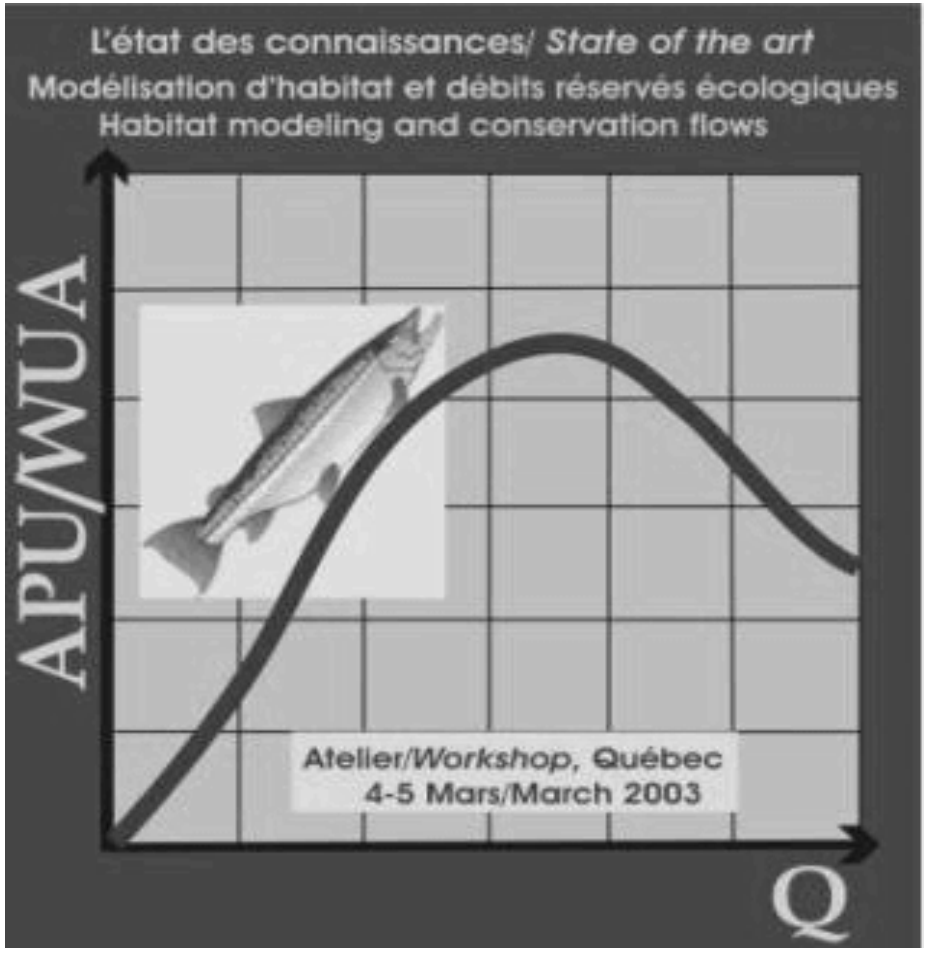
# CEA–DFO Instream Workshop
# April 3-5, 2003, Vancouver, B.C.




Report on March 3-4, 2003
Quebec Workshop

Michel Bérubé
Hydro-Québec

Gordon Walsh & Marie Gaulin
DFO – Québec Region

Hydro Québec

Pêches et Océans Canada | Fisheries and Oceans Canada

# Outline

- Presentation of the workshop
- Summary of presentations
- Workshop highlights

# Motivation behind the Workshop

- Institut national de la recherche scientifique, Eau, Terre et Environnement (INRS-ETE) initiated the workshop as a tool to face Quebec context
  - Wave of new major hydroelectric projects
  - Needs identified by stakeholders for science in support of instream flow assessment methods

# Partners

- INRS-ETE
- Government of Quebec
  - Ministère de l'Environnement
  - Société de la faune et des parcs
  - Ressources naturelles
- Government of Canada
  - Fisheries and Oceans Canada
- Hydro-Québec
- Québec Wildlife Foundation

# Workshop Description

- Two days of presentations and plenary sessions
- Attendance (on invitation) approx. 140
- 11 speakers from Canada (4), USA (3), Norway, Netherlands, Spain and France
- Synthesis of workshop and peer-reviewed papers will be published in a special issue of the Canadian Water Resources Journal (June 2003)

# Main Workshop Topics

- Modeling paradigms linked to aquatic habitats
- Habitat preference models
- Habitat availability
- Determination of minimum flow threshold and seasonal modulation schemes
- Mitigation measures and habitat restoration
- Data requirements
- Environmental follow-up

# Summary of Presentations

## Daniel Caissie and Nassir El-Jabi (Canada). *Instream flow assessment: From holistic approaches to habitat modelling*

- Emphasis on increased pressure for water use
- Review of hydrologic, hydraulic and IFIM models
- Habitat models should not be used alone
- Prudence regarding interpretation
- Hydrological models generally more conservative
- Research needs on methods applicability in winter
- Need to consider climate changes

