead, and Trout in the Pacific Northwest

	ADULTS RETURN TO STREAMS FROM OCEAN	SPAWNING LOCATION	EGGS IN GRAVEL**	YOUNG IN STREAM	FRESH WATER HABITAT	YOUNG MIGRATE DOWNSTREAM	TIME IN ESTUARY	TIME IN OCEAN	ADULT WEIGHT (average) English(Metric)
COHO	Sept. –Jan	coastal streams shallow tributaries	Sept -May	1+ years	tributaries, main stem side channels, and slack water	Mar-Jul (2nd year)	few days to one month	2 years	5-20 lb (8)
CHUM	Sep. –Jan	coastal rivers and streams, lower reaches	Sep-Mar	days-weeks	little time spent in freshwater	shortly after young leave gravel	7-14 days	2.5-3 years	8-12 lb. (10)
CHINOOK Spring run Summer run Fall run	Jan. – July Jun-mid Aug Aug. – Nov.	main stem-large and small rivers	Jul-Jan Sep-Nov Sep-Mar	1+ years 1+ years 3-7 months	main stem-large and small rivers	Dec – Mar. (2nd year) Spring (2nd year) Dec. - Mar (2nd year)	days-months	2-5 years	10-20 lb. (15) 10-30 lb. (14) 15-40 lb.
CUTTHROAT (Coastal-Sea Run)	Jul-Dec	tiny tributaries of coastal streams	Dec-Jul	1-3 years (2 avg)	tributaries	Mar-Jun (of 2nd-4th yr)	days-months	0.5-1year	0.5-4 lb (1)
PINK	Jul-Oct	main stem of streams, tributaries, and lower reaches	Aug.-Jan	days-weeks	little time spent in freshwater	Dec-May	few days	1.5 years	3-10 lb (4)
SOCKEYE	Jul-Aug	streams, usually near lakes	Aug. –Apr	1-3 years	lakes	Apr-Jun (of 2nd-4th yr)	few days	1-4 years	3-8 lb (6)
STEELHEAD··· Winter run Summer run	Oct-Jun Jun-Oct (Columbia) Apr-Nov (Coastal)	tributaries and small and mid-size streams and rivers	Feb-Jul Dec-May Feb-Jun Feb-Jul	1-3 years 1-2 years 1-2 years 1-3 years	tributaries	Mar-Jun (of 2nd – 5th yr) Spring & Summer (of 3rd-4th yr) Mar-Jun (of 3rd-5th yr) Mar-Jun (of 2nd-5th yr)	less than a month	1-4 years	5-28 lb (8) 5-20 lb 5-30 lb (8)

Adapted by Pacific State Marine Fisheries commission. Sources: Ocean Ecology of North Pacific Salmonids, Bill Pearcy, University of Washington Press, 1992 Fisheries Handbook of Engineering Requirements and Biological Criteria, Milo Bell, U.S. Army corps of Engineers, 1986, Adopting A Stream, A Northwest Handbook, Steve Yates, Adopt-A Stream Foundation, 1988

Table 2. Salmonid Hab[illegible] Requirements (continued)
Oregon Co[illegible]l Streams
Spawning (including upstream migration)

