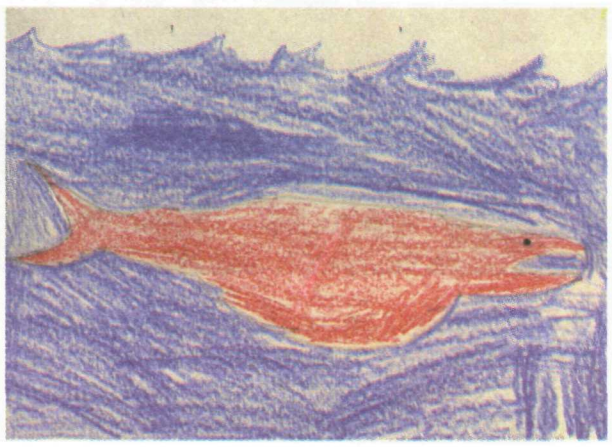
COHO SALMON & STEELHEAD TROUT RESTORATION PROJECT

POINT REYES NATIONAL SEASHORE

GOLDEN GATE NATIONAL RECREATION AREA

MUIR WOODS NATIONAL MONUMENT

Introduction and Overview

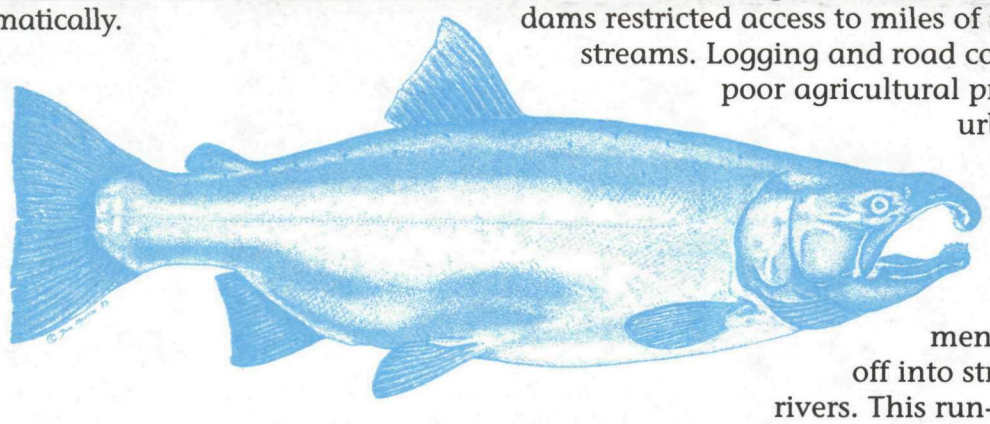


"Female salmon grow big stomachs when they return to fresh water."
Drawing & caption by Akira Robinson, age 8.

The Plight of the Salmon

For thousands of years, coho (silver) salmon (*Oncorhynchus kisutch*) and steelhead trout (*Oncorhynchus mykiss*) have migrated from the feeding grounds of the open ocean back to the streams of coastal California to spawn and die.

Shrinking Populations. During the past fifty years, however, the distribution and abundance of coho salmon and steelhead trout in California have declined dramatically. A recent survey of 248 streams found that only half still contain coho. Steelhead trout could once be found in rivers as far south as the Mexican border, but their current range is only to Malibu Creek, just north of Los Angeles. The most recent statewide estimate of spawning coho salmon is 31,000 fish per year — a startling 94 percent decline from about 515,000 since the 1940s. Although comparable statewide estimates are not available for steelhead, data from individual river systems indicate a similar trend.



DON MARTIN

Spawning male coho salmon

Local Status. In 1996 and 1997, populations of coho and steelhead along the central California coast were listed as threatened under the Federal Endangered Species Act. When listing species with wide geographic distribution, the National Marine Fisheries Service evaluates populations in discrete Evolutionarily Significant Units (ESUs). Western Marin County lies within the heart of the central California coast ESU, where at least 50 percent of the streams no longer contain coho.

