

Project Brief

Kokanee Salmon in the Flathead System



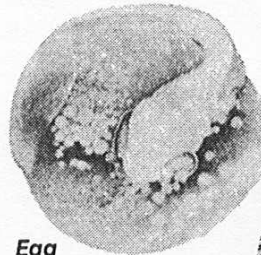
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What Are Kokanee Salmon?

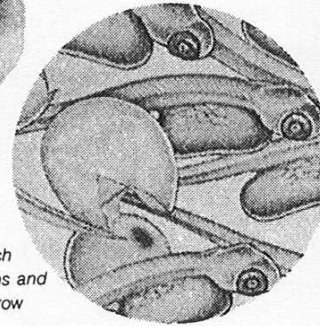
Kokanee are a landlocked form of the Pacific sockeye salmon. Like the sockeye, they migrate- but to freshwater lakes instead of the ocean.

Kokanee Salmon Life Cycle



Egg

Fertilized eggs lie in gravel about 50 days.



Alevin

Eggs hatch into alevins and quickly grow into fry.

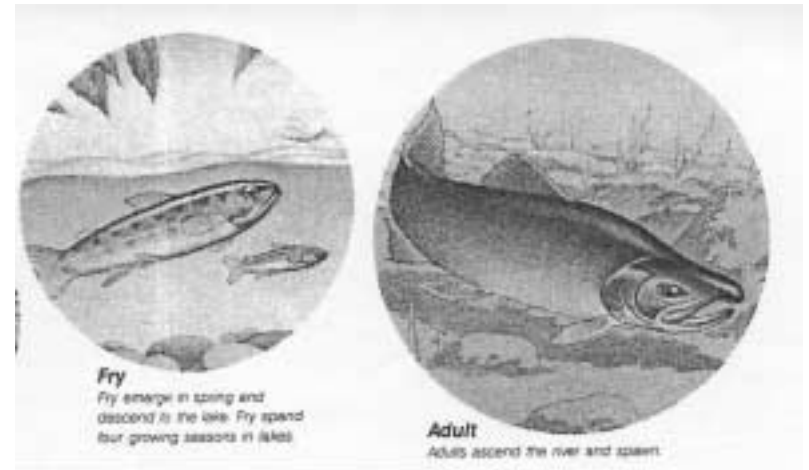
young "sac fry" remain in the gravel for three to six weeks after hatching. Once they have absorbed their yolk sac, the fry then move downstream through the Flathead River System or out of the bays into Flathead Lake. They typically migrate at night. Studies have shown that the inch-long fry can make the 60-mile downstream journey from McDonald Creek to Flathead Lake in less than 72 hours.

While in the lake, the salmon feed almost exclusively on tiny crustaceans and other zooplankton. After spending 3 or 4 growing seasons in Flathead Lake, the kokanee begin to mature. As they leave the lake to start their spawning run, they stop eating. Eventually they return to the waters of their birth to spawn, completing their life cycle.

Young kokanee living in Flathead Lake are silver-colored. As they migrate to spawn in the shallow bays of Flathead Lake or in the Flathead River system, they turn coppery or bright red in color. Males develop large hooked jaws and humped backs. The mature fish range from 13 to 17 inches long, with males averaging about an inch longer than females.

Most of the spawning takes place from late September until mid-November. Female kokanee carry about 1,000 eggs and deposit them as they are being fertilized by males. The eggs are deposited in gravel nests or mounds, called "redds". Kokanee--like all Pacific salmon--die after they spawn.

