

**Missisquoi Bay Basin Project:  
Identifying Critical Source Areas of Pollution**

**Lake Champlain Basin Preliminary Hydrographic Data Assessment Workshop**

***Workshop Summary***



Tuesday, March 16  
and  
Wednesday, March 17, 2010

Centre for Topographic Information  
Sherbrooke, Québec

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**DAY 1**

**I. Welcome, Introductions, and Overview**

Bill Howland, manager of the Lake Champlain Basin Program (LCBP) welcomed workshop attendees to Sherbrooke and introduced Mike Laitta, GIS Coordinator for the International Joint Commission (IJC) and member of the Transboundary Data Harmonization Task Force. Mike described the day's agenda and the need for seamless hydrographic datasets between the US and Canada. This workshop focused on data for the Missisquoi Bay Basin and the greater Lake Champlain Basin, and workshop goals were to:

- Identify, evaluate and verify the condition of hydrographic data in the Missisquoi Bay watershed in the context of the greater Champlain Drainage system.
- Garner a better understanding of the hydrographic geospatial datasets used by natural resource agencies in the Champlain Basin.
- Identify appropriate base data to use for potential harmonization.
- Identify future applications utilizing harmonized data.
- Plan a Data Harmonization Workshop for the Champlain Basin.

**II. Role of the LCBP**

Bill Howland described the geography of the Lake Champlain Basin and *Opportunities for Action*, a comprehensive management plan for the Basin. Reducing phosphorus inputs to the lake is a high priority and many significant pollution issues occur in transboundary portions of the lake, such as the Missisquoi Bay Basin. A cooperative agreement establishes that Vermont and Québec accept responsibility for 60% and 40% of phosphorus loads to this basin, respectively, and are working to reduce their contributions to a target load by 2016. The IJC has funded a study, by the LCBP, of critical source areas of phosphorus pollution within this basin, which has allowed for increased meteorological and water quality monitoring. In the critical source area project, certain transboundary data discrepancies – for drainage area extents and hydrographic linework – will present challenges in the attempt to model pollution transport across the border.

**III. Provincial Datasets**

Martin Mimeault, Ministère du Développement Durable, de l'Environnement et des Parcs (MDDEP), provided an overview of water policy, management, and research in Québec. In 2001, Québec water policy ensured protection of water for public health and ecosystem preservation and established water as a common resource. In 2009, Québec created Integrated Water Management Zones to increase water resource protection; however, these zones do not correspond to Canadian National Hydro Network (NHN) working units (NHN units are similar in size to each other, because they are created through data

management). The MDDEP uses a Water Quality Index to classify the health of a river and has established the Centre d'expertise hydrique to collect and analyze water data. Since 2001, Québec has monitored water quality at ten stations in the Missisquoi Bay Basin and has identified the Pike and Lower Missisquoi Rivers as the largest contributors of phosphorus loads to the bay. The MDDEP has also established the Institut de Recherche et Développement en Agroenvironnement (IRDA), which uses monitoring data to model agricultural pollution and best management practices (BMPs).

Danielle Sabourin, Centre for Topographic Information-Sherbrooke (CTIS), explained NHN data management and harmonization with the US National Hydrography Dataset (NHD). Currently, the NHN contains data of different resolutions and completeness levels across Canada, using the best available geospatial data. Québec is currently preparing 1:20,000 scale provincial hydrographic data to replace current NHN data (which is at 1:50,000 scale for Québec); the target date for this March 2011. Data will be at Completeness Level 2 (both linear network flow and waterbody definition are established), if possible, prior to integration with the NHD.

#### **IV. New York Watershed Boundary Delineation**

Doug Freehafer, US Geological Survey New York (USGS), and Cathy Keenan, Natural Resources Conservation Service New York (NRCS) reviewed the process of creating a Watershed Boundary Delineation (WBD) dataset for New York at the 10-digit Hydrographic Unit Code level (HUC), which was certified in March 2009. The ten-year effort included edge matching with adjacent states and coordination among federal, state, and local partners. The WBD group decided not to use USGS, NRCS, or NY Department of Environmental Conservation watershed datasets, and instead redefined watersheds using base data, such as USGS topographic maps. National support for the WBD project was important to success in NY. Challenges included coordinating partners, version tracking, and retaining adequate expertise for delineation. The NY WBD will be integrated into the NHD before September 2010 and will be maintained by the NRCS and the USGS.