	Migration	Spawn Time	Location	Substrate Size	Water Depth	Water Velocity	Dissolved Oxygen	Spawning Water Temp	Percent Fines Tolerable	Notes
Chinook – Fall	Sep-Dec	Oct- Jan	Mainstem and large tributaries	Pea to orange (1.3-10.2 cm)	Extremely variable 0.05-7 m	0.1 – 1.5m/s; max is 2.4 m/s	> 5 mg/l	5.6-13.9°C	Fines (<6.4 mm) make up less than 25% of substrate	Large body size limits movement over barriers
Chinook-Spring	Mar-Jun	Late Aug -Oct	Upper mainstem streams	Pea to Orange (1.3-10.2 cm)	Extremely variable 0.05-7m	.21-1.5 m/s; max is 2.4m/s	>5 mg/l	5.6 –13.9°C	Fines (<6.4 mm) make up less than 25% of substrate	Require deep water for travel-pools for summer habitat
Coho	Sep-Jan	Sept - Jan	Small tributaries	Pea to Apple (1.3-9.0 cm)	0.18 – 1 m	0.08 – 0.11 m/sec; max is 2.4 m/s	>8 mg/l	4.4-14°C	Fines (<6.4 mm) make up less than 25% of substrate	Primary target for many sport fisherman
Chum	Oct -Dec	Nov-Dec	Lower mainstem and tributaries	Pea to Orange (0.5-10.2 cm)	13-50 cm; ideal 21cm	0.21-0.83 m/s; max is 2.4 m/s	>5 mg/l; above 80% saturation best	7.2-12.8°C	Fines (<6.4 mm) make up less than 25% of substrate	Strong swimmer but doesn't jump
Steelhead-Winter	Nov-May	Dec -May	Small & mid-size tributaries with moderate gradient	Pea to Apple (0.5-9.0 cm)	> 18 cm	<2.4 m/s	>5 mg/l	3.9-9.4°C	Fines (<6.4 mm) make up less than 25% of substrate	May spawn more than once
Steelhead-Summer	May-Jul	Jan-Jun	Small & mid-size tributaries with moderate gradient	Pea to Apple (0.5-9.0 cm)	>18 cm	<2.4 m/s	>5 mg/l	3.9-9.4°C	Fines (<6.4 mm) make up less than 25% of substrate	May spawn more than once
Sea Run Cutthroat Trout	Jun-Oct	Dec-Feb	Small headwater tributaries 1st & 2nd order streams	Pea to Golf Ball (0.5-7.5 cm)	0.01 –1 m; 10-15 cm best	0.11-0.90 m/s; max is 2.4m/s	>5 mg/l	6-17°C; best is 10°C	Fines (<6.4 mm) make up less than 25% of substrate	May spawn more than once

Salmonid Ha' · Requirements
Oregon Co.. .al Streams

	Incubation			Rearing					Status
	Incubation Temp.	**Fry Emerge**	**Fry Habitat**	**Juvenile Habitat**	**Preferred Temp.**	**Freshwater Residency Period**	**Estuary Residency Period**	**Notes**	**2004 Status**
Chinook – Fall	0.0-20°C; best 5.0-14.4° C	Mar-May	Stream; river edges	Deeper water in main river channel	7.3-14.6° C Growth stops at 20.3° C lethal at 25.2° C	Days to 2 or 3 months Fall smolt	Extensive 5-6 months April-Oct.	Estuaries play a vital role in survival of young	Healthy and stable
Chinook-Spring	0.0-20°C; best 5.0-14.4° C	Feb-Mar	Stream; River edges	Deeper water in main river channel	7.3-14.6° C Growth stops at 20.3° C lethal at 25.2° C	Days to 2 or 3 months Fall smolt	Extensive 5-6 months April – Oct	Large body size limits movement over barriers	Depressed
Coho	4.4-13.3° C	Feb-June	Backwater pools and stream edges	Pools in summer, off channel alcoves, ponds, dam pools with complex cover in winter	11.8 – 14.6° C Growth stops at 20.3° C Lethal at 25.8° C	One year Spring smolt	Move through 2-9 days, sometimes longer	Low pH (<5.01) can be lethal to alevins	Depressed
Chum	4.4 – 13.3°C	Late Mar-Apr	Move directly into estuary	High sediment levels (15.8-54.9 g/l) will kill juveniles	6.7 – 14.6°C Growth stops at 20.3°C lethal at 25.8°C	Hours to few days, leave quickly Spring smolt	2-32 days	Use estuaries immediately for food and adjustment	Depressed
Steelhead Winter	4.4- 13.3° C	May – June	Stream Edges	Pools, riffles, and runs of tributary, streams, complex habitat with, large woody debris, (LWD) preferred	7.3-14.6°C Growth stops at 20.3° C Lethal at 24.1° C	2-3 years Spring smolt	Move through in days	Good habitat =small and large wood complexity	Depressed
Steelhead-Summer	4.4 – 13.3°C	May-June	Stream edges	Pools, riffles, and runs of tributary, streams, complex habitat with, large woody debris, (LWD) preferred	7.3 – 14.6°C Growth stops at 20.3° C lethal at 24.1°C	2-3 years Spring smolt	Move through in days	Summer steelhead require deep cool pools to live in before spawning	Primarily hatchery fish
Sea Run Cutthroat Trout	6.1 – 17.2°C	Mar-May	Stream Edges and backwater pools, large wood, (LWD) important	Prefer pools but are often displaced by coho or steelhead, low velocity pools, and side channels	9.5-12.9°C Growth stops at 20.3°C lethal at 23.0°C	2-4 Years Spring smolt	Used extensively as adults before upstream migration	Rearing in estuary is common	Depressed

