Developing a national policy to direct instream flow protection strategies for permitting new projects in Canada; how it's working out.

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Acknowledgements

Roger Wysocki (DFO Ottawa) Co-chaired this process

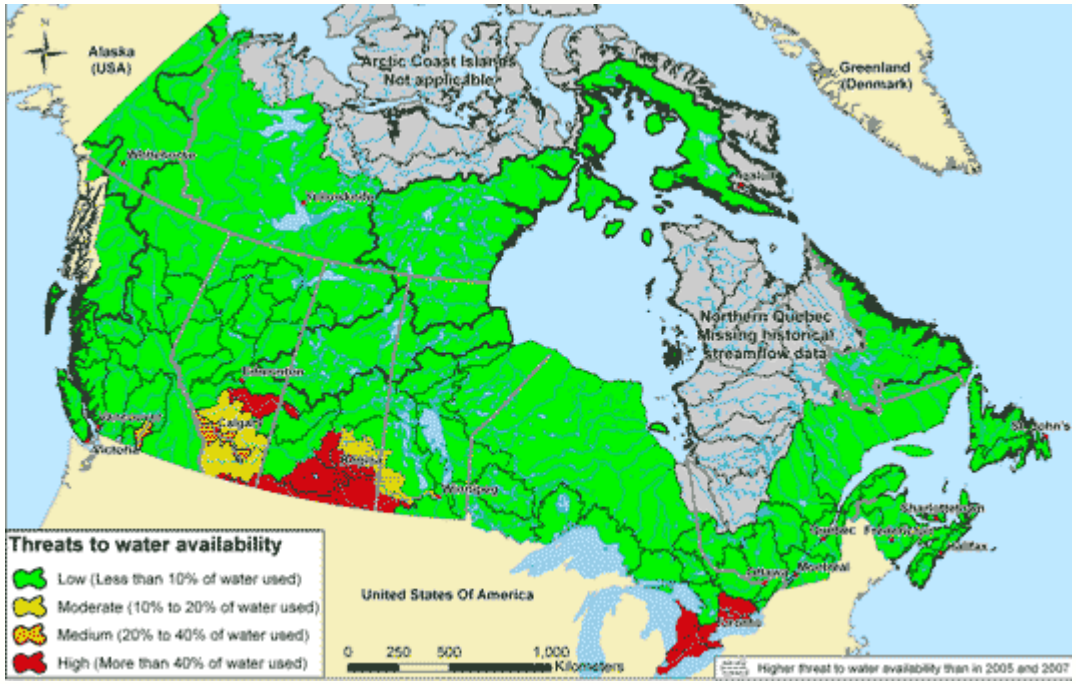
The Canadian Rivers Institute (CRI) group that put together the review for the Advisory Meeting: Lead author Tommi Linnansaari, Co-authors: Wendy Monk, Donald Baird and Allen Curry

The Participants at the Advisory Meeting: We had 33 experts from a wide array of water and fisheries disciplines from across Canada (and USA) participate in the meeting and the aftermath of developing the advisory document.

Talk Outline

- The Question / Issue
- The CSAS Process (March 2012)
- The Review Document
- The Advisory Document
- What Happened Next
  - Canada's Fishery Act Changes (June 2012)
  - How we see the Advice fitting into the new Fishery Protection Provisions / Program (FPP) (full implementation Nov 25, 2013)
- What we Learned to Date

The Question / Issue



Water Availability Indicator based on the 30-year long-term yearly average water supply (1980 to 2009 or best number of years available to 2009)

Source: Canada Water Act Annual Report for 2011-2012

- Canada is a big country
- Water Management is always complicated (Many cooks)
- Fisheries were the focus of this exercise

- There was a need/want for more consistency in decision making (across the country) with respect to Environmental Flows and Fisheries Act Reviews.

The CSAS Process

The DFO Science Advisory Process (at a glance):

