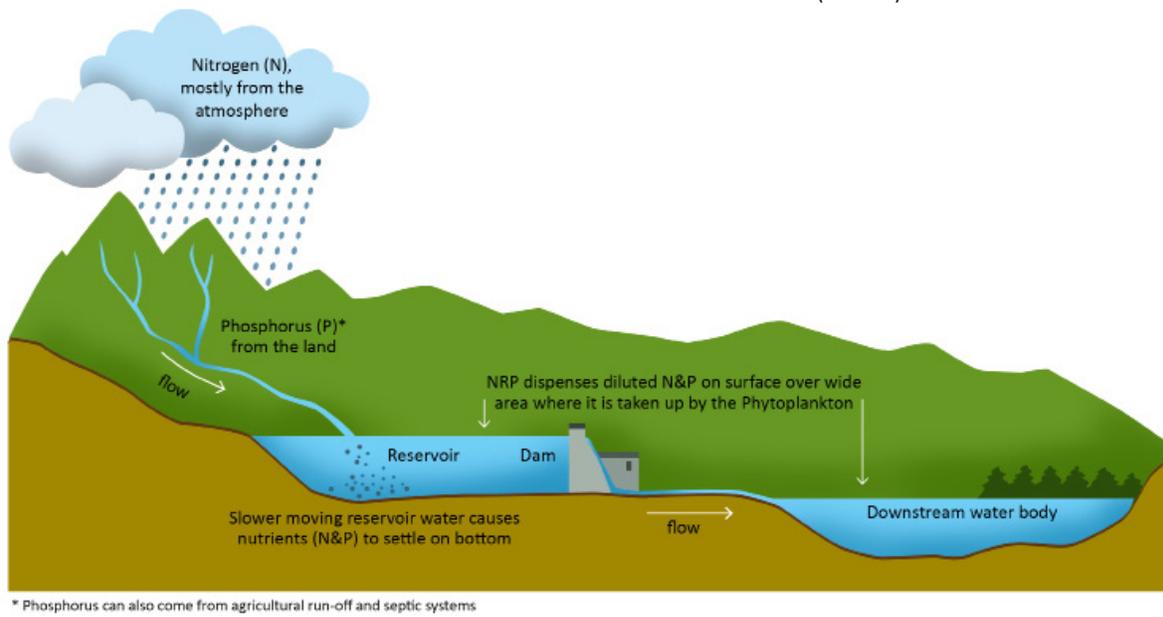


NUTRIENT RESTORATION PROGRAM

The Nutrient Restoration Program is rebuilding the natural aquatic food web that existed in Kootenay Lake and the Arrow Lakes Reservoir before the construction of BC Hydro dams. Since the 1990s, the Nutrient Restoration Program has been simulating the in-flows of nitrogen and phosphorus that would naturally occur during spring freshet.

Liquid nitrogen and phosphorus are added to both waterbodies. The nutrients feed the microscopic phytoplankton, which feed the zooplankton, which feed the kokanee and in turn the many other fish and wildlife that depend on this ecosystem. The nutrients are made up of phosphorus—agricultural grade ammonium polyphosphate (10-34-0)—and nitrogen—agricultural grade urea ammonium nitrate (28-0-0).



Nutrient additions are enhancing food web productivity

In 2022, an independent technical review of the Nutrient Restoration Program confirmed that the program is successfully restoring food webs in Kootenay Lake and the Arrow Lakes Reservoir to support fish populations.

The review recommends the program continue. Minor adjustments to the program were recommended, and were incorporated starting in 2023.

Key findings of independent technical review

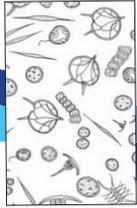
- Since nutrient additions began, productivity at the bottom of the food web has increased by at least 50 to 100%
- Kokanee biomass (i.e., total weight of kokanee in the waterbody) has been on average about three times higher than before nutrient additions started
- If the Nutrient Restoration Program stopped, productivity could decline to pre-addition levels with consequences to the upper food web including kokanee
- The primary source of variability is annual weather and in-flows to the water bodies that influence growing conditions. In Kootenay Lake a predator-prey imbalance has caused substantial variation throughout the food web
- The delivery of the Nutrient Restoration Program—the quantity of nutrients, the way they are added, and the source of the nutrients—is suitable.



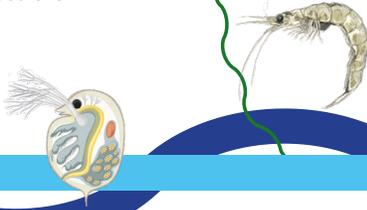
REBUILDING THE FOOD WEB

Phytoplankton

These plants, known as algae, use nutrients and sunlight to grow. They feed the zooplankton which feed the kokanee.



Mysids are small crustaceans and were introduced but now compete with kokanee for the Zooplankton.

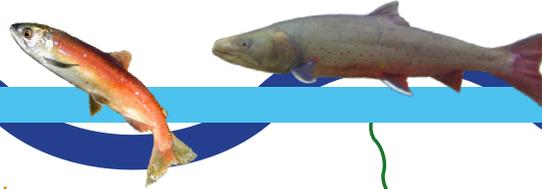


Zooplankton

These microscopic organisms include Daphnia, a food preferred by kokanee.

Kokanee

Kokanee are a food source for bears, eagles, osprey and they are an important part of the aquatic food web.



Piscivorous (fish-eating) species such as bull trout rely on kokanee as their main food source.

Monitoring helps balance a complex food web

Kootenay Lake and the Arrow Lakes Reservoir are large, cold, and naturally lower in nutrients than smaller, warmer water bodies. Careful monitoring of nutrients and fish populations is key to adapting the delivery of nutrients to meet the unique and complex variables of the food web.

Adding too many nutrients can lead to over-enriched bodies of water that produce too much or undesirable algae. As these algae die, they use oxygen to decompose, which is unhealthy for fish, plants, and other animals, and not all algae are edible to zooplankton.

Annual delivery of the Nutrient Restoration Program is adapted based on results from monitoring stations in the North and South Arms of Kootenay Lake, and in the Upper and Lower Basins of the Arrow Lakes Reservoir.

Monitoring includes temperature, chemistry, phytoplankton, zooplankton, and the presence of mysids—which were originally introduced to feed the kokanee but now compete with kokanee for food. In-lake kokanee abundance is estimated through hydro-acoustic surveys and trawl sampling, and kokanee spawners are counted in various tributaries to both Kootenay and Arrow, and at the Hill Creek and Meadow Creek spawning channels. Bull trout redd counts are monitored on select tributaries to Kootenay and Arrow, and angler surveys are carried out on Arrow Lakes Reservoir.

The Nutrient Restoration Program is a partnership

The Nutrient Restoration Program is an annual and ongoing project funded primarily by the FWCP's Columbia Region. It is reviewed each year by the Columbia Region's fish technical committee and board.

The Nutrient Restoration Program is delivered on behalf of the FWCP by the Province of B.C. through a long-term agreement with participation from the Ktunaxa Nation, Okanagan Nation Alliance and the Secwepemc Nation. The Province of B.C. is responsible for managing fish stocks.

Columbia Power funds approximately 25% of the costs in the Arrow Lakes Reservoir. In the North Arm of Kootenay Lake, BC Hydro funds approximately 17% and, in the South Arm, the Kootenai Tribe of Idaho has funded nutrient additions in the past and is currently funding some of the monitoring on Kootenay Lake.