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2. Groot, C. and L. Margolis, 1991. *Pacific Salmon Life Histories*. UBC Press, Vancouver, British Columbia
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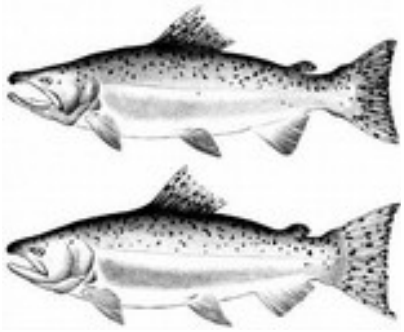


CHINOOK SALMON

SCIENTIFIC NAME: Oncorhvnchus tshawvtscha, ("on-ko-rink-us tau-wee-cha") from the Greek word onkos (hook), rynchos (nose) and tshawytscha (the common name for the species in Siberia and Alaska).

COMMON NAMES: King salmon, tyee salmon, Columbia River salmon, black salmon, chub salmon, hook bill salmon, winter salmon, tules and black mouth.

DESCRIPTION: The chinook salmon is blue-green on the back and top of the headwith silvery sides and white bellies; black spots on the upper half of its body with gray/black mouth coloration. Up to 58 inches in length and weigh up to 129 pounds; although chinook salmon are generally up to 36 inches in length and weigh up to 30 pounds.

LIFE CYCLE: Spawning in streams that are larger and deeper than other salmon utilize, chinook salmon spawn from late summer to late fall, depending on the run. Fry and smolts usually stay in freshwater from 1 to 18 months before traveling downstream to estuaries, where they remain up to 6 months. Chinook salmon may spend between 1 to 8 years in the ocean before returning to their natal streams to spawn; though the average is 3 to 4 years.

RANGE: Chinooklu range from Kotzebue Sound, Alaska, to Santa Barbara, California. Spawning and rearing chinook are found in most of the rivers in this region, with significant runs in the Columbia River, Rogue River, and Puget Sound.

HABITAT AND ECOLOGY: Freshwater streams and estuaries provide important, habitat for chinook salmon. They feed on terrestrial and aquatic insects, amphipods, and other crustaceans while young and primarily on other fish when older in the, ocean. Eggs are laid in deeper water with larger gravel, and need cool water and, good water flow (to supply oxygen) to survive. Mortality of chinook salmon in the early, life stages is usually high due to natural predation and human induced changes in, habitat, such as siltation, high water, temperatures, low oxygen conditions, loss of stream cover and reductions in river flow. These impacts are the result of poor, agricultural, and forestry practices, dams, and water diversions. Some of the causes, of adult mortality are harvest, predators, poor ocean conditions, and changes in, hydrology.

