Rationale and Institutionalizing of Adaptive Management in the Regulation of Transboundary Water Levels and Flows

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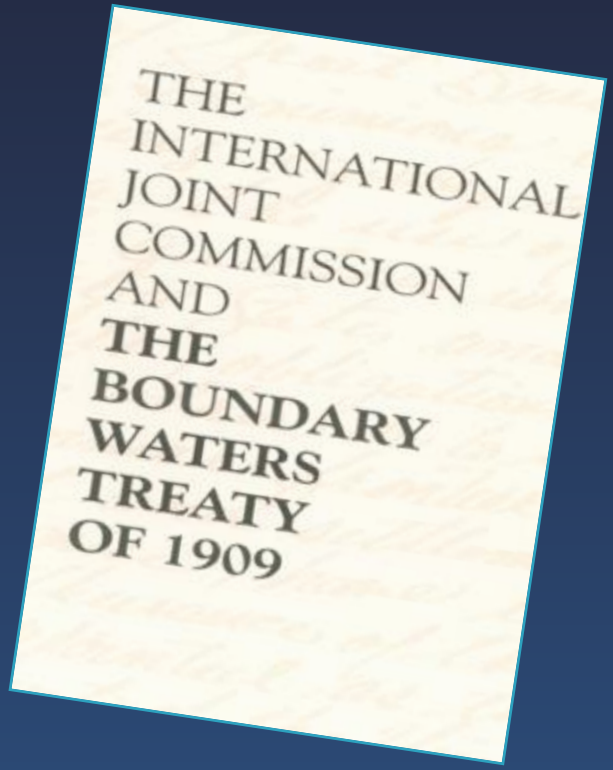
Outline of Presentation

- Transboundary Water Level and Flow Regulation: International Joint Commission
- Rationale for Implementing AM
- Institutionalizing of AM
- Key Messages

Boundary Waters Treaty - Principles

- Equal and similar rights to use of boundary waters
- Order of precedence of use – sanitary/domestic, navigation, power generation and irrigation
- Structures/diversions not to affect levels and flows on the other side
- Must not pollute water on either side to the injury of health or property on the other side



IJC Mandate

- Under Boundary Water Treaty (1909), the IJC
  - rules upon applications for approval of projects affecting boundary or transboundary waters (**orders of approval**) and may regulate the operation of these projects
  - investigates issues referred by governments and makes non-binding recommendations for resolution (**references**)
  - assists governments through permanent references
    - GLWQA role a permanent reference under BWT
  - alerts governments to emerging issues

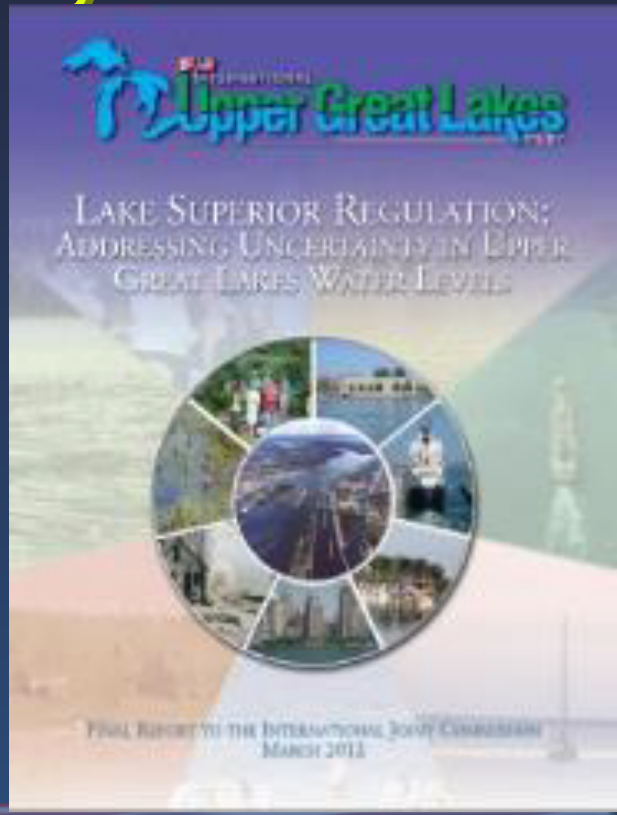
IJC Boards

1. International St. Croix River Watershed Board
2. International St. Lawrence River Board of Control
3. International Niagara Board of Control
4. ***Multiple Great Lakes Boards and Advisory Groups***
5. International Lake Superior Board of Control
6. International Rainy River Watershed Board
7. International Red River Board
8. International Souris River Board
9. Accredited Officers of the St. Mary-Milk River
10. International Osoyoos Lake Board of Control
11. International Columbia River Board of Control
12. International Kootenay Lake Board of Control

