Project Element Four

Workplan: Inventory of Information on Ecological Impacts

Overview

In conjunction with the Project Management Team and Advisory Committee, the Project Secretariat will prepare a descriptive inventory of the scientific literature addressing the ecological impacts of current and prospective water use. The review will be followed by analysis and discussion, with a focus on how results might be reflected in inventory components and accommodated (quantitatively or qualitatively) in any type of decision support system the states and provinces ultimately adopt.

While natural factors (e.g., climate conditions and events) are primarily responsible for historic fluctuations in levels and flows, human interventions (e.g., withdrawals, consumptive use, diversion, dredging, shoreline alteration) also significantly impact ecological, social, cultural and economic characteristics of the system and its associated uses and user groups. These interventions are inherently cumulative: the impact of localized, small scale activities may be difficult to quantify on an individual basis but, collectively, can significantly alter the levels and flow regime and associated ecological conditions. The cumulative nature of these impacts becomes more pronounced as one proceeds downstream through the Great Lakes-St. Lawrence system. Impacted sectors include hydropower, municipal water supply, shipping, shoreline interests, recreational boating, fisheries, wetlands, water quality, Native Americans/First Nations and others (e.g., water based tourism, agriculture, public perception/reaction).

The cumulative impacts associated with past and current change due to human activity – primarily withdrawals consumptive use, diversion, dredging and chemical/shoreline alterations – have been documented to varying degrees. Impacted sectors include municipal water supply, shipping, shoreline interests, recreational boating, fisheries, wetlands, water quality, Native Americans/First Nations and others (e.g., water based tourism, agriculture, public perception/reaction).

This project element builds upon work conducted by the Great Lakes Commission in 1999 in support of a water use reference of the International Joint Commission. U.S. and Canadian experts convened at that time agreed that the ecological and economic impacts of most water withdrawals, diversions and consumptive uses to date have not been quantified with any degree of precision. Impact assessments have predominately been linear interpolations of past experience. Assessments of water removal proposals, where pursued, have been hampered by a lack of relevant data and information and typically have not addressed the cumulative impact considerations on a system wide basis. Further, it has been difficult to verify causal relationships in light of other confounding factors affecting the physical, chemical and biological characteristics of the basin=s water resources.

Experts generally agree that water use demands and conflicts (intra and interbasin) will increase, and enhanced understanding of ecological impacts (local and systemize) will be key to formulating scientifically sound and legally defensible water use decisions that respect ecological, social and economic considerations. Toward this end, this project element will be addressed through four steps: a literature search and analysis; an investigation of relevant hydrology/ecological impact models; experts workshops; and the development of findings and recommendations as to how ecological impacts might be reflected in inventory components and accommodated (qualitatively and quantitatively) in a decision support system.

a) **Literature Search and Analysis:** With the assistance of a consultant (Michel Slivitsky, Québec), the Project Secretariat will prepare a descriptive inventory of the scientific literature addressing the ecological impacts of current and prospective water use. The literature search process will capture information relating to the open waters, near shore and tributaries of the Great Lakes-St. Lawrence System, and will also address literature associated with other freshwater systems with Great Lakes applicability.

The search will constitute an expansion of a Great Lakes Commission/consultant generated report (1999) titled *Cumulative Impacts in the Great Lakes-St. Lawrence River Ecosystem from Factors Affecting Water Levels and Flows*. Database searches (e.g., Water Resources Abstracts, Aquatic Sciences and Fisheries Abstracts, BIOSIS, NTIS) will be complemented by reports and materials acquired from relevant sources including the IJC, which has contributed substantially to the impact assessment literature through water use references. A subset of relevant citations will be abstracted and categorized. The resultant report will present recommendations as to how the search outcomes might be incorporated into the water use inventory and associated decision support system. Relevant citations will be incorporated into the decision support system web site and linked in such a way to ensure ready access to those using the information to assess ecological impacts of water withdrawals.

Timeline and Responsibilities: The literature search and analysis will be initiated in November 2000, with completion set for July 2001. An interim report will be generated in April 2001 and finalized following the Project Management Team meeting in May 2001. Team members and secretarial staff will access and analyze additional literature on an ongoing basis thereafter and incorporate it, as appropriate, into the decision support system. Mike Donahue will coordinate this effort in consultation with Wendy Leger. Michel Slivitisky will serve as consultant.

b) **Inventory of Existing Models**: Complementing the literature search will be a descriptive inventory of models that may contribute to a better understanding of ecological impacts. This will include hydrologic (watershed); hydraulic (hydrodynamic); sediment transport; contaminant transport and other impact assessment models which reside in various agencies including U.S. Army Corps of Engineers (Waterways Experiment Station, Institute of Water Research); NOAA; USGS; U.S. Department of Agriculture; U.S. Environmental Protection Agency; and Environment Canada. The descriptive inventory will build upon model characterization/assessment activities of the Great Lakes Commission over the past two years. The outcome will be an assessment of model applicability to ecological impact, and will address such matters as model sensitivity, precision, data requirements and spatial capabilities. This outcome will allow the policy/management community to determine model applicability to a decision support system.