Estuaries and their associated wetlands provide vital nursery areas for the chinook, prior to its departure to the open ocean. Wetlands not only help buffer the estuary from, silt and pollutants, but also provide important feeding and hiding areas. The draining, and filling of wetlands and the pollution of the estuary from industrial discharges and, run-off negatively impact chinook salmon.

ECONOMIC VALUE: Chinook salmon are highly valued by commercial fishermen. They are also an important subsistence fish and a valuable recreational resource.

Prepared by the Pacific States Marine Fisheries Commission, F I S.H. Habitat Education Program.

COHO SALMON

SCIENTIFIC NAME. Oncorhvnchus kisutch, ("on-ko-rink-us ki-sooch") from the Greek word onko (hook), rynchos (nose) and kisutch, the common name for the cner-ioq in Siberia and Alaska.

COMMON NAMES: Silver salmon, blueback salmon, salmon trout, silverside salmon and white salmon.

DESCRIPTION: The coho salmon is bluish-black with silver sides in saltwater; black spots on the back and upper part of the caudal fin. Smaller and slimmer than the chinook salmon, the inside of the mouth is gray or black with white gums. Coho salmon reach up to 38.5 inches in length and weigh up to 31 pounds; although they usually weigh between 6 to 12 pounds.

LIFE CYCLE: Spawning occurs from September to January, with the eggs hatching the following spring. Coho fry remain in streams one to two years. Moving seaward the following spring, most cohos return to spawn when they are three years old. The mature male fish which return early are known as "jacks" and in Oregon and Washington, the abundance of "jacks" are used to predict the next year's three year old return.

HABITAT AND ECOLOGY: Coho salmon utilize freshwater, near-shore and offshore environments during its life cycle. Coho salmon have similar spawning habitat requirements as chinook, however, coho prefer lower stream velocity, shallower water and smaller gravel. Most coho fry stay in the stream for over a year feeding on aquatic insects, zoo plankton and small fish. Adequate stream cover is important to fry survival, as is high dissolved oxygen levels, and off-stream channel habitat such as ponds and sloughs. Mortality is especially high during freshwater life stages, often a result of poor forest and agricultural management practices that lead to siltation, which may ruin spawning beds or smother the eggs. Migrating coho salmon also face physical obstacles and high water temperatures resulting from dams, inadequate water flows due to diversions for irrigation and impoundment of water for power generation. Harvest, competition with hatchery fish, and poor ocean conditions may also contribute to mortality. Once reaching the estuaries, coho salmon fall prey to a number of other species and may be impacted by human changes, such as shoreline development, residential drainage and the filling of marine wetlands. The time spent in this habitat is critical to the development of the species and their ability to survive in the offshore environment.

RANGE: Coho salmon spawn in coastal streams from Northern Japan to the Anadyr River in Siberia and from Monterey Bay in California to Point Hope in Alaska. This species can also be found in the ocean from Baja, California, to the Bering Sea in Alaska. Major U.S. spawning grounds are in Alaska, Washington and Oregon.

ECONOMIC VALUE: The fourth most abundant salmon species, coho salmon are a culturally and economically important resource, and an important subsistence fish.

Prepared by the Pacific States Marine Fisheries Commission, F.I.S.H. Habitat Education Program.

STEELHEAD

DID YOU KNOW? Steelhead may spawn several times, unlike most salmon, which die after spawning.

SCIENTIFICNAME: Oncorhvnchus mvkiss, ("on-ko-rink-us my-kiss") previously known as Salmo qairdneri.

COMMON NAMES: Kamchatka salmon trout, coastal rainbow trout, silvertrout, salmon trout, steelie, hardhead and ironhead.

DESCRIPTION: In the sea, bluish from above and silvery from below - tends to be more greenish in freshwater. Small black spots on back and most fins. Up to 45 inches in length and 40 pounds in weight; although usually weighs less than 10 pounds.

