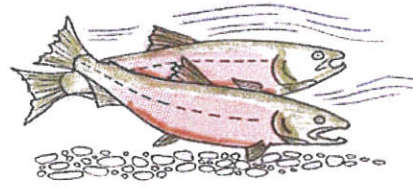


Salmonid Life History



Young steelhead and coho salmon.
Photo by Joe Pecharich.



Adult male coho salmon.

Steelhead and coho salmon are anadromous fish; they are born and rear in freshwater streams, migrate to the ocean to grow and mature, and return to freshwater to reproduce.

The life history of salmonids is relatively complex with some slight variation between species.

Steelhead and coho salmon need a variety of habitats to support each stage of their development during the journey from egg to spawning adult.

The diagram and text below outline the key stages and habitat requirements; a specific timeline for each species follows.

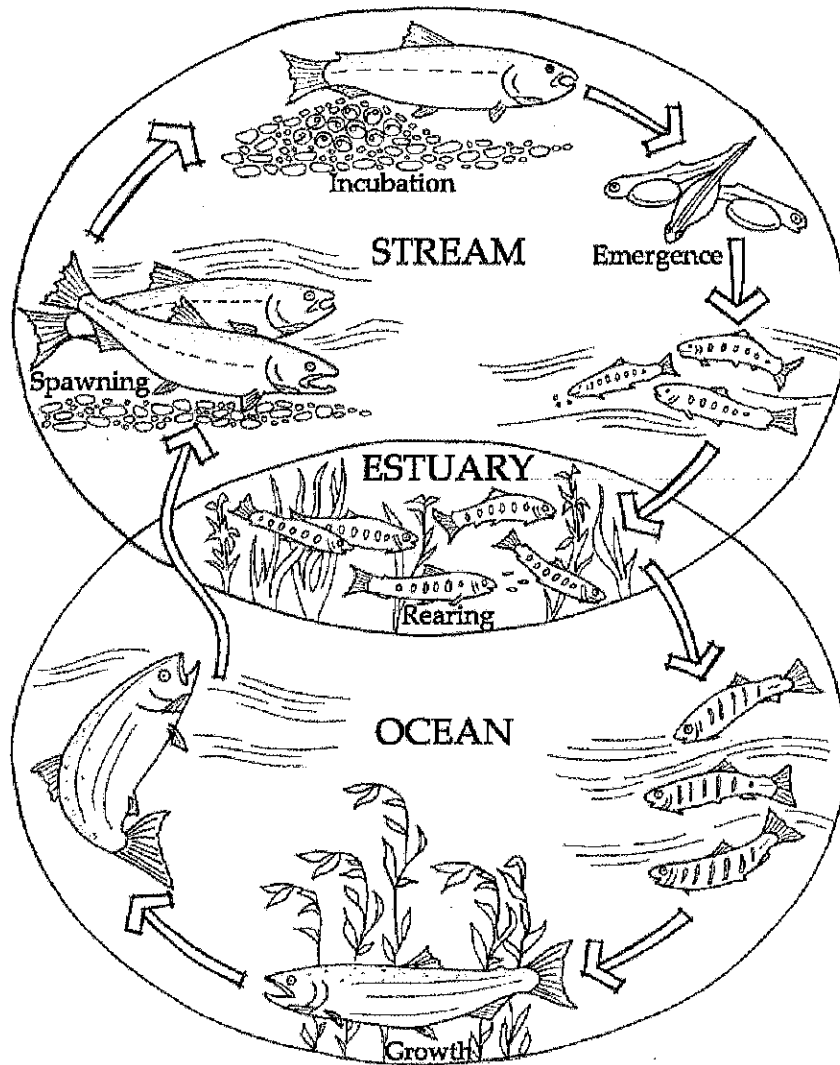


Illustration by Maggie Young

Spawning, Incubation, and Emergence

Each winter after the rains have returned, adult salmon begin to congregate at the mouth of the stream where they were born, guided by their keen sense of smell detecting small particles in the water. As they navigate upstream to select a suitable nesting site, they struggle against high winter flows and both man-made and natural obstacles. Once they reach their destination, the female selects a mate and begins **spawning**. **Redds** (salmon nests) are typically constructed at the head of riffles, where oxygenation of the developing eggs is key to development, in pea- to apple-sized gravels. Each salmon nest contains 300 to 1,200 eggs. Coho salmon die after spawning, whereas steelhead may spawn several times. The decaying fish provide nutrients to the stream and nourishment for a variety of species including their developing young.

