

Technical Report Project 12 – Sockeye habitat analysis in the Lower Fraser River and the Strait of Georgia

Project description: The researchers will prepare a habitat inventory for sockeye habitats in the Lower Fraser River (below Hope) and identify human activities that could affect them; analyze Lower Fraser River and Estuary development; describe human activities in the Strait of Georgia that could negatively affect sockeye salmon; evaluate protection strategies related to human development, and shipping; provide a synopsis of water quality conditions in the Strait of Georgia along the sockeye migration routes; and quantify sockeye food abundance in the Strait of Georgia, in relation to the potential for food competition and limitation.

Company: Golder Associates is a respected, employee-owned, global company providing consulting, design, and construction services in the areas of earth, environment, and the related areas of energy. From 160 offices worldwide, Golder’s nearly 7,000 employees work with clients to manage their environmental and engineering activities in a technically sound, economically viable, and socially responsible manner. The Canadian operation, Golder Associates Ltd., has over 2,600 employees in over 30 offices. In British Columbia, Golder Associates has 11 offices staffed by over 600 people. The project has been led by Dr. Mark Johannes and a team of specialists.

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The report reviews and summarizes potential impacts from human development from 1990 to 2010, and examines potential interactions between development and activities in the Lower Fraser River and Strait of Georgia and sockeye salmon habitats.

The Strait of Georgia, the lower Fraser River and watersheds are used by both juvenile and adult sockeye salmon as key habitats (spawning, incubation, rearing) and as migration corridors on their way to and from the North Pacific. Annual variation in the quality of the water and ecological conditions experienced in these habitats may have important links and potential effects on Fraser sockeye production. Juvenile sockeye first entering into the ocean are particularly sensitive to annual changes in water properties and levels of food, competitors and predators.

To examine possible outcomes of human activity, the researchers looked at the following factors and their potential interactions with sockeye habitats:

- Population (size, density)
- Land use (agriculture, forestry)
- Large industrial and infrastructure sites and projects
- Waste (liquid and solid waste)
- Shipping vessel traffic
- Lower Fraser River dredging and diking
- Strait of Georgia biological and physical water characteristics, including non-native or invasive species and human-derived contaminants

## **Human activities, habitat interactions**

The population of the Lower Mainland and on southern Vancouver Island have increased 150 per cent in the last 20 years. Historically, many human activities may have had moderate to severe effects on sockeye habitats, but these impacts have not generally been observed during the last two decades. At the same time, programs have been in place to curb and manage human development and potential interactions and effects on sockeye habitats. The physical construction of development projects adjacent to sockeye habitats has also been regulated, and evidence shows that habitat conservation efforts have resulted in recent habitat gains in the Lower Fraser River and estuary. Importantly, impacts from project development have not been observed to coincide with the decline of the Fraser River sockeye.

There is, however, room for continued improvement in environmental management, protection and conservation of sockeye habitats.

## **Recommendations for habitat protection strategies**

The habitat protection strategies used in the Lower Fraser River and Strait of Georgia are helping to support sockeye habitat conservation. The evidence shows that declines in Fraser River sockeye production from 1990 to 2009 are not a direct result of habitat impacts from project development.

However, the researchers found that habitat losses associated with project development did occur before the period covered by this report. Those losses were presumably the result of inadequate knowledge and experience in the design and construction of habitat compensation. It also indicates that historically the regulatory review process may not have been appropriately used.

As habitat compensation projects become more challenging and environments are more strongly influenced by changing climates and diminishing space in which to construct new habitats, the researchers recommend that habitat management should:

- Continue to maintain active review of habitat projects for current and future activities and human development
- Undertake further research in habitat ecology to evaluate alternative approaches to those prevailing today to adequately evaluate habitat compensation projects
- Create an integrated framework that brings together habitat science, management, inventory and reporting