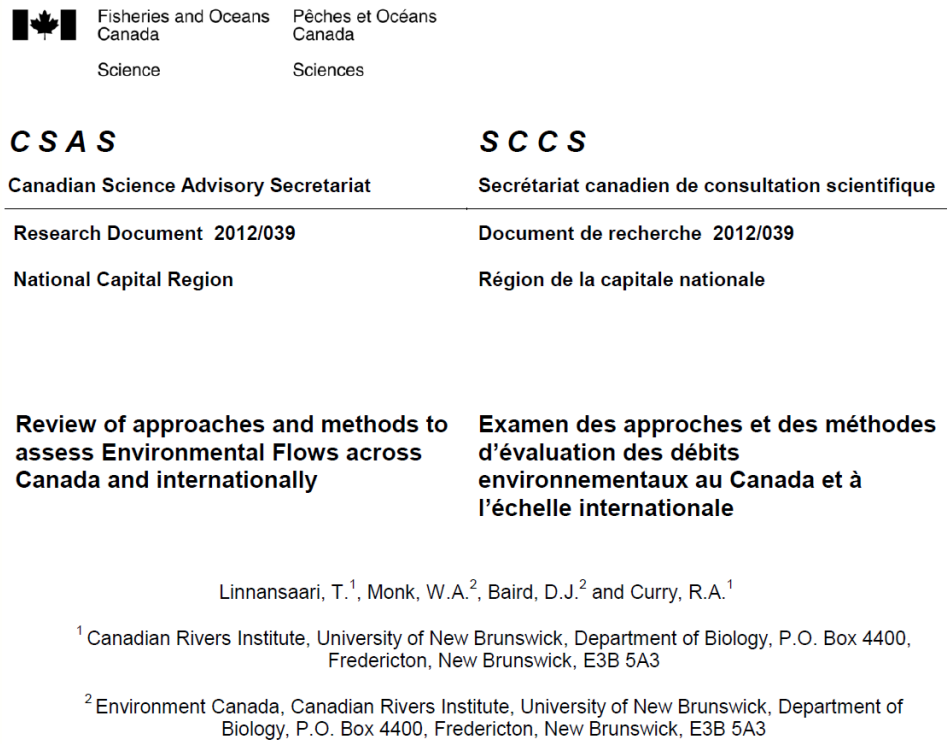
- DFO Science advisory process is well established, and provides the basis for policy and management options and decisions.
- Canadian Science Advisory Secretariat (CSAS) coordinates the DFO Science advisory process, including publication of advice.
- Science advice is produced via a variety of processes; across a range of scales from Regional to National.
- Approach is based on Government of Canada's Framework for Science and Technology Advice: Guidelines for Scientific Advice for Government Effectiveness (SAGE).
- Over 200 Science publications per year; derived from about 100 workshops and meetings per year (2005-2007).

The CSAS Process

After a request from Habitat Management a CSAS national meeting was held in Montreal from March 6-8, 2012 with the following objectives:

1. Peer review a Review Document on methodologies.
2. Review and clarify the various definitions and terminologies commonly used in IFN methods/assessments.
3. Review and compare the various IFN methodologies, including the benefits and assumptions of each, and situations under which they are most appropriate and for which management purposes they were designed.
4. **Provide technical recommendations towards the standard(ized) assessment of IFN for the management of fish and fish habitat in the Canada.**

The Review Document



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Science | Sciences

CSAS | **SCCS**

Canadian Science Advisory Secretariat | **Secrétariat canadien de consultation scientifique**

Research Document 2012/039 | **Document de recherche 2012/039**

National Capital Region | **Région de la capitale nationale**

Review of approaches and methods to assess Environmental Flows across Canada and internationally

Examen des approches et des méthodes d'évaluation des débits environnementaux au Canada et à l'échelle internationale

Linnansaari, T.[1], Monk, W.A.[2], Baird, D.J.[2] and Curry, R.A.[1]

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- The review characterized four main methods/approachs for Environmental Flows (focus on Canada but international examples also reviewed).

- **Never under estimate the utility of a good 'review' document when trying to formulate science advice.**

The Advisory Document

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Science | Sciences

National Capital Region

Canadian Science Advisory Secretariat
Science Advisory Report 2013/017

FRAMEWORK FOR ASSESSING THE ECOLOGICAL FLOW REQUIREMENTS TO SUPPORT FISHERIES IN CANADA

Figure 1: Map of the various DFO Regions in Canada.

- This is where the consensus findings of the meeting are outlined.
- **It is the official Science Advice to the Management and/or Policy group asking the questions.**

The next few slides will provide the highlights of this advice linked to the objectives of the meeting.

The Advisory Document (Objective 1)

Table 1: Summary of the major categories of methodologies for the assessment of ecological requirements of fisheries in Canada (after Linnansaari et al. *2013):*