Locally, in Pine Gulch Creek, there have been no recorded observations of coho since the late 1970s. Olema, Redwood, and Lagunitas creeks now sustain relatively small coho populations. In Lagunitas Creek, with about 10 percent of natural spawning population in the ESU, the highest count in recent years was 549 coho in 1996-97. Lagunitas Creek also presently supports roughly 500 adult steelhead, a decline from historical numbers.

Threatened Habitats. Decreases in coho and steelhead populations are related to past human activities and development. The construction of dams restricted access to miles of spawning streams. Logging and road construction, poor agricultural practices and urbanization all increased the amount of sediment that runs off into streams and rivers. This run-off chokes the spawning gravels with fine silt and sand, suffocating eggs and trapping alevins (see Glossary, back page). Adult populations of fish have been reduced by commercial and recreational overharvest. Large scale hatchery production has diluted the genetic integrity of many wild populations, weakening their ability to survive in changing conditions. In addition, natural phenomena such as catastrophic floods, prolonged droughts, and variable ocean conditions have exacerbated the human causes of the decline.

Conservation. Fortunately, increased awareness has led to more beneficial practices. Land owners and land management agencies have instituted stream-friendly practices, including fencing streams to prevent trampling and sedimentation, keeping planned development away from areas alongside streams, logging carefully and constructing roads away from streams. These actions, along with community stream restoration projects, all contribute to a healthier stream environment and increase the survival rate of salmon and trout.

Coho and Steelhead Restoration Project

what

A five-year project to restore and enhance coho and steelhead populations and their habitats.

why

Coho and steelhead populations have declined drastically since the 1940s.

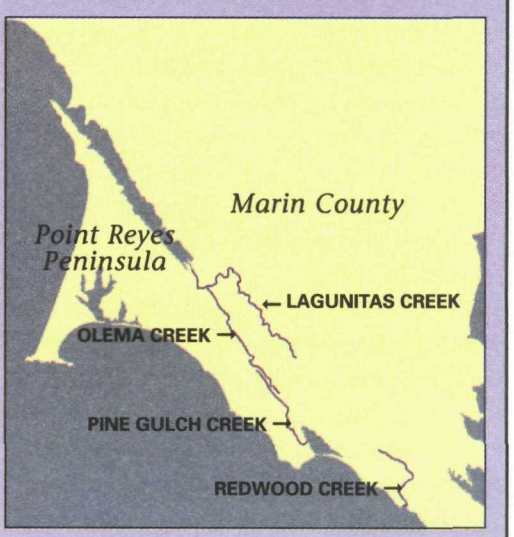
where

Four watersheds in federal parklands in Marin County, California

who

National Park Service scientists and staff, volunteers, school groups, cooperating land owners.

See stories on page 2



The Coho & Steelhead Restoration Project

DANIEL EVANS

Volunteers learn methods for assessing stream habitat and counting fish.

Armed with hip waders and measuring sticks, National Park Service staff and volunteers brave streams swollen from the winter rains to survey for spawning coho and steelhead. They track spawners, carefully count carcasses, and take tissue samples for DNA study, providing valuable information to study the abundance and distribution of these fish. This is part of the work of the Coho and Steelhead Restoration Project.

When coho salmon and steelhead trout were placed on the threatened species list, the National Park Service initiated a five-year project to identify, evaluate, restore, and enhance coho and steelhead populations and their habitat within three West Marin parks, Point Reyes National Seashore, Golden Gate National Recreation Area, and Muir Woods National Monument. The Coho and Steelhead Restoration Project is focusing on Pine Gulch, Redwood, Olema, and Lagunitas creeks and their watersheds. The project has the following six objectives:

- To learn what may influence the reproductive success of coho and steelhead by looking at present stream conditions.
- To investigate past stream conditions and how these have affected populations of salmon and steelhead.
- To assess current salmon and steelhead abundance and distribution.
- To develop and implement a plan for restoring and monitoring the fish and their habitat.
- To inform the public and other resource managers.
- To encourage community involvement through education and restoration of the watersheds.