The Genesis of the AM Discussion

Addressing Uncertainty

- **Natural Factors:** Uncertainties inherent in the nature of the system, including its expansiveness, hydrologic complexity and dynamic nature.
- **Anthropogenic Factors:** Uncertainties introduced through human actions…
- **Societal Preferences:** Uncertainties that reflect the continuing (and often unpredictable and contentious) evolution of social preferences relative to the desired state of the resource and the nature of "acceptable" uses.
- **Governance:** Uncertainties associated with the continuing evolution of laws, regulations, policies and programs, as well as the priorities and behaviors of the complex array of institutional arrangements charged with interpreting and implementing them.



Decision Criteria for Evaluating Performance of Regulation Plans

1. How well does the plan perform in keeping Lake Superior water levels between 182.76 and 183.86 m (599.6 to 603.2 ft)?
2. Does the plan maintain the historical balance of Lake Superior levels with Lake Michigan-Huron levels?
3. How much does the plan lower the highest Lake Michigan-Huron levels and raise the lowest?
4. Does the plan create fewer Lake Superior levels below chart datum for the historical NBS than pre-project?
5. Does the plan enhance ecological attributes and reduce negative environmental impacts?
6. Does the plan minimize disproportionate loss to any particular water interest?
7. How much does the plan reduce net shoreline protection costs?
8. How much does the plan increase benefits for consumers affected by shipping costs?
9. How much does the plan increase benefits for those who use hydropower generated on the St. Marys River?

NBS Sequence (Stochastic, Dry)

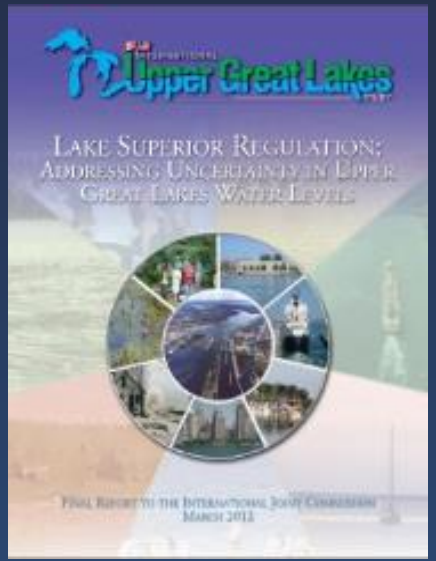
Decision Criteria	Nat64D	Bal26	PFN3	129	1977A
1. Maintain Lake Superior between 182.76 and 183.86 m	183.93	Fails Both	Fails Both	Fails Both	Fail
2. Balance water levels	Pass	Pass	Pass	Pass	Pass
3. Balance Lake Michigan-Huron water levels	Mixed	Pass	Mixed	Mixed	Pass
4. Fewer Lake Superior levels below chart datum than pre-project	Fail	Fail	Pass	Fail	Pass
5. Minimize environmental impacts	Fail	Fail	Pass	Pass	Pass
Number of fewer Zone C PI-Years	1	7	8	7	0
Number of greater Zone C PI-Years	2	9	0	0	0
SUP-01	0.41	0.45	0.34	0.39	0.40
SUP-02	0.53	0.59	0.42	0.55	0.52
6. Minimize disproportionate loss					0
Coastal (Δ SP Costs)	Pass	Fail	Fail	Fail	Pass
Boating slips	Pass	Fail	Pass	Pass	Pass
7. Reduce net shoreline protection costs (avg. annual reduction)	$0.26	$0.11	-$0.39	$0.18	$0.00
8. Increase navigation benefits	$0.11	$0.43	$0.13	$0.06	0
9. Increase hydropower benefits	$0.37	-$0.25	-$0.44	-$0.34	0
Increase average energy (kWh)	407	51	464	310	0

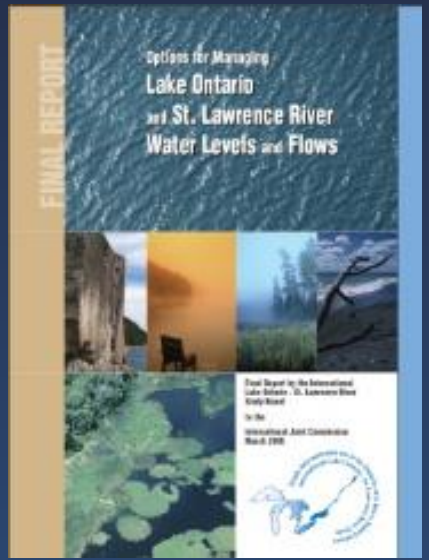
Summary Evaluations of Robustness of Plans