LIFECYCLE: Spawning in streams and rivers, steelhead rear in freshwater for 1 to 4 years before migrating downstream through estuaries to the open ocean. Steelhead spend 1 to 5 years at sea before returning to natal streams or rivers. At least two categories of stocks of steelhead have developed; those that enter fresh water during fall, winter and early spring -- the winter run – and those that enter in spring, summer and early fall – the summer run. Steelhead do not always die after spawning; some will migrate through estuaries to the ocean again.

HABITAT AND ECOLOGY: Steelhead rely on streams, rivers, estuaries and marine habitat during their lifecycle. In freshwater and estuarine habitat, steelhead feed on small crustaceans, insects and small fishes. Eggs are laid in small and medium gravel and need good water flow (to supply oxygen) to survive. After emerging from the redd (nest) they remain in streams and rivers for 1 to 4 years before migrating through the estuaries to the ocean. Because young steelhead spend a significant portion of their lives in rivers and streams, they are particularly susceptible to human induced changes to water quality and habitat threats. Poor land-use practices in both urban and rural areas can lead to siltation in streams, which may ruin spawning beds or smother the eggs. Additionally, in the Columbia River, migrating steelhead face the physical obstacles and high water temperatures resulting from dams, inadequate water flows in rivers and streams due to water diversions for irrigation, and the impoundment of water for power generation.

RANGE: Steelhead were originally found from northwestern Mexico to the Kuskokwim River in Alaska, however, now it is unusual to find steelhead south of Ventura River, California. Some of the significant steelhead rivers in Oregon include the Rogue, Umpqua and Clackamas Rivers.

ECONOMIC VALUE: Steelhead are one of the top five sport fish in North America, and are caught primarily in streams and rivers. At the present time only Native Americans are allowed to fish for steelhead commercially in Washington or Oregon.

Prepared by the Pacific States Marine Fisheries Commission, F.I.S.H. Habitat Education Program.

Attention Anglers!

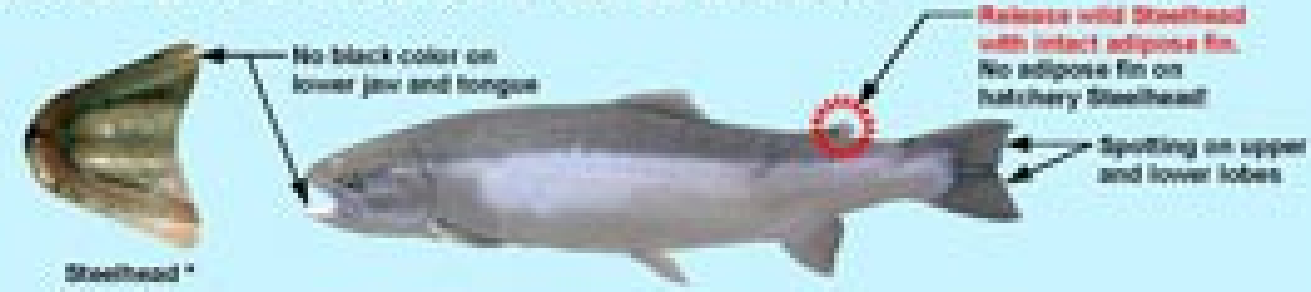
It's Illegal to Keep Coho Salmon, Chinook Salmon and Wild Steelhead

If Mouth has Black, Put It Back!

Coho Salmon**

Chinook Salmon**

Wild Steelhead: Put it Back!



Steelhead Trout

Coho Salmon Recovery Program Partners:

CDFG Fish Phone: 707-944-5594

CALTIP: 1-888-DFG-CALTIP NOAA Office of Law Enforcement: 1-800-853-1964

Photography Credits: * California Department of Fish & Game ** Washington Department of Fish & Wildlife

Salmon Biology Station

Questions you may be asked include:

What kind of Salmon are these?

Most Salmon Watch field trips will be observing fall Chinook salmon, also knows as “kings.” Some sites will include Coho salmon, also called “silvers.”

What are they doing when they return?

