

## Topics of Interest in Fisheries Conservation Planning

Aquatic ecosystem, aquatic habitat, fish species concerns:

1. The importance of connectivity between lakes, rivers and reservoirs and how it shapes life history forms among fish species; it is a continuum from Columbia Lake to Mica Dam and fish populations interact at this spatial scale;
2. The role of kokanee salmon in upper Columbia nutrient dynamics and ecosystem interactions;
3. Species of special concern: burbot (freshwater ling) and westslope cutthroat trout;
4. The role of habitat restoration towards conservation needs.



## Kokanee salmon and ecosystem interactions

### Ecological importance:

1. Pacific salmon extirpated from the Upper Columbia River in BC with completion of Grand Coulee Dam in 1936;
2. Kokanee salmon introduction to Kinbasket Reservoir in mid-1980's fills a void that existed for a period of 50 years;
3. Kokanee spawners have since pioneered in a variety of tributaries in the upper drainage, and have been highly successful in the mainstem Columbia R in areas previously utilized by chinook salmon;
4. Kokanee are considered a keystone species since they not only serve as an important food source to aquatic and terrestrial species, they serve a critical role in nutrient cycling throughout the upper drainage (i.e., critical in trophic level interactions that extend to aquatic, riparian and terrestrial communities);
5. In the face of current challenges with Pacific salmon re-introduction to the upper watershed, kokanee provide an opportunity for the re-establishment of First Nation food fisheries.



## Species of concern in the upper Columbia:

A high conservation priority for freshwater lingcod (burbot) in consideration of :

1. History of cumulative effects (over-harvest of spawning populations, habitat and flow alteration, and water quality impairment) have resulted in extremely low abundance and decreased fish size;
2. Populations typical of multiple life history forms (lake, river, stream) have been reduced to remnant populations in more isolated areas of their historical range; historical fisheries have targeted migratory (river) populations characteristic of large size, high fecundity and highly discrete (localized) spawning habitats (recall the spear fishery on the lower Spillamacheen River); the apparent loss of life history diversity has a direct effect on population resiliency, particularly in response to environmental change or disturbance (be it natural or anthropogenic);
3. Traditional fisheries for ling (Columbia Lake, Windermere Lake, Columbia River between Columbia Lake and Kinbasket Reservoir) have been closed since 2008; despite closures, more recent assessments (Westslope Fisheries 2016) of the Columbia Lake population suggest a declining trend.

## Species of concern in the upper Columbia:

### Westslope cutthroat trout:

1. Currently blue-listed in the Kootenay Region; issues surround genetic introgression with supplanted rainbow trout in headwater lakes that have connectivity with stream populations of cutthroat;
2. An area of interest should consider the Bugaboo Creek populations since a number of barriers throughout the watershed have likely created a unique opportunity for genetic divergence;
3. Westslope cutthroat trout are a native species that are more isolated in tributaries and display fluvial life history traits( life cycle completed entirely in stream environments within a narrow range); identification and protection of these unique populations is a recommended priority action.



## The role of habitat restoration in conservation planning:

### Considerations:

1. Identification of limiting factors affecting a particular life stage that serve as a bottleneck to population recovery;
2. Where habitat limitations are identified, apply treatments at a sufficient spatial scale that are meaningful and allow evaluations that are measureable; better to concentrate on fewer projects that can demonstrate a high level of success than to spread investments across multiple projects with higher uncertainty of success;
3. Look to multiple sources of funding particularly where large investments will be required to complete projects of significant scale.



## Top recommendations that will make a difference:

1. Consider the upper Columbia system in its entirety since populations operate over large spatial scales (think laterally and longitudinally);
2. Recognize the importance of kokanee in ecosystem structure and function and direct efforts at protecting critical spawning environments in the upper basin that may be affected by development;
3. For burbot recovery, align with the East Kootenay Burbot Working Group; a SARA listing may be the first step in raising awareness of an imperiled population; look to recovery efforts in the lower Kootenay River below Libby Dam for alternatives (re-stocking has shown some promise);
4. For westslope cutthroat trout, consider future assessment work surrounding genetic integrity of headwater populations; identify and manage potential threats of introgression; safeguard habitat.
5. Habitat restoration: treatment size matters.