Timeline and Responsibilities: The inventory of existing models will be pursued in the same time period associated with the literature search and analysis. It will be initiated in November 2000, with an interim report in April 2001 and a final report (reflecting Project Management Team input) in July 2001. Mike Donahue will coordinate this effort, with Rao Manam serving as consultant.

c) **Experts Workshops**: The Project Secretariat will engage the services of U.S. and Canadian experts to determine how scientific understanding and modeling capabilities can be practically and pragmatically incorporated into water use inventory and decision support system development. Two related workshops will be conducted. The first, sponsored by Environment Canada as a component of its own water resources management initiative, will examine ecological impacts and include a focus on minimum streamflow requirements and indicators of ecological impact. It will take place while the literature search and model inventory is in process and, consequently, will help influence the direction of those efforts.

The second experts workshop will follow completion of the two draft reports, and will bring together U.S. and Canadian researchers/scientists with policy/management officials from the states, provinces and relevant federal agencies. The workshop will focus on a series of questions and information needs

that collectively elicit an assessment of ecological impact when applied to a specific water withdrawal scenario. Those questions/information needs will be generated prior to the workshop in consultation with Project Management Team members and experts workshop invitees. Information elicited at the workshop is likely to include substantive responses, references to existing materials and recommendations for needed research and/or data gathering and analysis. Such information will be categorized and included, as appropriate, in the web site associated with the decision support system.

Timeline and Responsibilities: The initial expert's workshop (sponsored by Environment Canada) will be conducted in mid-April 2001, and outcomes will promptly be incorporated into all relevant project tasks. The second workshop is set for the August-October period of 2001, and will be preceded by an intensive effort to identify the questions and information needs to be addressed at the workshop. Wendy Leger will provide lead support on the initial workshop; Mike Donahue will do the same with the second workshop.

d) **"Resource Improvement" Analysis**: Annex 2001 to the Great Lakes Charter calls for a new decisionmaking standard that is based, in part, on the following principle: "An improvement to the waters and water-dependent natural resources of the Great Lakes Basin." The Project Management Team agreed, in June 2001, to amend the Work Plan (and reallocate funds as needed) to provide for an analysis of the "resource improvement" concept. This will entail preparation of a "white paper" presenting various definitions, interpretations and applications of a resource improvement standard to water and related natural resources issues. Outcomes will be discussed by the TSC and PMT, and recommendations developed that will help inform Annex 2001 implementation plans.

Timeline and Responsibilities: The analysis, in the form of a "white paper" will be initiated in December 2001 and be completed in draft form in February 2002. Mike Donahue will coordinate the effort; background research and report production will be accomplished by project consultant Limno-Tech, Inc. The document will be reviewed and approved by the PMT.

e) **Synthesis Report Incorporating Ecological Impacts Into Inventory Efforts and Decision making Procedures**: This project element includes a synthesis report that addresses literature search, model assessment and expert workshop outcomes and relates such outcomes to policy and management needs. Once endorsed by the states and provinces through the Project Management and Advisory Committees, synthesis report recommendations will be incorporated into inventory and larger decision support system development processes.

Timeline and Responsibilities: The synthesis report for this project element will be prepared in the November 2001-January 2002 timeframe. During this period, project element outcomes (i.e., literature references, models, key questions for ecological assessments) will also be incorporated into the decision support system to assist those involved in assessing ecological impacts of proposed water withdrawals. Mike Donahue and Wendy Leger will co-lead this effort with assistance from Project Secretariat staff.

Progress Report: Inventory of Information on Ecological Impacts

a) Literature Search and Analysis: Consultant Michel Slivitizky was retained for this task, and supplemental funds were secured from Environment Canada for study conduct. A contract was executed; the interim report was submitted in April 2001, and a final (revised) report was submitted to, and accepted by the PMT in November 2001.

b) Inventory of Existing Models: Consultant Rao Manam (Great Lakes Center, U.S. Army Corps of Engineers) was retained to assemble material for a descriptive inventory. An interim report was received in April 2001. Commission staff and consultant (Limno-Tech) are refining a draft inventory and will complete in February 2002.

c) Experts Workshops: Project Secretariat staff and selected PMT members presented at/participated in a mid-April workshop organized by Environment Canada in Burlington, ON. Among others, the focus was on 1) means to determine minimum streamflow requirements to minimize/avoid ecological impacts of water withdrawal; and 2) indicators that can be employed to assess such impacts. Project Secretarial staff and TSC members also organized and successfully conducted a workshop on November 13-14, 2001 in Ann Arbor. Mor than 35 experts from a dozen disciplines participated, along with many PMT members. The focus was on identifying "essential questions" that need to be asked (and tools that should be used) to assess ecological impacts fo water withdrawal. Proceedings document available in January 2002.

d) "Resource Improvement" Analysis: This additional task was authorized by the PMT in June 2001. It will entail preparation of a "white paper" that presents alternate definitions of "resource improvement," review of case studies and applications; and identification of issues and recommendations associated with Annex 2001 implementation.

e) Synthesis Report: This project activity will be initiated and completed in the November 2001-January 2002 timeframe, following completion of the preceding project tasks.