Principles & Guidelines
for the
Harvest Management of Fraser Sockeye Salmon
(DRAFT – January 2013)

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Abbreviations

The following abbreviations are used throughout the document:

- **AFE:** Aboriginal Fisheries Exemption
- **BM:** benchmark
- **CU**: Conservation Unit
- **DBE:** Difference between estimates
- **ER:** Exploitation Rate
- **LAER**: Low Abundance Exploitation Rate
- **FRP**: Fisheries Reference Point
- **MA:** management adjustment
- **MU:** Management Unit
- **TAM:** Total Allowable Mortality
- **SR Model:** Spawner-Recruit Model
- **R/S:** Recruits per spawner

Executive Summary

This paper is part of an on-going process to develop guidelines for setting annual spawning and exploitation goals for Fraser River Sockeye Salmon. The initiative began in early 2002, and has since evolved through a series of workshops and on-going feedback from First Nations and stakeholders. A quantitative modeling tool has been used to support the planning process, and has been peer-reviewed by CSAS in 2003 and again in 2010. More information about the process and the model is available through the documents listed in the *Further Reading* section.

This *Principles and Guidelines* document lays out the general approach for establishing an escapement plan and managing the annual harvest of Fraser River sockeye salmon, rather than a set of specific rules (which always end up requiring exceptions for special circumstances). The document is organized to first present a very high-level summary and then gradually introduce additional levels of detail. The Executive Summary outlines 9 management principles; the body of the document consists of short sections with more information about each principle. Throughout, there are links to more detailed guidelines in the Appendix.

This document is intended to evolve over time based on feedback. To provide comments, contact the Canadian Chair of the Fraser River Panel.

The following 9 principles shape the annual planning and implementation of Fraser sockeye fisheries:

1) Fraser River sockeye harvests are managed for maximum sustainable benefits.
2) Management of Fraser sockeye fisheries tries to account for key sources of uncertainty.
3) Fraser River sockeye harvests are managed in aggregates of one or more Conservation Units, called management units.
4) The only aspect under direct human control each year is the level of harvest and harvest levels change with abundance (i.e., small runs are managed differently from large runs).
5) Fraser Sockeye management units (MUs) are not managed in isolation (i.e., harvest of Fraser sockeye MUs will take into account the abundance of co-migrating MUs, component CUs, as well as other species).
6) Aggregates dominated by highly cyclic CUs are managed differently from non-cyclic aggregates.
7) Additional management actions are taken for CUs at very low abundance or very poor status.
8) Additional management actions may be taken for management units or CUs at very high abundance.
9) Management plans for Fraser sockeye are subjected to public review.

The rest of this Executive Summary offers a short explanation of each principle.

1) Fraser River sockeye harvests are managed for maximum sustainable benefits

   The fundamental objective for the management of Fraser sockeye fisheries is to achieve sufficient spawner abundances such that Fraser sockeye continue to exist into the future and provide for maximum sustainable use. In this context, sufficient spawner abundance is defined as a range of abundances which is considered likely to meet a diversity of biological and socioeconomic goals over the long-term. In terms of biological goals, sufficient spawner abundance means preserving the diversity of Fraser sockeye (i.e. genetic, life history, geographic, migration timing) as well as their contribution to the ecological systems they are a part of (e.g. nutrient transport into distant watersheds). For socioeconomic purposes, sufficient spawner abundance means maintaining the potential for future human use of the Fraser Sockeye resource whenever environmental conditions are favourable (e.g. FSC fisheries, commercial harvest, recreational fishing opportunities, and non-consumptive uses)

2) Management of Fraser sockeye fisheries tries to account for key sources of uncertainty.

   The general management approach is precautionary and risks are specifically evaluated where possible. Risk management tools in use for Fraser sockeye include: general form of the harvest strategy, use of in-season management adjustments, and annual implementation based on observed in-season abundances rather than forecasts. Alternative harvest strategies are evaluated and collaboratively developed through the exploration of simulated risks across multiple population models, taking into account uncertainty in parameter estimates for each model, and alternative scenarios of future productivity

3) Fraser River sockeye harvests are managed in aggregates of Conservation Units, called management units.