Eggs hatch between December and May. The



Fry

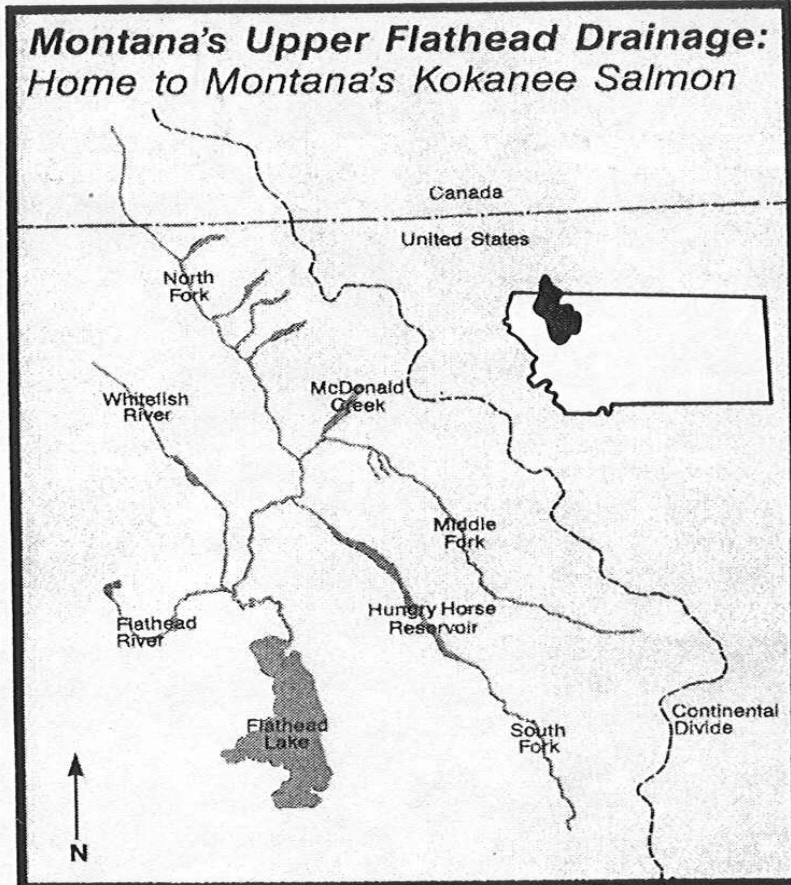
Fry emerge in spring and descend to the lake. Fry spend four growing seasons in lakes.

Adult

Adults ascend the river and spawn.

For every 1,000 eggs deposited, an average of 20 percent make it to the fry stage. Of those, only 4 percent survive the four years in Flathead Lake.

History of Kokanee in the Flathead



Spawning areas for Flathead Lake kokanee include McDonald Creek, the Middle and South Forks and main stem of the Flathead River, the Whitefish River and the Flathead Lake shoreline.

Kokanee are not native to the Flathead drainage. They were introduced into Flathead Lake in 1916, shortly after Glacier became a National Park. An early season run of kokanee was first noticed in Glacier Park's McDonald Creek in the mid-1930s, when the first park busses were rolling over the Going-to-the-Sun Highway.

A sport fishery began in 1933. Since then, kokanee have become the most popular game fish in the basin. According to studies by the Montana Department of Fish, Wildlife and Parks, kokanee make up more than 90 percent of the game fish caught in the Flathead system.

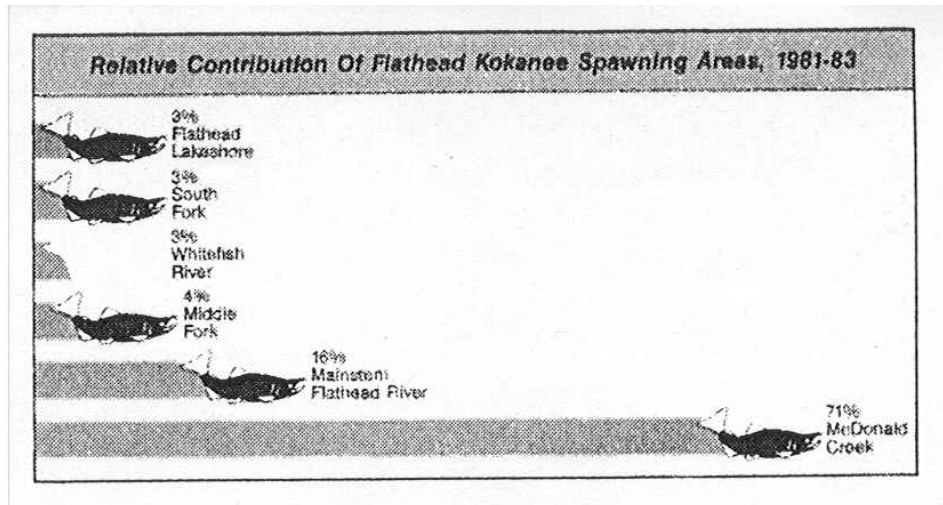
By the end of 1950s, warm water releases from Hungry Horse Dam--constructed on the South Fork in 1953--had attracted a late season run of spawners to the main stem of the Flathead River. McDonald Creek and the main stem of the Flathead remained the major spawning grounds for kokanee during the 1960s and 1970s. Flathead Lake fishing holes became thick with kokanee. The competition between the fish for food became so intense, that their average size dropped from 16 to 10 inches.