The benefits of this program extend far beyond these salmonids. Healthy streams and riparian systems in West Marin will protect habitat for a myriad of other aquatic and land creatures such as river otters, California freshwater shrimp (an endangered species), California red-legged frogs (a threatened species) and migratory songbirds that nest in creekside bushes and shrubs.

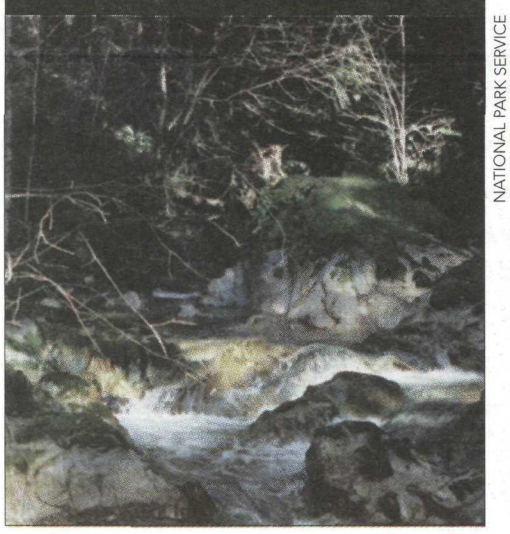
The success of this ambitious program depends on the active participation of the public, local community conservation organizations, adjacent landowners, and public agencies. By working together, we will lay the groundwork for sustainable and healthy streams, riparian zones, and watersheds.

Salmon in the ocean eat small fish.

Drawing by Devon Lees and Okasako Schmucker, age 8.

Lagunitas Creek

LANNY WAGGONER



- Mainstem length 13.9 mi
- Tributary length 24.2 mi
- Watershed area 45,300 acres
- Maximum elevation 2,044 ft

Flowing west from the hill country of western Marin County into Tomales Bay, one of the most pristine estuaries in the United States, Lagunitas Creek watershed contains several notable streams — Olema, Cheda, Devil's Gulch, and Lagunitas creeks — all of which have historically supported large runs of steelhead and coho. Lagunitas Creek now supports approximately 10 percent of the remaining wild coho salmon stock in central California.

Impoundments, land-use activities, water development and diversions have changed virtually all the streams within this watershed, eliminating more than one-quarter of the historic spawning and rearing habitat from the Lagunitas Creek watershed. The protection and enhancement of the remaining habitat is an issue of critical importance.

Olema Creek

NATIONAL PARK SERVICE

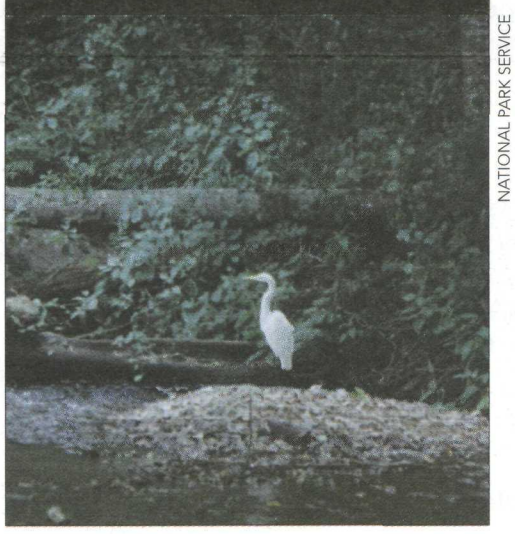
- Mainstem length 9.9 mi
- Tributary length 27.8 mi
- Watershed area 9,200 acres
- Maximum elevation 1,456 ft

An undammed tributary of Lagunitas Creek, Olema Creek flows northward through the Olema Valley between Inverness and Bolinas ridges to its confluence with Lagunitas Creek and ultimately into Tomales Bay.

The Olema Valley has a rich history of beef and dairy ranching. A portion of the watershed, protected from development, has been less affected by human activity, but past land-use activities have altered much of the lower reaches of the stream habitat within this watershed. Recent proactive land management programs have restored some of the habitat in order to increase numbers of juvenile coho salmon and steelhead trout. Adults returning upstream still face barriers, such as inadequate resting pools and altered flows caused by culverts on many of the tributaries to Olema Creek.