   Salmon management is complex, involving five species divided into hundreds of Conservation Units in many watersheds that are harvested in highly diverse fisheries (sectors/stakeholders, areas, gear types). Considerations of biology and geography need to be brought together in an organized way with social and economic considerations to enable practical and efficient planning. Fraser River sockeye salmon are managed based on the aggregate abundance of groups of populations with similar run timing called management units (MUs). Harvest decision rules for each management unit are developed to maintain the individual conservation units (CU) in the group over time. CU status evaluations are conducted regularly by an expert panel based on a suite of formal status metrics (e.g. for abundance and trend) in combination with qualitative information (e.g. migration conditions) and direct experience. In-season estimates of aggregate abundance are based on data from catch monitoring, test fisheries, and in-river assessment projects, such as the hydroacoustic program at Mission. Individual populations within a management unit may change over time as their timing changes.

4) The only aspect under direct human control each year is the level of harvest (i.e. People can't manage fish, people can only attempt to manage human impacts),

and harvest levels change with abundance (i.e. small runs are managed differently from large runs)

The abundance of salmon populations varies substantially from one year to the next and among populations. Explicit harvest rules with abundance based reference points will be used to set spawning goals. Management units returning at low abundance are managed differently than in years when they are returning at high abundance. A low amount of harvest is typically allowed on MUs at low abundance to enable harvest of more abundant, co-migrating MUs and/or some small directed fisheries in terminal areas. MUs at moderate abundance are typically fished at moderate exploitation rates to contribute to the overall diversity of fishing opportunity. Targeted harvests are focused on MUs that are observed in-season to be returning at large abundances subject to any constraints imposed by component CUs that are at very low abundance or very poor status.

5) Fraser Sockeye management units (MUs) are not managed in isolation (i.e., harvest of Fraser sockeye MUs will take into account the abundance of co-migrating MUs, component CUs, as well as other species).

   Planning for harvest management begins at the MU scale, but allowable ERs for a given MU may be adjusted for co-migrating MUs, component CUs and/or other species. Allowable ER based on TAM rules can differ substantially between MUs, and any MU can act as a constraint on others (e.g. Allowable ER for Early Summer might be much lower than for the Summer Run). Annually, the challenge is to develop a fishing plan in the face of fluctuating salmon abundance, so that the implications for fishing plans are strongly influenced by in-season run size estimates and management adjustments to account for environmental conditions during the return migration, and how they change through the season.

   The abundance of other fish species will also shape the implementation details of the annual fishing plans for Fraser sockeye. For example, the large abundance of Fraser pink salmon in odd-numbered years affects catchability, incidental harvest, and in-season run size estimation of Fraser Sockeye. Similarly, poor status of other fishes can constrain harvest opportunities for Fraser sockeye. For example, a window closure is in place annually to protect Interior Fraser Coho during the peak of their migration through different areas. Non-salmon considerations, such as Rockfish Conservation Areas, can also shape the operational details of salmon fisheries.

6) Management Groups dominated by highly cyclic CUs are managed differently from non-cyclic management groups.

   Off-cycle years are likely part of a biological pattern, and are not the same as a poor return year in a non cyclic CU. Therefore they need to be managed differently. Dominant years have been managed based on the Total Allowable Mortality (TAM) rules (see Principle 4 above), whereas off-cycle years have been managed based on a minimal allowable impact while directing fisheries on more abundant Management Units. Alternate methods of setting escapement goals for MUs containing highly cyclic stocks should be explored.

7) Additional management actions are taken for CUs at very low abundance or very poor status.

   CUs of very poor status are identified through a status assessment based on a period of low abundance, not a single year of poor return. In-season, new information (e.g., extremely adverse migration conditions) may also cause additional management actions to be considered. The general harvest approach for variable abundance of aggregates is modified to protect component CUs of very poor status through measures such as moving window closures or caps on aggregate harvest rates.

8) Additional management actions may be taken for management units or CUs at very high abundance.

   Before additional management measures can be taken, management units or CUs of very high abundance need to be identified in-season based on quantitative estimates of run size (e.g., based on test fisheries, Mission hydroacoustics, and stock ID). The general harvest approach for variable abundance of aggregates is modified to allow additional harvest on the abundant management units or CUs (#4). The principle of considering all intercepted components (# 5) still applies, and therefore any additional ER might only be accessible in situations where it is not limited by any given CU or co-migrating Management Unit such as in a terminal or near-terminal area.

9) Management plans for Fraser sockeye are subjected to public review.

   Fishery implementation is reviewed annually through an extensive post-season consultation process. Periodic re-assessments of the general harvest strategy focus on the specific shape and details of the TAM rules, but are not intended to revisit all of the underlying assumptions and policy choices.

Annual Process for Setting Spawner Goals by Management Unit