Plan	Strengths	Limitations	Study Board Decision
129	Provides small net economic benefits under historical NBS	Like **1977A**, allows Lake Superior levels to drop too low in severe dry NBS sequences.	**Eliminated** because of poor performance in severely dry NBS sequences
PFN3	Compressed the range of Lake Superior levels Maintained Lake Superior levels in TR "severely dry" NBS sequence	Compression often caused slightly worse economic and ecological scores	**Eliminated** because of mixed performance and because it compressed Lake Superior levels at the expense of levels on Michigan-Huron
Bal26	Scores on all nine criteria were very close to Nat64D	Not clearly better than Nat64D and not balanced in extremely dry sequences	**Eliminated** because of limitations under dry NBS sequences
Nat64D	Better than **1977A** for most of the criteria and historical NBS Among the best plans for all NBS	Does not outperform **1977A** for all criteria and every NBS	**Preferred** because of the gained benefits and robustness

Making the AM Case

- Recommendations from the two major binational studies were instrumental in the adoption of AM by the IJC





Importance of AM

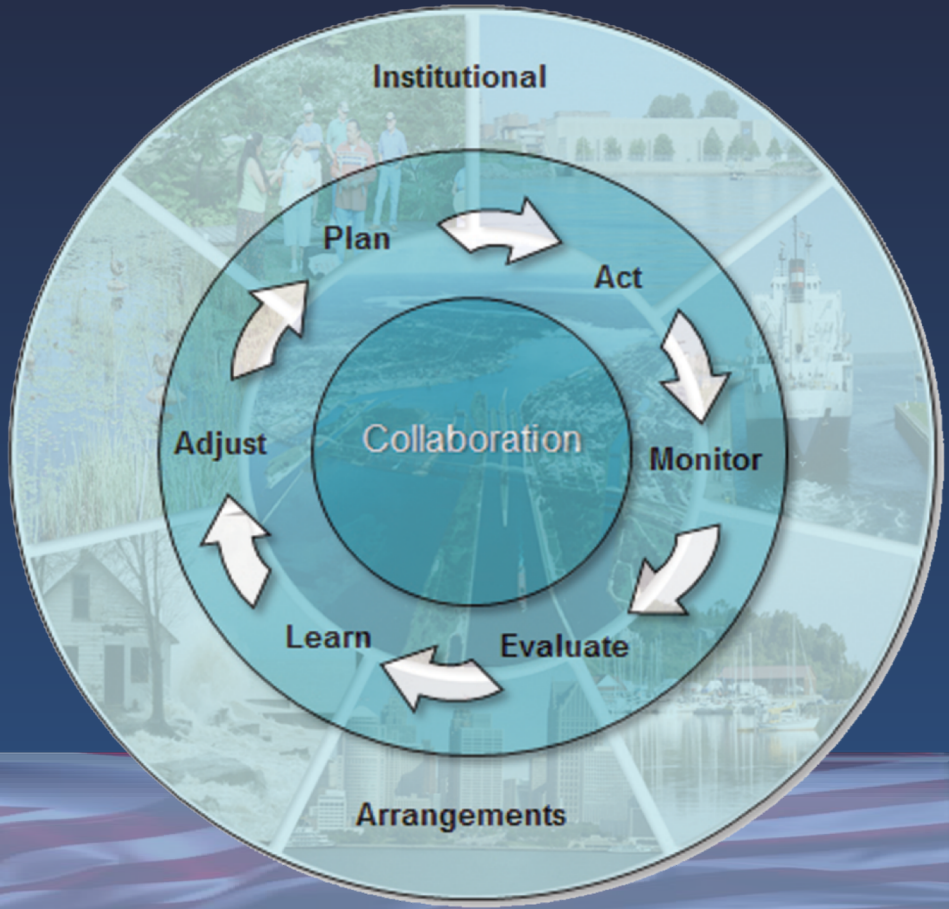
Both studies saw an on-going need to assess regulation plans through regular monitoring and assessment to ensure:

1. Information is available to determine if the expected outcomes of the regulation plan are being realized; and

2. Climate conditions and the interest sectors aren't changing such that the plans no longer meet expectations.

International Upper Great Lakes Study

- The final report (2012) has a full chapter dedicated to AM



Some AM Considerations

- Securing on-going resources to implement
- Keeping AM closely linked to the regulation plan review
- Re-assuring for interests that have concerns over the regulation plan

International Upper Great Lakes Study

An adaptive management strategy should be applied to address future extreme water levels that include:

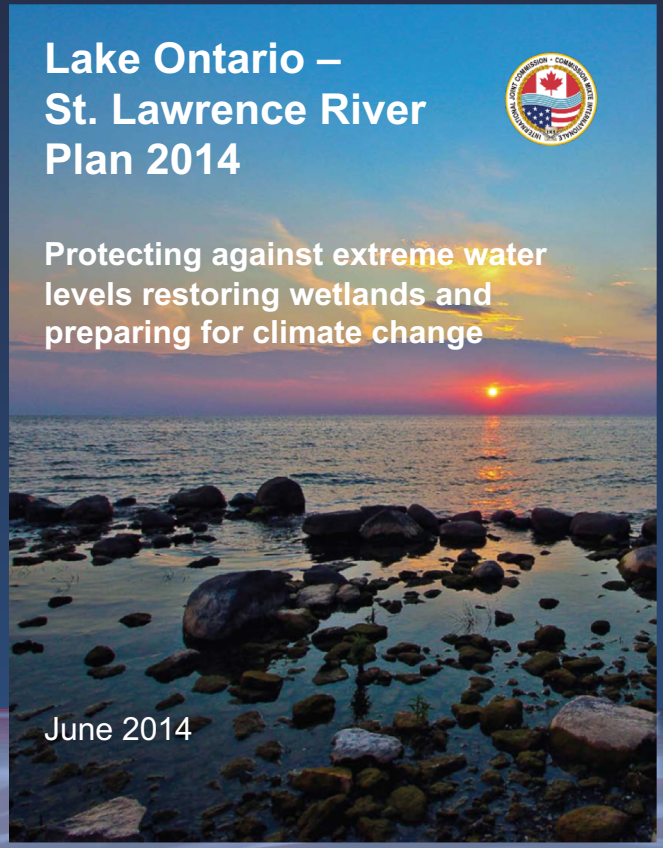
- strengthening hydroclimatic monitoring and modelling;
- ongoing risk assessment;
- ensuring more comprehensive information management and outreach;
- improving tools and processes for decision makers to evaluate their actions;
- establishing a collaborative regional adaptive management study for dealing with water level extremes; and,
- promoting the integration of water quality and quantity modelling and activities.

Post IUGLS

- 2013 IJC AM Task Team report: Recommends to adaptively manage governments' collective response to the impacts of water level changes, not just water level management.
- 2014 Lake Superior Supplementary Order of Approval came into effect (to be reviewed in 15 years)
- 2014 IJC's Great Lakes – St. Lawrence River control boards recommend that IJC set up AM group to assist board's with regulation plan monitoring.
- 2014 IJC advises governments that it will set up GLAM committee to monitor and evaluate the regulation plans.

IJC Report to Governments

- Chapter 5 and Annex E addresses AM



IJC Report to Governments (Annex E)

The IJC always has strived to improve its regulation rules over time; adaptive management is a more structured, science-based and effective way of doing it because:

- data collection is more purposeful and better coordinated, increasing the chances that the data needed to inform regulation decisions will be available…

- on-going evaluation of the rules should be easier because the tools and knowledge needed to assess performance are maintained …

- decisions are more transparent because …

AM embedded in the New Order

Whereas clause:

*The Commission finds that an **adaptive management approach** would enable the effects of regulation in the Lake Ontario - St. Lawrence River System to be assessed and would provide a valuable source of information for future reviews. **Monitoring, data collection, and assessment are necessary to validate the models upon which the regulation plan was built, to evaluate the effectiveness of regulation, to analyze the effects of other changes** impacting the system (such as climate change), and to consider possible future improvements in system regulation…*

AM embedded in the New Order

Condition O.

No later than 15 years *after the effective date of this Order, and periodically thereafter in consultation with the governments, the Commission* ***will conduct a review****… This review will include an assessment of the extent to which the results predicted by the research and models used to develop any approved regulation plan occurred as expected,* ***consistent with adaptive management****…*

Mechanisms for Implementing AM

- Great Lakes Adaptive Management (GLAM) Committee
  - Multi-board collaboration (Wendy to provide details)
  - Interconnectivity driver
- International Rainy- Lake of the Woods Watershed
  - Discussing creation of the Adaptive Management Committee (AMC)

Key Messages

- Periodic evaluations are limited, especially if there is a large gap between assessments
- Targeted, on-going assessment is the most cost-effective approach
- A changing climate and associated science requires on-going attention
- Addressing uncertainty and risk further requires this structured AM approach

Summary

The IJC has embraced Adaptive Management and has moved it from a concept to a cornerstone in the regulating of transboundary water levels and flows.

Questions ….

Transboundary Setting

- 15 distinct basins
- some 300 lakes and rivers
- water covers 43% of the 8,900 km border