Pine Gulch Creek

SANDY DIERKS



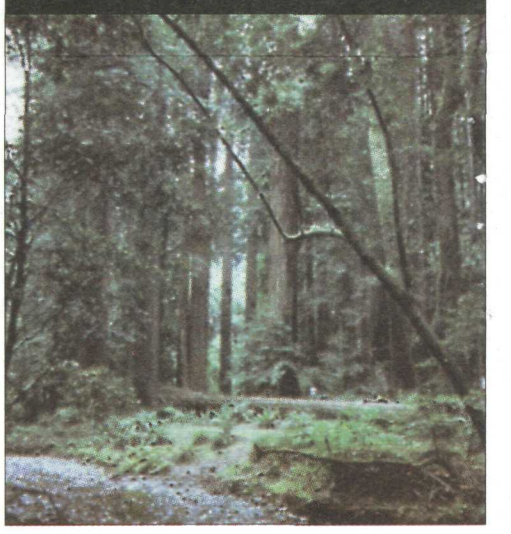
- Mainstem length 7.6 mi
- Tributary length 16.2 mi
- Watershed area 4,900 acres
- Maximum elevation 1,566 ft

Pine Gulch Creek is the major source of freshwater flow into Bolinas Lagoon, a high-value estuarine preserve. Approximately 75 percent of this watershed lies within National Park Service lands, with the remainder in private ownership. Pine Gulch Creek formerly supported coho salmon, with the last recorded observation in 1979. Steelhead trout populations, on the other hand, are doing relatively well within the drainage.

This watershed has in the past been influenced by land-use activities, seasonal dams and diversions. The current low-impact agriculture operations and progressive water-use programs have significantly reduced the negative impacts of these types of operations on the watershed.

Redwood Creek

NATIONAL PARK SERVICE



- Mainstem length 5.9 mi
- Tributary length 14.2 mi
- Watershed area 5,610 acres
- Maximum elevation 2,575 ft

From its headwaters on Mt. Tamalpais, Redwood Creek flows through Muir Woods National Monument to Big Lagoon near Muir Beach. Since the Monument was established nearly 90 years ago, visitors from all over the world have marveled at the beauty of this old-growth redwood forest. Lucky winter visitors get an added bonus: the spectacle of spawning coho salmon in Redwood Creek! Redwood Creek is significant in that it may support a genetically intact wild coho salmon population. Once comprised of hundreds of coho, the run is now much smaller. Channelization of the stream in the 1930s, woody debris misguidedly "cleaned-up," lack of a defined trail, logging in a side canyon, intense dairy farming and other agriculture in the lower sections of the system all caused extensive erosion as well as loss of critical riparian vegetation.

Life Cycle of Coho and Steelhead

NATALIE COSENTINO

After two to three years in the ocean, they return to their home streams to spawn, guided by an amazingly keen sense of smell. Coho males turn brilliant red; they grow hooked jaws and long teeth and then battle over the privilege of fertilizing eggs. Females undergo a similar but less dramatic transformation.

JEFF FOOTT

Once she has found the stream of her birth, the female digs a series of shallow nests and lays her eggs. The male fertilizes them and the female covers the eggs with gravel.

Each winter, after the rains begin, adult coho salmon and steelhead trout return from the ocean to the coastal streams of their birth to lay and fertilize their eggs. After hatching and maturing in the creek, the young fish swim out to sea, continuing the ancient cycle. Steelhead trout may repeat this journey several times. Salmon make the round-trip journey only once, dying in their native streams. Decaying, they provide nutrients for the next generation and the cycle begins again.

JEFF FOOTT

The eggs hatch in four to six weeks. After hatching, the alevins remain under the gravel for several weeks, living off the leftover yolk.