## Diego Garcia de Jalón (Spain). *The Spanish experience on determining minimum flow regimes in regulated streams*

- Most flows established using % MAF
- Arising of new methods e.g. benthos diversity, IFIM and benthos mixed method
- Hydrological methods based on % MAF not adapted because of large flow variations
- Variability of natural flow regime is the main factor structuring communities and stream types
- Ideal method combines criteria on minimum flows, natural flow regime and habitat requirements

## Chris Katopodis (Canada). *Case studies of instream flow modeling for fish habitat in Canadian Prairie Rivers*

- Use of 2-D habitat models (River 2-D)
- Cases of Kananaskis, North and South Saskatchewan and Assiniboine rivers
- Many methods available; none is perfect but decisions have to be made
- Hydraulic models are now highly developed but biological models are the weak link

## Harm Duel (Netherlands). *Habitat modelling of rivers and lakes in the Netherlands: An ecosystem approach*

- Priority to wetlands rehabilitation
- Models of riparian, terrestrial and aquatic habitats all integrated
- Consider needs (nutrient, food, shelter) and threats (toxic chemicals)
- Target species (endangered and indicator species) selected by experts
- Ecological networks approach (habitat sizes and interrelations)
- Uncertainty analysis important for habitat models credibility

# Jean Morin (Canada). *Habitat modelling in the St. Lawrence River – A global approach*

- Huge data base on one river reach near Montreal
- 2-D modeling using new variables (macrophytes, light)
- Macrophytes have as much importance on current as substrate
- Light is good for walleye habitat models
- Use of logistic regressions
- Applications on zebra mussels impact studies

# Daniel Boisclair (Canada). *Dynamic modelling of fish habitat quality in rivers*

- Use of Habitat Probabilistic Index (HPI) as compared with Habitat Suitability Index (HSI) on juvenile salmon habitat
- HPI seems to fit well with juvenile salmon densities
- Depth, velocity and substrate explain more than 80% of observed density variations
- Tested in the field and more transferable than HSI

# John Brittain (Norway). *Mitigation measures and compensatory flows – The Norwegian experience*

- "The weir project" and "The biotope adjustment programme" 1973-1997
- Lessen effect of regulation
- Improve fish recruitment of some species and lessen winter mortality of salmonids
- Increase benthos density and biodiversity at a local scale
- Increased sedimentation, fish migration barriers, species communities alteration, excess macrophyte growth
- Good and bad weirs design

# Thomas Hardy and R.C Hadley (U.S). *Instream flow assessment modelling: Combining physical and behavioral based approaches*

- Incorporate new variables to habitat models: fish behavior as related to competition, food and shelter availability
- Decision-based habitat algorithms
- Tested in the field
- Precise GIS system to position fish
- Huge set of data

# Piotr Parasiewicz (U.S.). *Upscaling – Integrating habitat model in river management*

- Upscaling aspects :
  - Spatial (habitat ⇨ catchment)
  - Biological (species ⇨communities)
  - Temporal (biological, flow and morphological dynamics)
- Use of basic physical attributes representative of river reaches and associate it with fish species combinations
- Can be used to assess long term and large scale changes

## Yves Souchon, Nicolas Lamouroux and Hervé Capra (France). *Simplified habitat model for fish in large scale, multi-site and multi-specific simulations. Validation for population and communities*

- Large scale and long term biological validation
  - With standard approach (1984-1995)
  - For fish communities and guild proportion (1995-1999)
- Impacts of hydraulic modifications can be evaluated with simple variables like Reynold's (flow) or Froude's (morphology) number
- Hydraulic geometry model and habitat simulations compared
- Prediction of habitat modification a key element but only one in impact evaluation

# Chris Yoder and B.H Kulik (U.S.). *The development and application of multimetric biological assessment tools*

- Biological integrity indices
- Long term and large scale data base
- Used in US Midwest
- Predict response to chemical, physical and biological perturbations

# Main Workshop Highlights

# Highlights – General

- Instream flow assessment methods must be adapted to river size
- Impacts should be assessed at several different scales (spatial, biological, temporal)
- In complex cases, several instream flow methods should be used

# Highlights – General (cont.)

- Using professional judgment is a key component of instream flow assessments
- Interpretation of results should integrate various information types (e.g. existing monitoring data)
- Instream minimum flow should not be a unique minimum flow but a regime of minimum flows, with intra-annual and inter-annual variations (e.g. flushing flows)

# Highlights – Habitat Modeling

- Effects of instream flow modification on both macrohabitat (longitudinal scale) and microhabitat (local scale) should be assessed
- Main gaps identified regarding microhabitat modeling
  - Selection of appropriate variables
  - Improving preference models
  - Understanding and modeling physical and biological conditions in winter
  - Improving methods for the validation of results

# Highlights – Habitat Modeling (Cont.)

- Few biological validations of habitat modeling predictions achieved until now; existing validations show variable results
- Because of uncertainties associated with biological predictions, security margins should be used
- Two approaches in using instream flow methods
  - Improving situation for already altered rivers (e.g. Europe)
  - Protecting integrity of natural rivers (e.g. Canada)