They are returning to the river where they were born in order to build redds, spawn, reproduce and die. After generations of natural selection salmon become adapted to conditions in a specific section of the river. Through this process, separate and identifiable “stocks” develop.

What are redds?

Redds are fish nests, depressions dug in the river gravel 6 to 18+ inches deep made by the female salmon in which to lay her eggs. The water near the redds must be the proper depth and velocity, have plenty of oxygen to percolate around the eggs, and have the right sized gravel without silt. The average redd is built in water that is from 9 inches to 3 feet deep.

How do salmon spawn and how long does it take?

The female turns on her side facing upstream and digs a redd by thrashing up and down with her body and tail, alternately digging and settling back into the redd to release the eggs. A male moves in next to the female and releases sperm at the same time. Due to the shape of the redd, the oscillating water mixes the sperm with the eggs and fertilization occurs. Each egg pocket in the redd is covered by gravel as the female digs the next redd upstream. The redd increases in size upstream as the spawning is completed reaching a size of 25 to 60 square feet. Spawning may take 3 to 7 days.

How many eggs does each fish lay?

The number of eggs laid averages about 5,000, depending upon the size of the female. Eggs incubate in the gravel and hatch the following spring. The newly hatched eggs called “alevins” remain in the gravel for 3-7 weeks. After emerging, the “fry” spend 3 months in freshwater and grow to about 4 inches long before migrating in schools to the sea. During this time they slowly undergo many physiological changes, called ”smolting,” enabling them to adapt to the saltwater conditions in the ocean. Estuaries, where fresh and salt water mix, are important for this transition.

How many fish survive?

Only 2% to 8% of all the eggs survive to become smolts. Predation by other fish, birds and unfavorable river conditions including high water temperatures, high winter flows that wash the eggs out of the gravels, or too much silt deposited in the redds that may suffocate the eggs may hinder the survival of the fish.

How many fish return to the River?

On the average only 0.5% to 3% of all the smolts that migrate to the ocean will survive to return and spawn. Natural predation, food supply and fishermen affect ocean survival. For fall chinook in the Sandy River Watershed, 5% return as jacks (early maturing males) after one year at sea, 36% return after two years, 51% return after three years, and 8% return after four years.

What is the white stuff on the fish skin?

As the fish become weaker during spawning, a white fungus invades their skin and they begin to quickly deteriorate. The decaying carcasses release nitrates and phosphates into the water, providing the basis for more life.

How does being raised in a hatchery affect the genetics of the wild run over time?

In the hatchery process of spawning and rearing fish, a totally different kind of selection and adaptation takes place than occurs in the wild. Historically, hatcheries tended to use fewer males to fertilize the female eggs, resulting in the loss of genetic material. Hatchery conditions with ample food supply and antibiotics are favorable to the survival of the fish. The fish do not have to capture their own food, avoid predators or develop natural resistance to diseases. Genetically different fish are produced within just a few generations. In addition, large numbers of hatchery fish may cause a major disruption in the existing wild population by competing for food and space, and causing genetic changes in the wild fish, thereby reducing the chance of survival for wild fish.

Are fish carcasses important?

Yes, biologists have determined carcasses play an important role in stream ecosystems. Carcasses provide food for aquatic invertebrates, juvenile fish and wildlife. Salmon store nutrients from the ocean such as nitrogen, and these nutrients fuel a complex food chain.

How can the wild populations be maintained? The importance of maintaining high-quality habitat to ensure the existence of wild fish populations cannot be over-emphasized. Silt-free pools and riffles and cool water temperatures must be maintained. Healthy riparian vegetation must be present on the streambanks to stabilize them and prevent erosion. Healthy streambanks also store and slowly release water during critical low flows, provide thermal cover, and are a source of important woody debris and nutrients. In addition, the fisheries must be regulated to allow enough spawners to reach spawning areas, and hatcheries must be operated to minimize genetic changes in hatchery fish that may spawn with wild salmon.