POINT REYES BIRD OBSERVATORY

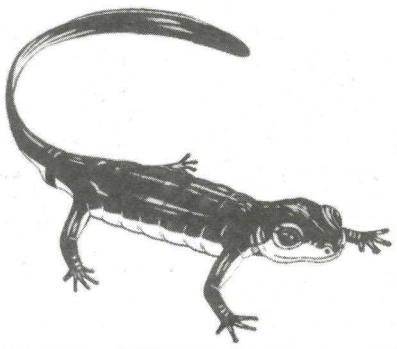
In order to live in salt water, the young fish, now known as smolts, adapt as they migrate. Their gills and kidneys change, and their color becomes silvery for better camouflage in the ocean.

JEFF FOOTT

When the yolk is depleted, the young surface from the gravel and are known as fry.

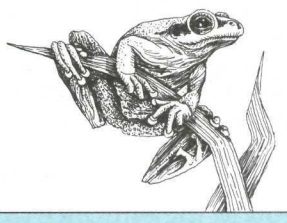
DAVID MANNING

Steelhead and coho fry spend one to three years in the streams, eating small prey or being eaten. Spots and oval parr marks help the young fish blend into the environment. Despite their natural camouflage, only one in ten survives to enter the ocean.



JOHN PETERSEN

Among the many organisms that also rely upon healthy riparian habitat are the Pacific tree frog (right) and California newt (far left).



ANE ROVETTA

Fish Facts

Coho Salmon (silver salmon)

SCIENTIFIC NAME *Oncorhynchus kisutch*

RANGE North Pacific Basin from North Korea to Central California (San Lorenzo River in Santa Cruz).

IDENTIFICATION

JUVENILES:
- 2-15 months of age; 2-4 inches long.
- No spots on body, dorsal fin or tail.

ADULTS AT SPAWNING:
- 3 years old; 25 inches long; 10 pounds.
- Jacks (precocious males): 2 years old, 16 inches, 2-5 pounds.
- Bright red sides; hooked jaw ("kype") on males; scattered irregular spots; gums white at base of teeth, rest of mouth is black.

LIFE HISTORY
- Eggs deposited in winter, fry emerge in spring, smolts migrate the following spring.
- Freshwater residence 15-18 months.
- Saltwater residence 4-18 months.
- Adults enter fresh water in fall and winter.

World record: 31 pounds, caught in British Columbia in 1947.
California record: 22 pounds, caught in Lagunitas Creek in 1959.

Steelhead Trout (anadromous form of coastal rainbow trout)

SCIENTIFIC NAME *Oncorhynchus mykiss irideus*

RANGE Alaska to southern California (Malibu Creek)

IDENTIFICATION

JUVENILES:
- 2 months – 4 years old; 2-8 inches long.
- Dark spots on body, dorsal fin and tail.

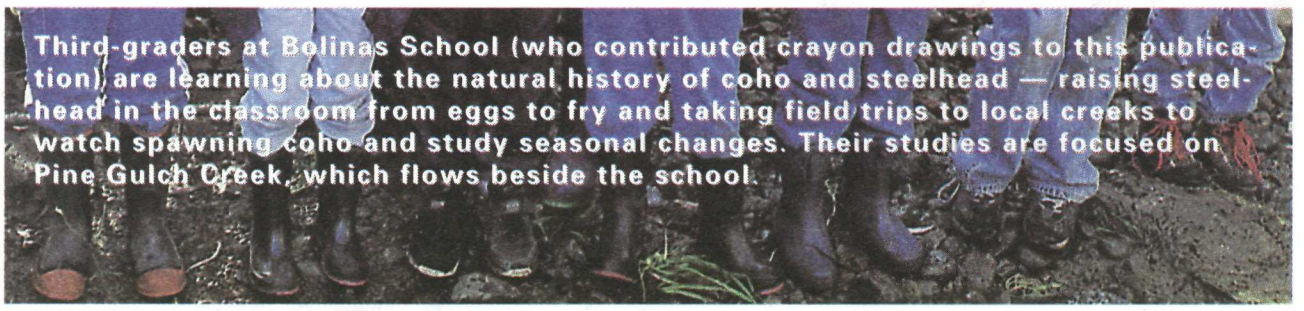
ADULTS AT SPAWNING:
- 3-6 years, 12-40 inches, 5-20 pounds.
- Steelhead size at spawning is variable.
- Body color silver with red lateral stripe, many small scattered spots on back; gums and inside of mouth all white.

