

Abstract: Understanding connectivity – Animal (including fish) behavior, Instream flow needs, channel morphology, and watershed/ecosystem context, and potential risks (i.e. native/introduced species interactions) – Part 1

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Open Pit mining, forestry, agricultural land use and urban development all have the potential to impact/alter channel processes and the physical channels which can affect morphologic processes, and fish and fish habitat. Within the province of British Columbia, and in particular southeastern BC - Kootenay Region, the traditional territory of the Ktunaxa people, large scale resource extraction (industrial mining, open pit - coal; and underground - lead, silver, zinc, other metals) have, in some watersheds, highly altered natural channel processes through water extraction and burial of channels, diversion, changes in sediment (suspended and bedload) and physical alterations (loss of riparian, linear infrastructure/corridors, roads, railways, bridges).

Habitat fragmentation, loss of connectivity (linear – upstream/downstream, and lateral – to the floodplain) and changes to fluvial processes/geomorphology have contributed to declines and loss, particularly for native species or *Species at Risk Act* (SARA) listed species including Westslope Cutthroat Trout. The East Kootenays represent key core3 habitat areas within their BC (if not Canada/North America) range for Westslope Cutthroat Trout, Bull Trout,

White Sturgeon, salmon and burbot. Large hydro dams, online sediment control ponds, culverts, railways all have resulted in the good, the bad, and the ugly in terms of how stream crossings are designed or restored.

Understanding the biology and behavior of fish species, and their ability and timing for upstream and downstream movements, particularly in response to water temperatures and the hydrograph, are critical components toward the design of proper stream crossings, and effectively managing development within the floodplain. Comprehensive biological, hydrology, and morphology studies to understand the relationship between fish behavior, instream (including floodplain) flows, and channel morphology are critical to both mitigating potential impacts from new or existing streams, and designing/restoring connectivity.

In this presentation, we will discuss the following key themes:

- Species of concern/listed species (biological concerns);
- Fish behavior, and research/study needs;
- Instream flows, timing, hydrograph, ramping rates;
- Floodplain connectivity and geomorphology; and
- Project/study team and approach.

Introduced (non-native) species, or the re-introduction of native species to disconnected habitats, also create potential management conflicts and decisions. Understanding the linkages (physical, chemical,

biological) within natural and modified channels, and the permitting/policy decisions that may influence/be influenced by restoring connectivity requires an inter-disciplinary and multi-agency/stakeholder approach to be successful. In southeastern BC, this is a large part of the focus for restoring connectivity and rehabilitating natural systems.