Method Category	General purpose	Scale	Scope	Additional comments, including suggested uses:
Hydrological	Examination of historic flow data to find flow levels that naturally occur in a river and can be considered "safe" thresholds or within the range of natural variability patterns for flow alteration.	Whole rivers, applicable for regional-scale assessments.	Mainly based on discharge data.	Useful for situations where the potential risk of impact to aquatic resources is low. Regionalization techniques can allow the transfer of data from gauged to un-gauged systems. A "percent flow" method assumes the availability of data from a gauged reference system. Data may be available from Environment Canada (HYDAT) for use with hydrologic methods.
Hydraulic rating	Examination of change in a hydraulic variable, e.g. "wetted width", as a function of discharge. The change in this examined variable is a proxy for the general quantity of fish habitat in a river.	Applied at a study site / river segment scale, up-scaling to whole river level based on the assumption of availability of "representative" sites. Methodology is river specific.	Based on physical (hydraulic) characteristics. Some consideration of biological characteristics.	Hydraulic methods can be effectively used to validate other statistical analyses (primarily for periods of low flow). Hydraulic relationships can work well for site-specific, individual stream sections (over a range of discharges). However, these relationships can vary (often widely) between sample sites or transects on the same river (even sites in close proximity) necessitating examination of multiple transects for each river segment studied.
Habitat simulation modelling (HSM)	Examination of change in the amount of physical habitat based on selected variables and target species, as a function of discharge.	Applied at a study site (micro) / river segment scale (meso), upscaling to whole river level based on the assumption of availability of "representative sites". River-specific.	Detailed assessment.	More indicative of assumed habitat use (by species or guilds) than necessarily reflective of actual habitat quality. Useful for identifying trade-offs in physical habitat over a range of flows. Habitat quality reported using this method is a function of sample size and spatial and temporal scales associated with data collected. Meso-habitat or generalized statistical modelling can be used to reduce costs and field work from more comprehensive habitat simulation modelling. In order for HSM methods to be biologically meaningful, habitat managers / scientists skilled in the use of these methods and with experience reviewing and conducting instream flow assessments should be involved in HSM design, data collection, and analysis. Selected study site(s) should be generally demonstrated as being representative of habitat, and hydraulics for the reach being assessed or for the particular fishery resource of interest.
'Holistic' frameworks	Examination of flows based on multiple data inputs including expert opinion, leading to recommendations of flow regimes for all components of the riverine ecosystem. May include consideration of socio-economic objectives.	Whole rivers, applicable for regional or river specific scales	Flexible.	Useful to examine overall ecosystem function. Broad-scale, often comparable to environmental assessments in scope and content. These methods are often multi-disciplinary in nature and may require the use of experts for each riverine element/component being assessed. As such, conducting these studies may be beyond the ability of most fisheries managers to conduct by themselves.

The Advisory Document (Objective 2)

Instream Flow Needs – "The amount of water needed in a stream to adequately provide for instream uses within the stream channel" (i.e., for aquatic organisms and riverine processes).

Environmental Flow: "Environmental flow describes the quantity, quality and timing of water flows required to sustain freshwater ecosystems and the human livelihoods and well-being that depend on these ecosystems" (after the Brisbane Declaration, 2007).

Ecological Flow Needs: "The flows and water levels required in a water body to sustain the ecological function of the flora and fauna and habitat processes present within that water body and its margins".

Base Flow is defined as "That part of the stream discharge that is sustained primarily from groundwater discharge. It is not attributable to direct runoff from precipitation or melting snow." Base flow is a hydrological term, and should not be confused or substituted for ecologically-based flow recommendations to support sustainable fisheries in Canada.

Ecological flow requirements for fisheries: "*the flow regimes and water levels required to maintain the ecological functions that sustain fisheries associated with that water body and its habitat*".

The Advisory Document (Objective 3)

Example of a "strengths and weaknesses table"

Table 4: Summary of the general strengths and weaknesses of Habitat Simulation Methods (after Linnansaari et al. *2013).*

Strengths	Weaknesses
Assess one aspect of riverine ecology (i.e. quantity of habitat) to changes in flow for selected species.	Considerable amount of field work & expertise required; time consuming & relatively expensive.
Can address river-specific issues in high-risk situations	Considerable modeling assumptions are made, not always validated and uncertainty is not often expressly communicated.
Can provide a better spatial estimate of the potential impact of the project, when compared with hydrological/hydraulic methods.	Misapplication of the results is reportedly common; a change in amount of habitat is often interpreted as having a similar change in fish abundance or other target organisms. While a relationship does exist, it is often unique to each river and segment, with limited transferability.
Can provide accurate estimates of flow regimes required to maintain physical integrity of habitat in river segments (i.e., wetted area, depth, discharge and water velocity within that area).	May lead to uniform, stable ("flat-lined") prescriptions for the ecological flows required for fisheries since the models do not address flow regime needs for other biological functions aside from habitat needs, or for other riverine components like water quality, fluvial geomorphology, and connectivity.
The resulting habitat-discharge relationship can be used as a negotiating tool (i.e. to calculate compensation requirements).	Criticized for lack of ecological specificity and uncertainty for habitat vs. species abundance relationship.