Questions you might want to ask kids include:

1. What's up with these fish? Why don't they just live in either the river or the ocean?

2. Steelhead fish are able to return to the ocean after spawning yet Chinook, Coho and other salmon species are essentially programmed to die. Biologists have determined that this programmed death evolved more recently as a special adaptation. Why?

3. How might a healthy forest's riparian zone benefit salmon?

4. How do returning salmon benefit the forest?

5. Research in Yellowstone Park shows that the reintroduction of wolves has benefited fish. How might that have happened?

6. True or false – you can find salmon DNA in trees in Idaho. Do you know why?

"Answers"

1. The clear, nutrient-poor Cascade streams provide much less food for the organisms living in them. Because of this, there are fewer predators. By overwhelming the river with thousands of offspring all at once, salmon ensure that every predator can eat its fill and still leave the vast majority their eggs and fry safe. The Pacific Ocean is rich in nutrients and life. By moving to the ocean as somewhat larger smolts, salmon enter at the middle of the ocean food chain rather than at the bottom. This allows them to take advantage of the abundant food supply as ocean predators.

2. By depositing their nutrients in the clear Cascade waters, salmon provide food (mostly indirectly) for their young. The carcasses feed aquatic invertebrates, thereby increasing their populations and feeding the fry that will hatch in the spring. The nutrients (most importantly Nitrogen and Phosphorus) lead to more bacteria, fungi and algae in the stream which also provides food for aquatic macroinvertebrates. You can tell the kids that the parents made the ultimate sacrifice to "pump up the food chain" and feed their children.

3. Salmon need cold, clear water, food, resting places and protection from predators. A healthy forest has trees with roots that prevent soil from eroding into the water and burying redds in silt. The nurse logs and duff on the forest floor act as a sponge, preventing flash floods from destroying the redds and gradually releasing cool water to the stream during the warm, dry months. The shade from riparian trees helps keep the water cool. Leaves from alder and other riparian trees feed many macroinvertebrates. Trees that fall in the river slow the current and add structure, providing places for salmon fry to rest, safe from many predators.

4. See the answer to question 10, above. Kids will be able to name some animals that might eat salmon carcasses. The feces from those animals fertilize the forest, often far from the river. By studying isotopes of nitrogen, biologists have determined that more than 20% of the nitrogen in the tissues of riparian trees and shrubs originated in the Pacific Ocean.

5. This question emphasizes the complexity of ecosystems. Wolves essentially make deer and elk nervous, preventing them from feeding too long in one patch of the riparian zone. Areas that were once sparse or denuded now support rich riparian forests.

6. True. Salmon swim up the Columbia River, and those that get past the dams find their way up streams and creeks. Then a bear eats them, and does what a bear does in the woods. That "waste" fertilizes the soil, a tree grows, and there you go – salmon DNA in a tree... The circle of life continues...

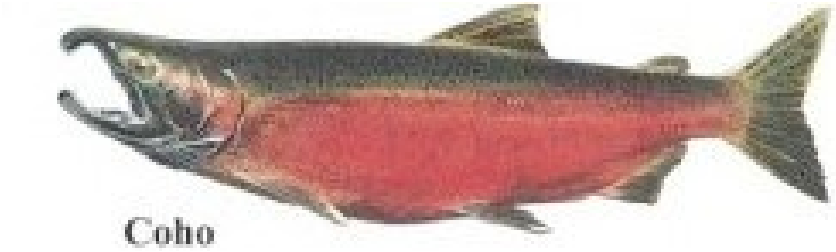
SALMONWATCH

Morphological Differences Between Chinook and Coho Salmon

Chinook	Coho
Chinook do not have a distinct red patch on their gill cover	Coho have a distinct red patch on their gill cover
Chinook have black gums	Coho have white gums
The spots running along the back of a Chinook are large and blotchy	The spots running along the back of a Coho are smaller
The posterior (back) end of the anal fin on a Chinook are shorter, resulting in a more triangular shaped anal fin	The posterior (back) end of the anal fin on a Coho is longer, resulting in a more square shaped anal fin
Male Chinook have a smaller kype (hook on lower jaw of males)	Male Coho have a larger kype (hook on lower jaw of males)
Nostril black	**Nostril white***
Tip of gill plate—muted white spot	**Tip of gill plate—bright white spot***
Tail more forked	Tail squared
Tail spots on both lobes	Tail spots only on top lobe