But in the late 1970s, the situation changed dramatically. While individual kokanee were larger, their total population was plummeting. Meanwhile, biologists noted that Hungry Horse Dam had changed its operations. The dam began releasing water for power production in the fall, the same time that kokanee were spawning in the river below. A study that the Bonneville Power Administration began funding in 1982 set out to find how river operations were linked to the kokanee decline.

Kokanee dig their redds in shallow shoreline areas. High river flows meant that the kokanee were depositing their eggs high on the river banks. In late winter, when power demands from Hungry Horse decreased, river flows dropped and spawning beds were left high and dry. Incubating eggs froze. Large numbers of kokanee fry were lost. Once, nearly half of Flathead Lake's kokanee hatched in the gravel of the Flathead River, downstream from Hungry Horse Dam. Between 1975 and 1985, the late spawning run of fish on the main stem of the Flathead River declined dramatically, from 100,000 to 10,000.

Downstream in Flathead Lake, kokanee choose well-graveled areas along the lakeshore to dig their redds. But the winter months that are most critical to egg and fry survival are also the months of greatest energy demand. When Kerr Dam, on the south outlet of the lake, moves water from the lake through turbines to produce electricity, the kokanee redds on the Flathead lakeshore met the same fate as the redds on the main stem. The BPA-Department study found that, before they hatch, eggs moistened only by damp gravel and sand can withstand extended periods in the open air. But once the eggs hatch, the fry will die if they are not in moving water within 48 hours. Fluctuating reservoir levels to meet power demands also erodes the lakeshore and filters silt into spawning gravels. Eggs and fry suffocate. In an average year, biologists might find only 750 redds on the north shore of the lake, as compared to the 30,000 to 100,000 in McDonald Creek.

McDonald Creek now supports 74 percent of the Flathead kokanee spawning population. The main stem of the Flathead River comprises only 13 percent of the kokanee population. Other areas of the river system and Flathead Lake shore contribute even less.



Boosting the Kokanee Salmon Runs

As a result of the BPA-funded study, the Department has recommended stable fall flows for spawning runs, and winter flows to keep kokanee redds wet. These flows were recommended through the Northwest Power Planning Council and are being provided by the Bureau of Reclamation and BPA. Under the BPA study, Department biologists will examine the effect that these new flows have on the kokanee population. At the same time, BPA managers are judging how to best balance power needs with protection of kokanee populations.

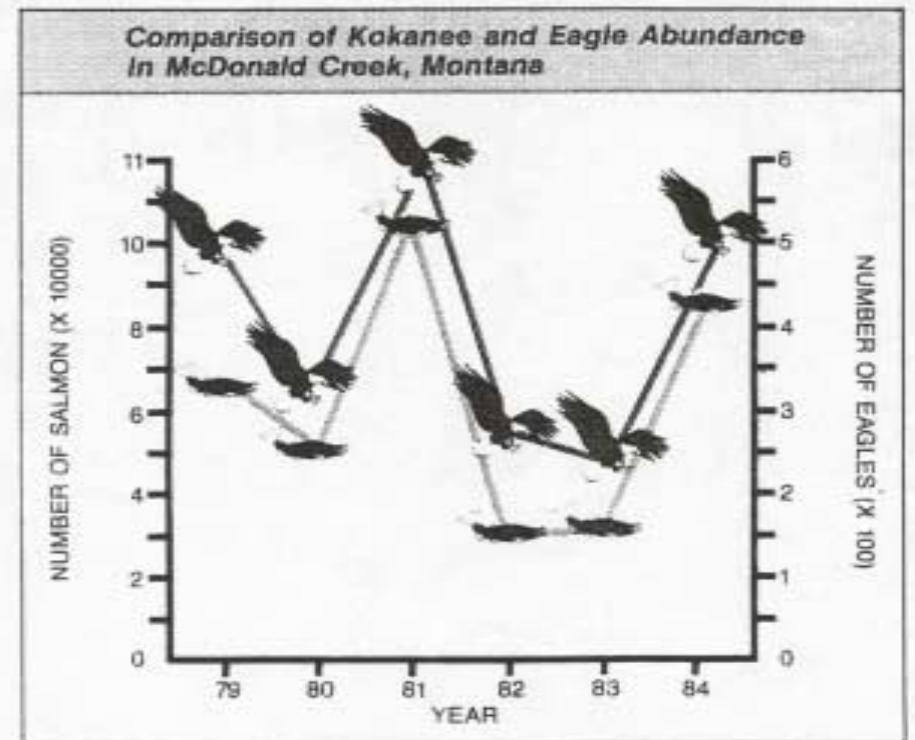
To speed recovery, the Department has shortened the fishing season and reduced the fishing limit on kokanee salmon in both the lake the river system.