LIFE HISTORY
- Eggs deposited in winter or spring; smolts migrate in spring.
- Freshwater residence: 1-4 years, typically 2 years.
- Saltwater residence 2 months to 4 years, typically 2 years; can spawn several times.
- In contrast to coho, fish that return after spending only a few months at sea (called "half-pounders") are not sexually mature, can be either male or female, and return to the ocean.

California record: 27 pounds, caught in the Smith River in 1976.

More Facts Coho salmon and steelhead trout are two of the seven anadromous species in the genus *Oncorhynchus* that occur in the Pacific basin and spawn in North American streams. ● *O. clarki* — coastal cutthroat trout ● *O. gorbuscha* — pink, humpback salmon ● *O. keta* — chum, dog salmon ● *O. kisutch* — coho, silver salmon ● *O. mykiss* — rainbow trout, steelhead trout ● *O. nerka* — sockeye, red, blueback salmon ● *O. tshawytscha* — king, chinook salmon.

BOLINAS SCHOOL

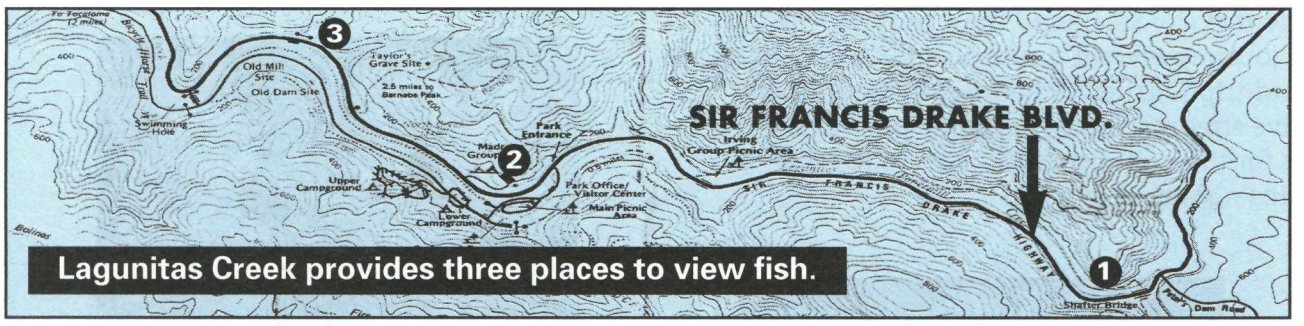


Third-graders at Bolinas School (who contributed crayon drawings to this publication) are learning about the natural history of coho and steelhead — raising steelhead in the classroom from eggs to fry and taking field trips to local creeks to watch spawning coho and study seasonal changes. Their studies are focused on Pine Gulch Creek, which flows beside the school.

BOLINAS SCHOOL

Where to Find Spawning Coho Salmon & Steelhead Trout in West Marin

Winter rains bring new life to West Marin creeks. For thousands of years coho salmon and steelhead trout have returned from the vast ocean feeding grounds to the shaded streams of their birth. Look for salmon one to three days after a rainstorm. Traditionally, January is the best month to spot the spawning coho and steelhead. Listed below are some good sighting spots in western Marin County, California. Please use caution in these areas. Watch out for stinging nettle, poison oak and the swift currents.



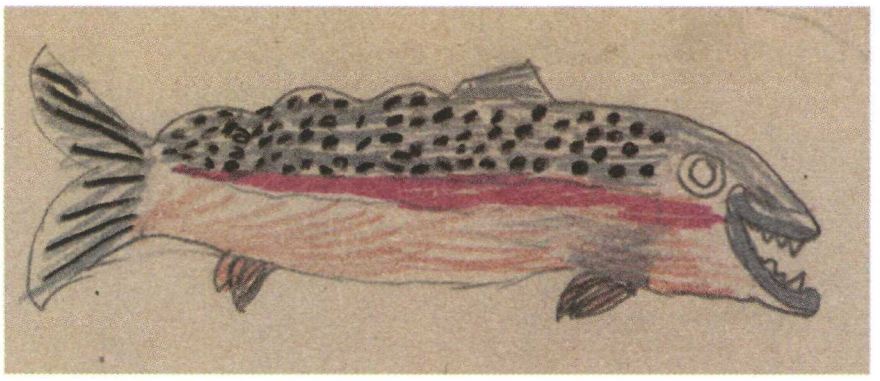
Lagunitas Creek provides three places to view fish.

