Stuart-Takla

Fisheries-Forestry Interaction Project

The Fraser Basin is the most important salmon-producing system in North America. On average, 25% of the annual production of sockeye salmon from the Fraser River originate in the Stuart-Takla drainage. Research is vital to ensure that these prime salmonid spawning and rearing habitats are protected in the future.

Focus

This project is a long-term, multi-disciplinary study of the effects of modern forestry practices on interior stream ecosystems, fish populations, and fish habitats.

Information obtained will be essential for making ecologically sound decisions about integrated resource management, and for testing, evaluating, and refining current harvesting and resource protection provisions for interior forests within the new Forest Practices Code.

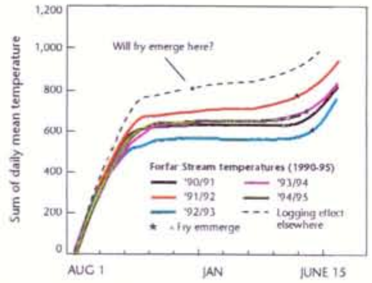
Stuart-Takla sockeye enter the Fraser River in June and migrate 1200 km in about 18 days to reach their spawning grounds.

Study Area

Plans are presently under way to designate the Stuart-Takla study area as an experimental watershed. Future research will concentrate on ecosystem management.

Control

In order to evaluate the impacts of harvesting conducted in other sites, one watershed, Forfar Creek, will remain unlogged for the duration of the project. A minimum of 4 years pre-harvest data will be collected from each watershed.



5–year study of stream temperatures at Forfar Creek. Slim Creek data suggest increased summer temperatures after logging may accelerate egg development, causing fry to emerge early in adverse seasonal conditions.

Streambed freezing can be a source of mortality in eggs and alevins during late autumn and early winter. Formation of streambed "anchor ice" is shown by ice covering this oxygen/temperature probe.

Component Studies Are Included Under Four Subject Areas:

Thermal Dynamics

Summer water temperatures increase when riparian forests are harvested, increasing the streams' exposure to direct sunlight.

Late autumn and early winter stream temperatures decrease after logging. Increased area and depth of streambed freezing may increase mortality rates of salmon eggs and newly hatched alevins.

The Forest Practices Code prohibits harvesting in riparian zones immediately adjacent to fish-bearing streams. However, this does not apply to tributaries without fish.

Sockeye spawn from August 1 to 15 in the Takla tributaries so that their eggs receive enough thermal units to develop into fry by next spring.

Solar radiation, air temperature, and wind are measured at several meterological stations. Stream temperatures are measured in several sites by sensor probes linked to data loggers.

Snow cores are taken to determine snow depths, water equivalents, and densities.

Hydrological weirs on tributaries are used to monitor changes in sub-basin discharge, turbidity, sediment transport, and water temperatures.

Hydrology

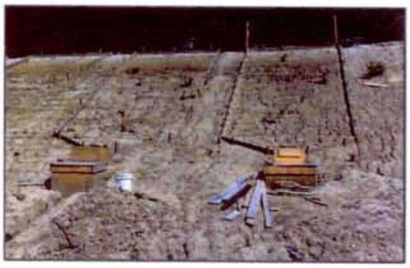
Hydrology in the Stuart-Takla area is determined largely by seasonal snowmelt; therefore, the highest stream discharges occur during spring.

Differences in snow accumulation and melt will be determined for harvest sites by using ultrasonic recorders, precipitation gauges, snow-core surveys, and lysimeters.

Peizometers located throughout the watersheds measure groundwater movement from the hillslopes to the stream channels.

Clearcut areas will form a relatively small proportion of the total watershed because harvesting will be conducted according to the Forest Practices Code. Resulting hydrological changes in main-stream channels will be subtle and difficult to detect.

Smaller tributaries will be more sensitive to forestry impacts. Therefore, changes in stream discharge and other physical processes due to logging will be documented using a pair of tributary sub-basins. One of the pair will be logged, and the other left as an unlogged control.



Rates of erosion and transport of fine sediments are determined at exposed hill slopes, and other sites such as road surfaces.

The effects of fine sediment on egg development and survival are studied by planting capsules containing fertilized eggs into different stream locations.

Sediment Dynamics

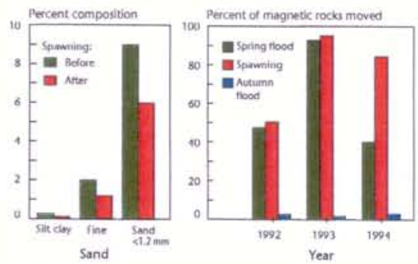
All study watersheds contain large deposits of fine, lacustrine sediments. Spawning salmon and other aquatic organisms can cope with large quantities of these sediments occurring naturally within interior streams.