***Bold-faced characteristics can be seen under the water**

Chinook Salmon



Coho Salmon

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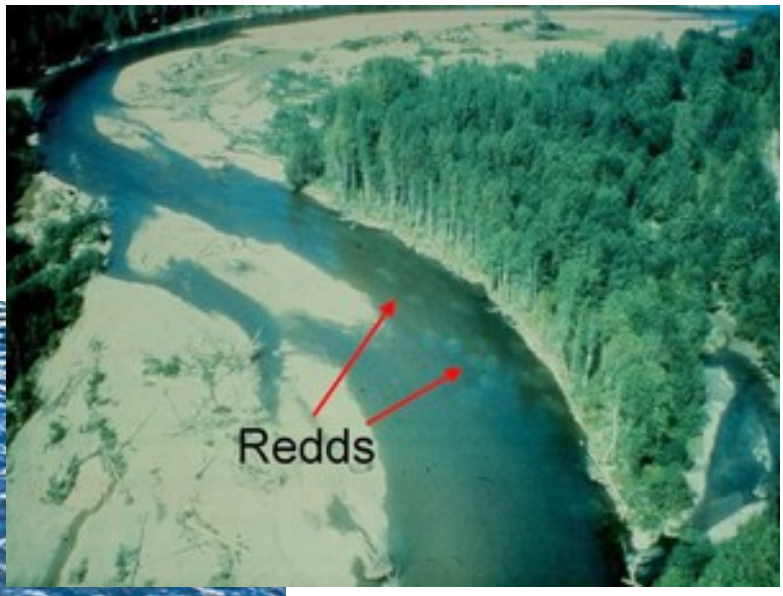

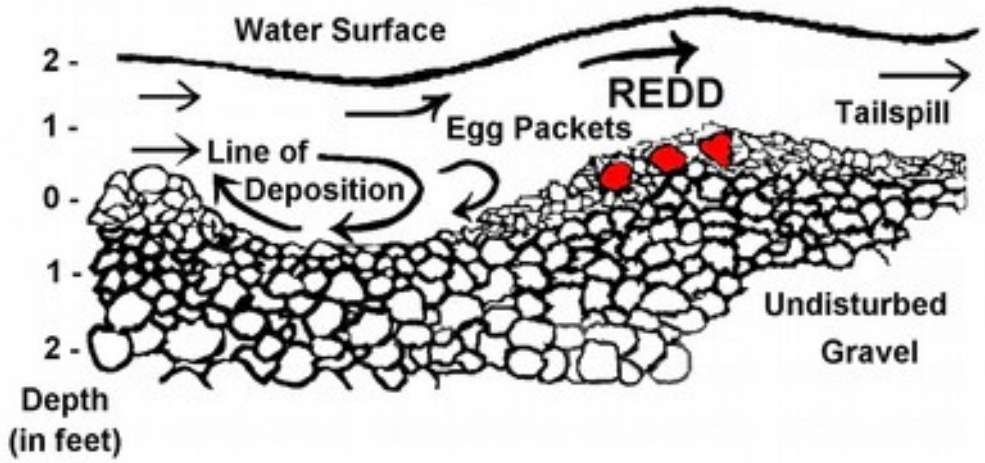

Salmon Redds:
A redd is a spawning nest that is built by salmon and steelhead in the gravel of streams or the shoreline of lakes. It is formed by the female using her tail to dig in a small area of gravel in the bottom of the stream or shore.

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