Lagunitas Creek: ❶ Leo T. Cronin Fish Viewing Area, Shafter Bridge On Sir Francis Drake Blvd. at the eastern boundary of Samuel P. Taylor State Park — $^{1}/_{2}$ mile west of the town of Lagunitas. The Marin Municipal Water District opens a parking area next to the bridge to facilitate fish viewing from December through mid-February. For information call Marin Municipal Water District Sky Oaks Ranger Station, (415) 459-5267. **❷ Samuel P. Taylor State Park** At the entrance station to the state park just off Sir Francis Drake Blvd., there is a short, steep access trail to the creek's edge where you may see the fish as they swim upstream. Samuel P. Taylor State Park, (415) 488-9897. **❸ Devil's Gulch** A few miles west of the park entrance is the Devil's Gulch tributary of Lagunitas Creek. The trail begins on the north side of the road, across from a pullout on Sir Francis Drake Blvd. A flat walk takes you along the creek, providing several spots from which to view the fish. Samuel P. Taylor State Park, (415) 488-9897.

Olema Creek: Five Brooks Trailhead Off Highway One, approximately 3 miles south of the intersection of Highway One and Sir Francis Drake Blvd. Park at the trailhead and follow the driveway back towards Highway One. On the right side, follow the path to the creek's edge. Point Reyes National Seashore, (415) 663-1092.

Redwood Creek: Muir Woods Highway One to Frank Valley/Muir Woods Road will take you to the entrance of Muir Woods. Park in the lot provided, then proceed on foot, following the path through the entrance gates ($2 entrance fee) and along Redwood Creek. Check the park schedule of ranger programs for an opportunity to learn more about the spawning salmon. Muir Woods National Monument, (415) 388-2595.

"The male salmon get fighting teeth when they return to the river."
Drawing & caption by Bryn Byer age 8.



A Coho Glossary

ALEVIN: yolk-sac fry stage of salmonids.

ANADROMOUS: *ana*=up, *dromous*=running (Greek): ascending rivers from the sea for breeding.

ONCORHYNCHUS: *oncho*=hook, *rhynchus*=beak, snout (Greek): the genus name of Pacific salmon and trout.

PARR: a young salmon during the first one to two years of its life when it lives in fresh water.

PARR MARKS: dark, round or oval markings on the bodies of salmonid fry.

RIPARIAN: *ripar*=bank of a stream (Latin); relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or tidewater.

RUN: to migrate, especially to move in a large group in order to spawn.

SALMONID: of or belonging to the family Salmonidae, which includes salmon, trout and whitefish.

SPAWN: to produce young or eggs, especially in large numbers — used in reference to an aquatic animal.

WATERSHED: an area or region bounded on the periphery by a summit or boundary line separating the drainage districts of two streams or coasts and draining ultimately to a particular watercourse or body of water.

ENDANGERED SPECIES: as defined by the Endangered Species Act of 1973, any species in danger of extinction throughout all or a significant portion of its range.

THREATENED SPECIES: as defined by the Endangered Species Act, any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

For information about becoming involved in the Coho and Steelhead Restoration Project, call project coordinator Ron Smith at (415) 868-0732.

Published in 1998 by the National Park Service

Project Staff: Ron Smith, David Manning, Brannon Ketcham, David Press

Managing Editor: Carlin Finke

Copy Editor: Nancy Adess

Designer: Claire Peaslee

Printed on recycled paper

National Park Service
Point Reyes National Seashore
Point Reyes Station, CA 94956

BULK RATE
U.S. POSTAGE
PAID
U.S. DEPARTMENT
OF THE INTERIOR
PERMIT NO. G-83