Forestry activities in interior watersheds may affect aquatic habitats and fish by increasing the natural rates of erosion and transport of fine sediments into streams and lakes.

Coarse sediments enter stream channels as gully torrents and landslides. They are transported along the streambed (*bed-load*) during floods and by spawning salmon.

Bedload transport is measured with bucket traps and painted magnetic rocks.

Annual changes in the composition of the streambed are determined from frozen core samples. Sockeye salmon eggs are visible in the central portion of this sample.



Spawning sockeye are able to clear fine sediments from the streambed, therefore improving conditions for egg development and survival. Annually, spawners also are able to move as much (or more) coarse sediment in streams as do spring floods.

Lower reach of O'Ne-eil (or Kynoch) Creek showing multiple channels, large organic debris, gravel bars, and the riparian forest.

Microhabitat characteristics (depths, velocities, surface subtrate textures) are determined at selected sites within each stream before and after the spawning season.

Stream Morphology and Aquatic Habitats

Stream morphology includes all of the physical features that together characterize the stream environment.

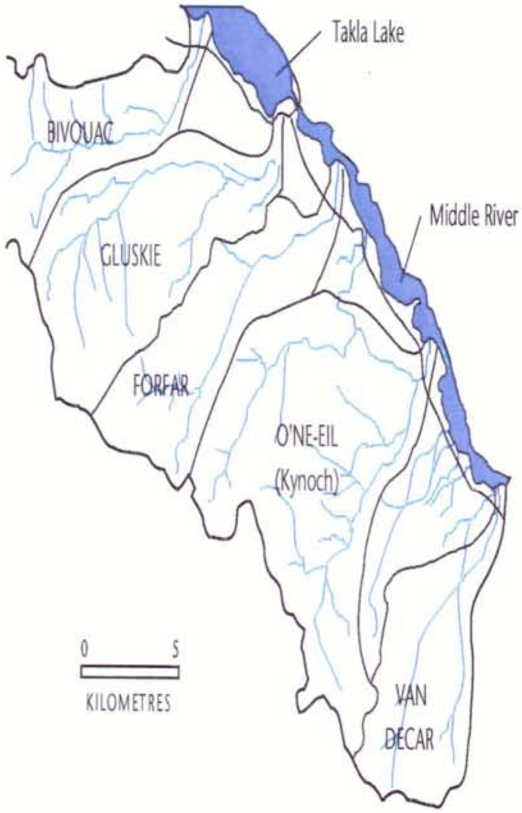
Features including turbulent riffles, low-velocity pools, and laminar-flowing glides provide important habitats for fish, aquatic insects, and other animals.

Large organic debris or LOD *(tree trunks, large branches, and root masses)* is another important structual component of streams.

This debris influences channel form and retains substrates which fish use for spawning and egg incubation.

Changes in stream morphology are determined by:

1. Annual low-level aerial photography of the entire channel.
2. Annual ground-based, detailed surveys in 200-metre reaches.
3. Historical channels located on photos and aged by using carbon-14 dating.



Research Partners

Partners in this research program include the federal Department of Fisheries and Oceans, BC Ministry of Forests, BC Ministry of Environment, Lands and Parks, Canadian Wildlife Service (Environment Canada), Tl'Azt'En Band (Tachie), Canadian Forest Products LTD., the University of Northern British Columbia (Prince George), the University of British Columbia (Vancouver), and Simon Fraser University (Vancouver).

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Component Studies

- Adult Sockeye Distribution, Habitat Inventories
- Annual Physical Characteristics and Morphology of the Streams
- Bird Populations and Biodiversity in Riparian Forests
- Composition of Streambed Gravels
- Enumeration of Fry Emigrating from the Streams
- Enumeration of Spawning Sockeye and Methodology Development
- Historical Changes of the Stream Channels
- Hydrological and Meteorological Monitoring
- Impacts of Beaver on the Stream Ecosystem
- Intragravel Environment for Salmon Eggs
- Productivity and Biodiversity of Watershed Insects
- Sediment Inputs to the Middle River Spawning Gravels
- Snowpack and the Hydrological Cycle
- Sockeye Salmon Rearing in Side-channel Swamps
- Sources, Erosion, and Stream Transport of Fine Sediment
- Spawner Site Selection and Egg Survival
- Stream Invertebrate Community and Production
- Stream Temperature Regimes
- Terrain Inventory and Sediment Sources
- Transport of Coarse Sediment in Streams