But the greater the variety of spawning habitats, the greater the chance kokanee have of surviving natural or manmade catastrophes. Under the BPA study, Department biologists are determining where and when kokanee spawn, what factors lead to successful kokanee production and the percentage of kokanee contributed by each area of the Flathead system. Throughout the fall and winter months, Department divers set traps, count fish and redds, and follow egg development.

Pinpointing areas critical to fish survival will result in plans that will directly improve spawning conditions and reproductive success of the Flathead's spawners.

Kokanee Salmon -An Important Part of the Flathead Ecosystem

Kokanee salmon have become an integral part of Flathead ecosystem. Fall migrations of kokanee, from the lake and upstream through the river system, provide food for a variety of wildlife species. Migrating bald eagles have grown dependent on the kokanee of McDonald Creek, Middle Fork and the main stem of the Flathead



River for a major source of energy on their way south. The salmon are particularly important to the young birds on their first migration. They are not good hunters and without this easy and plentiful food supply, a number of eagles would not survive.

McDonald Creek supports one of the highest seasonal bald eagle concentrations in the lower 48 states, because of the abundant salmon food source. But only a small number of eagles reside in Glacier National Park year-round. The rest are on their way to winter nesting areas in Utah, California and Colorado.

This concentration of salmon and bald eagles provides an excellent viewing and learning opportunity for Glacier Park visitors. Upwards of 50,000 people from all over the United States and other countries visit McDonald Creek each fall to view bald eagles and salmon.

The grizzly bear, coyote and a variety of other wildlife species also feast on the kokanee. BPA and the Department recognize the delicate ecological balance among salmon, bald eagles and other wildlife in the Flathead. By maintaining critical salmon habitat, the biologists aim to sustain a strong salmon run for McDonald Creek's eagles, Glacier Park's wildlife, the Flathead's fishermen and future generations of western Montana visitors

For Further Information

The kokanee study is just one of several joint efforts between the Bonneville Power Administration and the Montana Department of Fish, Wildlife and Parks. These projects help biologists measure the impact of hydropower development on game fish and wildlife in the northwest portion of the state. These studies will lead to the recommendations and plans that can protect--and directly increase--northwest Montana's fish and wildlife populations.

If you wish to learn more about these studies or comment on them, contact the Kalispell office of Montana Department of Fish, Wildlife and Parks, your nearest BPA Area or District office, the BPA Division of Fish and Wildlife, or the BPA Public Involvement Office and ask for a copy of the *Issue Backgrounder*: "West of the Divide: Fish and Wildlife Projects in Western Montana". In addition, BPA maintains a mailing list of people interested in keeping abreast of the agency's fish and wildlife activities. If you wish to be placed on that list, contact the BPA Fish and Wildlife Division at the number listed below.

Phone: BPA Area and District offices:

Portland -503-230-4551

Eugene -503-687-6952

Seattle -206-442-1430

Spokane -509-456-2515

Missoula -406-329-3060

Wenatchee -509-662-4377

Walla Walla -509-522-6226

Idaho Falls -208-523-2706

Montana Department of Fish, Wildlife and Parks P.O. Box 67
Kalispell, MT 59901 406-755-5505

Bonneville Power Administration Division of Fish and Wildlife-PJ P.O. Box 3621
Portland OR 97208 503-230-4981

Bonneville Power Administration Public Involvement Office P.O. Box 12999
Portland OR 97212
503-230-3478 (teletypewriter service available for the speech and hearing impaired)
800-452-8429 (toll free in Oregon) 800-547-6048 (toll free in other Western States)

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