The Advisory Document (Objective 4)

Moving towards a standardized framework for fisheries:

Screening Tools

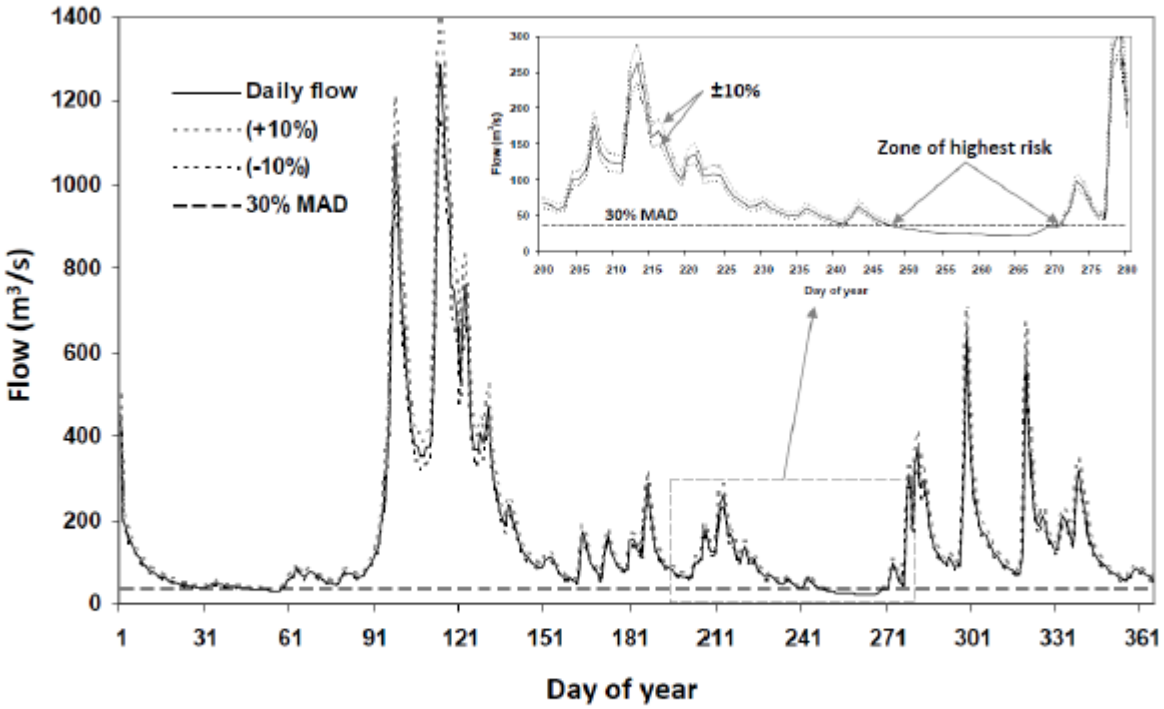

Figure 2: Graphic depiction of +/- 10% instantaneous flow and of 30% Mean Annual Discharge (MAD). Refer to Figure 3 for detailed examination of zone of highest risk. - (Courtesy of D. Caissie, 2012)

Cumulative flow alterations <10% of the actual (instantaneous) flow in the river relative to a "natural flow regime" have a low probability of detectable impacts to ecosystems that support fisheries.

The Advisory Document (Objective 4)

Moving towards a standardized framework for fisheries:

Screening Tools

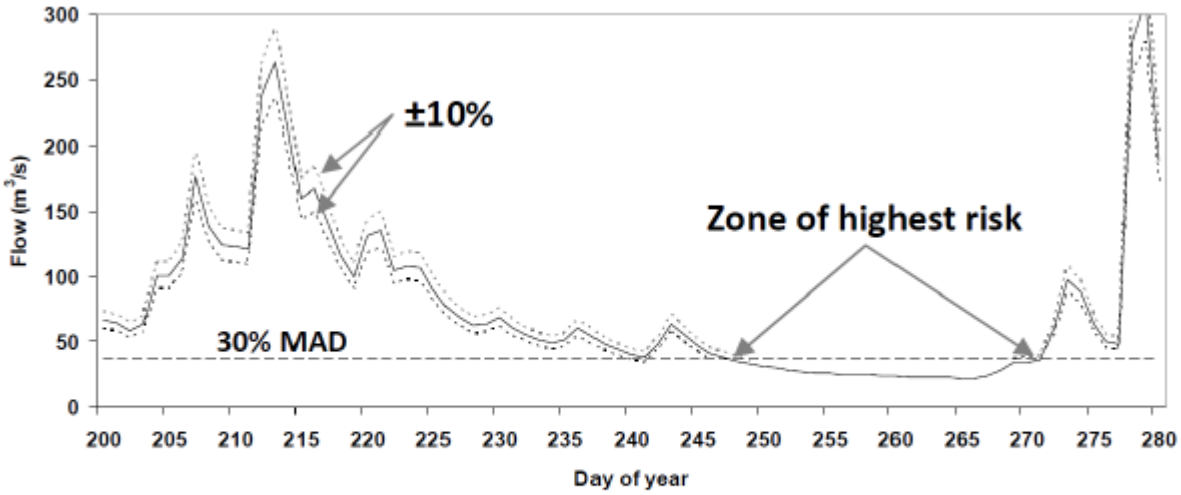

Figure 3: Detailed depiction of zone of highest risk; expressed as instantaneous discharges which are less than 30% Mean Annual Discharge (MAD) for the river/stream being assessed. (Courtesy of D. Caissie, 2012)

In addition, cumulative flow alterations that result in instantaneous flows less than 30% of the mean annual discharge (MAD) have a heightened risk of impacts to ecosystems that support fisheries.

The Advisory Document (Objective 4)

Moving towards a standardized framework for fisheries:

Screening Tools

- For fisheries in ecosystems subjected to levels of cumulative water use >10% of instantaneous discharge or exceeding 30% of the mean annual discharge (MAD), **a more rigorous level of assessment is required to evaluate potential impacts.**

- During low flow events (ie: drought, historic low flows, etc.), a 'cut-off limit' is a management tool which can serve to conserve and protect fisheries. It is recognized that having such a limit can preserve ecosystem structure and function in rivers and streams that support fisheries. Some jurisdictions in Canada currently have established methodologies to specify this 'cut-off limit'. In general, the development of such policy guidance is encouraged.

The Advisory Document (Summary)

This process provided:

1. An up to date review of methodologies, with comments on their use, strengths and weaknesses.
2. A set of definitions to help with national consistency.
3. A set of screening criteria, based on natural flow, that could be used nationally to help protect fisheries resources.

The process did not provide:

1. A cookbook for E-Flows, many manuals already exist (IFC, South Africa etc.).
2. A "cut off limit" that could be used throughout Canada.

What Happened Next

The Meeting occurred in **March 2012;** in June 2012 changes to the *Fisheries Act* were announced (Full implementation occurred November 2013).

These Changes lead to criticism and discussions both in the Science literature:

Gutting Canada's Fisheries Act: No Fishery, No Fish Habitat Protection

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Fisheries 2013

LETTERS

Canada's Weakening Aquatic Protection
Favaro et al.
(Science July 2012)

And the news media:

Fisheries Act changes questioned by former ministers
Bi-partisan letter expresses concerns about omnibus budget bill
By Max Paris Environment Unit , CBC News

Controversial changes to Fisheries Act guided by industry demands
GLORIA GALLOWAY
OTTAWA — The Globe and Mail

FLOW 2015

What Happened Next

How does the Advice fit into the new FPP

Screening Tools: used by Self Assessors, FPP Triage Sections and other interested parties*.

Review of methods, strengths and weaknesses assessment: Used by the Hydro and Flow Group within FPP.

Terminology: Used by All

BUT We are not there yet, the FPP program is fairly new and they have been through a great deal of change in a relatively short period of time.

In some respects we are only starting the implementation stage of this advice now (2012-2014 lost years).

What we Learned to Date

But we Can't be Pessimistic (according to Tom) and there are signs that the advice (especially the screening tools) are being picked up and used:

1. It was recently cited for use in the *MacKenzie River Basin Bilateral Water Management Agreement Between Alberta and the Northwest Territories* (signed March 18, 2015).

2. It is being cited/used in Alberta (Andrew Paul talk later today).

3. FPP staff in the Central and Arctic region (Alberta to Ontario and North) recently conducted a training session for their staff.

There are probably other examples that I am not aware of.

What we Learned to Date

Some Thoughts on Developing Science Advice for Managers:

1. Most common complaint: It is too complicated, we don't see how this fits.
   So use plain language and define your terms and concepts. Scientists love complicated concepts and big words.

2. The science is great but it is to broad, how does this fit my mandate.
   Stay within your mandate: While many scientists would like to skip to using 'holistic frameworks' for E-Flows that is not beneficial to most front line staff when faced with reviewing a project proposal.

3. Science does not provide any follow-up.
   Once an advisory document is released the scientists are done. Mangers continually ask for some form of training (this may be especially important when one of the goals is national consistency).

Thank You!!

For Additional Information Please Visit the CSAS website at:
http://www.dfo-mpo.gc.ca/csas-sccs/

FLOW 2015