

Kokanee Salmon Fishery

Note: this document was prepared for the Okanagan Collaborative Conservation Project (Feb 2025). It is a copy of an old web-page from the Royal BC Museum and, given that the page is long defunct, it is as faithful a copy as possible.

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Fishery: Introduction

Twenty years ago Mission Creek provided a spawning and rearing environment for 80 - 90% of the tributary spawning Kokanee of Okanagan Lake.

- Since then the Kokanee population has crashed to only 10 - 20% of those former years, with the most dramatic decline occurring in Mission Creek.

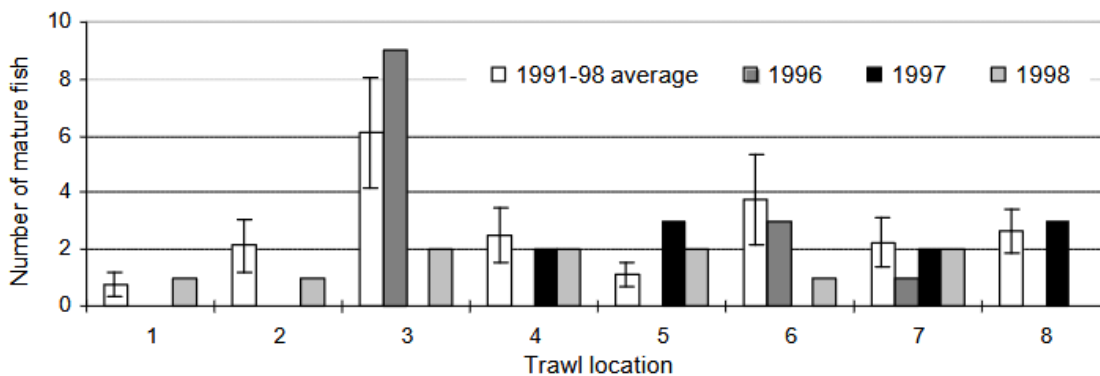


Figure 6. Distribution of mature fish in Okanagan Lake prior to shore spawning in 1996 to 1998 compared with the last eight years.

Fig 6 From: S Matthews & B. Shepherd. Okanagan Lake Action Plan (1998).

- Today only 35% of the lake's stream spawners enter Mission Creek each fall.

Fishery: Saving the Kokanee

One of the major projects in the Okanagan to help restore Kokanee populations is the Mission Creek Spawning Channel. The channel was developed to restore favorable conditions for Kokanee spawners. Clean gravel and special fencing was installed to direct Kokanee into the best spawning areas. It was hoped that these efforts would increase egg and fry survival rates from 5 % in the wild to 80 % in the channel. To date, the channel has not been as successful as hoped. In 1992, 36,000 Kokanee used the spawning channel, but by 1995 this number dropped to 5,000.

In addition to costly enhancement projects such as the one at Mission Creek, the Province of British Columbia imposed a ban on Kokanee fishing in Okanagan Lake in 1995. Scientists believe that this ban will be in effect until at least the year 2001. To avoid Kokanee over-fishing in nearby lakes, the Province also reduced catch limits from 5 to 2 Kokanee per day on Wood and Kalamalka lakes.

Fishery: Conservation

- This drop in Kokanee population has occurred despite
- In recognition of the fisheries value of this habitat it was recommended in the Okanagan Basin Study, 1974, that water discharge flows not drop below that which will support 300,000 spawners.
- This recommendation was reaffirmed in 1992 in the Okanagan Lake Tributary Plan.
- In the late 1980's the decline stimulated construction of a 1 km spawning channel in Mission Creek, and the introduction of four years of hatchery

reared fry.

- In 1995 the spawning channel under went considerable improvement.
- At the same time, however, other activities have reduced the quality and quantity of the Mission Creek habitat.
- Although, flow recommendations are in place to maintain a minimum flow of 1.13 cm during spawning and 0.85 cm during incubation, in only 8 of the last 19 years has even the average monthly flows met the minimum recommendations.
- Besides the low flows reducing the available spawning gravel, if it occurs during a warm September, the water temperature often exceeds the upper lethal limit for Kokanee eggs.
- If the Okanagan Lake Kokanee sports fishery is to depend on tributary spawners then Mission Creek requires more attention.
- The closing of the Kokanee fishery on Okanagan Lake was an attempt to minimize any further reduction of the Kokanee population.
- With the advent of global warming and increased dryness in the Okanagan Valley, dependence on Mission Creek will increase.
- Creeks that come from high elevations have high drainage areas which provide more stable water supplies.
- Without better success in its management, the creek habitat is not anticipated to be capable of meeting it's historical role in sustaining the Kokanee of Okanagan Lake.

Fishery: Reduction

Kokanee reductions in Okanagan Lake

Kokanee populations have been of great interest in the past two decades because many lakes that support them have undergone dramatic losses in Kokanee numbers. Okanagan Lake, British Columbia, Canada, is one of many lakes in which this has happened. Declining numbers are most often noted in the number of Kokanee that spawn each year. It is believed that almost one million Kokanee spawned in Okanagan creeks in the 1970s. This number declined to 101,000 by 1994.

There are a number of factors responsible for the decline in Kokanee numbers. Many of these factors destroy Kokanee spawning habitat. Scientists believe that of all Okanagan spawning habitat that existed 100 years ago, only 10 to 20 % remains today. Declining Kokanee populations are due to:

Over-fishing. It has been suggested that Okanagan Lake has been over-fished to a point where the Kokanee population has dropped, although this is not well documented. Over-fishing has likely played a part in the Kokanee fishery collapse, but it has probably been minimal. In 1988, biologists estimated that over 200,000 Kokanee were caught from Okanagan Lake. Normally this number would be acceptable for a lake the size of Okanagan, but with such limited spawning habitat, this count is considered very high. A similar situation occurred in the west arm of Kootenay Lake during the mid-to-late 1970s. The fishery there was many times larger than that of Okanagan Lake. In a study of the fishery collapse, over-fishing did appear to have a major effect, but several other factors contributed to the decline.