Salmon eggs **incubate** in the gravels for several weeks - ideally in cool, well-oxygenated water free of excessive suspended particles. After hatching, small fish called **alevin** continue their development in the gravel, nourished by their attached yolk sac. Once the yolk sac is depleted, the young fish **emerge** from the gravels, typically in spring. These young fish that emerge from the gravel and begin rearing in freshwater are called **fry**.

Habitat Elements Needed for Successful Spawning, Incubation, and Emergence

- High-quality, permeable gravels
- Sufficient riffles
- Passage to habitat
- Cool water temperatures
- High dissolved oxygen
- Minimal suspended sediment

Freshwater Rearing

Coho salmon typically spend a full year in freshwater, emerging from the gravels in spring and rearing there until the follow year. Steelhead may spend one to four years, typically two.

In **winter**, young, small fish are particularly vulnerable to high stream flows during storm events. They use the spaces between gravel particles and vegetation along stream banks for safety from winter storms and predators. As they gain strength and mobility, fry begin to seek out deeper, swifter water, yet they continue to need complex, low-velocity habitats throughout their rearing period.

During the **summer** rearing period, sufficient stream flows and optimal water quality conditions (cool water temperatures, well-oxygenated water, and clear conditions) continue to be critical for development. Low summer flows can reduce the availability of rearing habitat by creating isolated pools and increasing vulnerability to predators. Riparian cover is also important because it shades the stream channel, keeping water temperatures low.

Throughout the rearing period, salmonids need plenty of insects for food. Drifting terrestrial insects produced in the riparian canopy, aquatic invertebrates produced on the substrate, and leaf litter provide the bulk of their diet.

Habitat Elements Needed for Successful Rearing

- Low-velocity backwater areas (winter) and deep pools
- Shelter in the form of roots, large wood, vegetation, cobbles/boulders
- Vegetated stream margins
- Overhead shade and well-vegetated canopy

Helpful Definitions

Redd – a salmon nest dug in the streambed where eggs are deposited.

Spawning – process of building a nest (redd) in gravel, mating, and laying eggs.

Alevin – salmonid larvae still in the gravel with their yolk sacs attached.

Fry – young salmon rearing in freshwater.

Smolt – a juvenile seaward-bound salmonid in the process of transition from fresh to saltwater.

- Food supply
- Cool water temperatures
- High dissolved oxygen
- Minimal suspended sediment
- Sufficient flow (summer)

Estuary Rearing and Beyond

In the spring after completion of freshwater rearing, young salmonids begin to transition to life in the ocean. As they migrate downstream to the estuary, where fresh and saltwater mix, juvenile fish undergo a physiological process called **smoltification**, where their body makes adjustments to be able to survive in saltwater. Young fish may remain in the estuary for days or months as they adjust to the saltwater and grow. Salmon mature in the ocean in 1 to 4 years, depending on the species, before returning to their natal stream to begin the cycle all over again.

Habitat Elements Needed for Transition from Freshwater to Ocean

- Sufficient flow to allow safe passage
- Shelter in the form of roots, large wood, vegetation, cobbles/boulders
- Estuarine conditions that allow for adequate mixing of fresh and saltwater for gradual adjustment

Timeline of Salmonid Life History Stages within California Coastal Streams

(darker shading represents periods of peak activity; lighter shading represents less active periods)

| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept |
|-----------------------------------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|------|------|
| Steelhead | | | | | | | | | | | | |
| Upstream migration and spawning | | | Light | Dark | Dark | Dark | Light | | | | | |
| Egg incubation | | | | Dark | Dark | Dark | Dark | Light | | | | |
| Fry emergence | | | | | | Light | Dark | Dark | Dark | Light | | |
| Rearing | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark |
| Smolt outmigration (1 to 4 years) | | | | | | Light | Dark | Dark | Dark | Light | | |
| Coho Salmon | | | | | | | | | | | | |
| Upstream migration and spawning | Light | Dark | Dark | Dark | Light | | | | | | | |
| Egg incubation | | Light | Dark | Dark | Dark | Dark | Light | | | | | |
| Fry emergence | | | | | Light | Dark | Dark | Dark | Light | | | |
| Rearing | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark | Dark |
| Smolt outmigration (typically 1+) | | | | | | Light | Dark | Dark | Dark | Light | | |