Logging Activities. Logging mainly affects Kokanee populations by impacting

their spawning grounds. A number of stream characteristics, important to Kokanee, may be altered due to logging practices:

- a) Logging alters stream flow hydrology. Logged areas tend to have decreased fall and winter flows and sudden rapid spring freshets (runoff), when compared to undisturbed areas. This means that fish eggs can dry out, be exposed to freezing, or be flushed out prior to hatching.
- b) Logging and its associated activities, such as road building, can cause increases in stream sediment loads. Clear-cuts can cause increases in sediment loads due to mudslides and debris flows. Increased sediments may ruin spawning grounds by "choking" them out with fine particulate matter.
- c) Logging practices can affect water quality, including temperature, water chemistry and dissolved oxygen concentration. Salmonid fishes, such as Kokanee, require pristine spawning conditions which include cold, clean, well-oxygenated water. Lethal temperatures are often achieved in streams that have had their riparian (streamside) vegetation removed. This has been observed in Mission Creek, one of Okanagan Lake's major spawning channels. Improper logging techniques may result in increased nutrient loading in streams and decreased oxygen availability for Kokanee eggs.

Stream Modification. Many tributaries (streams) of Okanagan Lake have undergone some form of stream modification in recent decades. For example, the Okanagan River was diked and channeled during the late 1950s in an effort to reduce flooding in the Penticton area. Mission Creek in Kelowna was also channeled for a major portion of its lower reach. This resulted in effective flood control. Stream modification destroys Kokanee spawning habitat in several ways:

- a) Channeling results in the scouring away of the spawning substrates. Good spawning substrates, consisting of small, unconsolidated rock and gravel, are replaced with larger rocks and boulders, which are useless to Kokanee.
- b) Streamflow is altered so that suitable spawning areas are dry by the time spawning takes place, or shortly afterwards, resulting in high Kokanee egg mortalities. In other areas, stream flow is concentrated so it is too fast for the Kokanee to efficiently spawn. During spring freshets (runoff), boulders can crash over the spawning grounds due to increased stream velocities in the channels.
- c) Channeling results in the destruction of riparian vegetation along modified streams. This decreases stream shading, resulting in higher temperatures in the fall, and much lower temperatures in the winter. These temperatures may be lethal to delicate Kokanee eggs.

Lakeshore Development. Although shore-spawning Kokanee are not well documented, lakeshore modification has likely affected their numbers. The development of lakeshore has resulted in the destruction of spawning beds along it. Man-made beaches and road-building alongside the lake have probably destroyed much of the habitat for shore-spawning Kokanee.

Water Use. The Okanagan Valley relies heavily on water for agricultural and domestic uses. Several streams have significant amounts of water removed for these purposes. In addition, many streams travel through residential areas where storm sewers empty into them. These uses have negatively affected Kokanee spawning habitat:

- a) It is not uncommon to see streams that contain prime spawning habitat

become reduced to a trickle by the end of the summer (when the Kokanee spawn). The lack of water leads to higher temperatures in the fall, which are also detrimental to Kokanee and their eggs. This situation has repeatedly occurred at Trout Creek, in Summerland.

b) Other streams are frozen during the winter months because water flow is minimal and this kills Kokanee eggs.

c) Low flows promote the settling of fine particulate matter (sedimentation) which results in the smothering and death of Kokanee eggs.

d) Lake drawdown has not been much of a problem, but whenever it does occur, the consequences to the entire shore-spawning population are severe.

Mysis relicta. *Mysis relicta*, commonly referred to as opossum or mysis shrimp, was introduced into Okanagan Lake in 1966. These organisms were introduced in hopes of boosting the productivity of the lake, providing extra forage for game fish and enhancing the fisheries industry. Decisions for the introduction were based on several other North American and northern European lakes that observed increased productivity within a few years after the introduction of *Mysis relicta*. In the beginning, fish populations rose variably for the lakes, but then began to collapse. Scientists discovered that *Mysis relicta* is a good prey item for large Kokanee, but not for Kokanee aged less than one year. The shrimps are too large for small Kokanee to handle. The major food source for young Kokanee in Okanagan Lake is a small zooplankton species called *Daphnia*, otherwise termed the "water flea." Unfortunately, *Daphnia* is also the preferred food item for *Mysis relicta*. This leads to competition for the same food source, but the shrimps are more efficient predators than the Kokanee. They feed during the night, whereas the Kokanee do not, and they have a rapid generation time. The shrimps have few

predators and normally inhabit different zones of the lake than the Kokanee. It is unknown if *Mysis relicta* populations have stabilized in Okanagan Lake. If they continue to rise, the Kokanee population will continue to drop.

Fishery: Related Topics

- Diversity of spawning behavior in Kokanee of Okanagan Lake
- Kokanee (*Oncorhynchus nerka*)
- Productivity of a Kokanee Spawning Channel
- Game Fish -- *Fish BC*

Document Sources

- **Original Source:**
<https://royalbcmuseum.bc.ca/exhibits/living-landscapes/thomp-ok/kokanee-salmon/fishery.html>
- **Existing Source (as of Feb 2025):**
<https://web.archive.org/web/20210518232613/https://royalbcmuseum.bc.ca/exhibits/living-landscapes/thomp-ok/kokanee-salmon/fishery.html>