#### **V. International Watersheds Initiative and Hydrographic Data Harmonization Effort**

Mike Laitta described the IJC, which prevents and resolves disputes related to shared water resources between Canada and the US. The Commission's 17 International Advisory Boards and four current Binational Task Forces and Study Boards provide specific local expertise and conduct studies (i.e. joint fact finding) to help prevent or resolve disputes. The International Watersheds Initiative (IWI) of the IJC is mandated to support projects and activities by the participating Advisory Boards aimed at strengthening local capacity and expanding scientific knowledge of the watershed to address transboundary environmental challenges. Within IWI, the Transboundary Hydrographic Data Harmonization Task Force (THDHTF) seeks to harmonize transboundary, medium-resolution hydrographic datasets in order to:

- Assist border communities with the development of decision making tools
- Reduce redundancy in the reporting and tracking of legal and policy issues
- Strengthen federal, regional, and local stakeholder participation
- Create basin and hydrography data useful for real-world applications and analysis
- Provide a common base structure for adaptive management practices

Such datasets must be commonly coded and exhibit connectivity and shared topology. This coordination process includes:

- Establishing common baseline drainage area limits (based on US 8 - CAN 4 extents)
- Harmonize these drainage area units where possible
- Connect the streams, rivers, water bodies; establish flow path continuity
- Coordinate a regional/local Hydrographic Data Harmonization Workshop to refine hierarchical drainage areas

The THDHTF's current focus is the harmonization of transboundary drainage area containers at the US HUC-8 and Canadian 4-digit levels. This work began in the western US; May 2010 is the projected completion date for the Lake Champlain region.

## **VI. NHN/NHD Harmonization Status**

Pete Steeves, USGS, explained the role of the THDHTF in the data harmonization process; this Task Force is charged with:

- Harmonizing water-related, geospatial datasets (drainage areas, hydrography, and ultimately derivative datasets such as elevation, soils, land use/land cover, precipitation)
- Providing data at a suitable resolution for local planning and management (e.g. flood forecasting, water quality changes, land-use modifications, water and land management practices)
- Allowing applications and analysis with a common base data structure

In order to do this effectively, the Task Force must coordinate and oversee federal, regional, and local stakeholders, identify data stewards, provide technical guidance and documentation for future activities, and create a long-term plan for data updates and dissemination.

The process of harmonizing NHN and NHD hydrographic linework will result in new and identical linework contained in both the NHN and the NHD, though the attributes of these features will correspond with the standards of either the NHN or the NHD, respectively. A recent International Boundary Commission survey established a new border to which hydrographic data is now aligned when undergoing the harmonization process. The phases of this project include: connecting and redrawing hydrographic data across the border and establishing flow connectivity, assigning names and classifications to these features, and assigning permanent reach codes within the NHD or NIDs within the NHN. There may be data density differences across a region because of the resolution of original datasets, but all linework is connected across the border properly. The Task Force is currently focused on connecting geographic datasets and establishing flow, rather than how well these data align with actual hydrography.

Locally, the Vermont Hydrographic Dataset is maintained at a 1:5,000 scale, as compared to the 1:24,000 scale of the NHD. Currently, VT data is being harmonized with NY and NH datasets and will soon be harmonized with Québec data. The largest challenge to this is the scale of the currently available Québec data (1:50,000). Ultimately, the USGS will provide only one dataset for each state, at the highest resolution possible, which will include harmonized transboundary data.

## **VII. Drainage Area Harmonization**

Karen Hansen, USGS, elaborated on the role of the THDHTF in the transboundary harmonization of drainage area containers. The Task Force notes discrepancies between the US-8 and Can-4 datasets and makes recommendations to local data stewards on how to change these area extents, based on the best available data. Geobase, the NHN clearinghouse, is a logical liaison between local data managers (stewards) and national/regional agencies in Canada. Adjusting a drainage area boundary has a trickle-down effect on other datasets, especially when the extent of a sub-basin is changed by the identification of a new outlet from a waterbody. Coastlines and lakeshores have been removed from this dataset and will be maintained by the NHN and NHD. Before NHN/NHD edge-matching begins, these drainage area containers must be approved. The Task Force will establish a mechanism to replace all older data with updated, harmonized data once the work is completed.

When harmonization of hydrographic data occurs, it will be necessary to agree on a shoreline for Lake Champlain, based on a set lake level (this may be difficult to establish because photographs have been taken at different levels). Identification of the end of the lake and the beginning of the Richelieu River would be helpful for drainage area delineation. The Task force is ready to recommend drainage area delineations for the Lake Champlain Basin (and surrounding areas) and host a workshop involving local stakeholders. Vermont has not signed an agreement to work with or accept this drainage area harmonization, so duplication of efforts needs to be avoided. The MDDEP may be able to provide Québec's working units for comparison with federal and US data, though higher-resolution drainage areas might intersect, rather than contain, lower-resolution hydrographic linework from the NHD/NHN harmonization process. Thus, harmonization may have to begin with lower resolution Québec data until higher resolution hydrographic data becomes available, so that this work can meet its September 2010 deadline.

## **VIII. Application of the NHD to Water-Quality Nutrient Modeling**

Craig Johnston, USGS, outlined the use of NHD data for the New England SPARROW model, which estimated phosphorus and nitrogen loads based on 1990s era water quality data. In order to model nutrient transport across the international border, the USGS purchased Canadian data, selected an appropriate density of features, and matched them with 1:100,000 NHD data while correcting flow directions. The model relied on 1:100,000 scale drainage areas, which extended into Canada within the Missisquoi Basin. The model predicted total nitrogen and phosphorus loads and concentrations for 42,000 stream reaches across the Northeast. Some areas were not included in the analysis because of inadequate or unavailable supporting data (e.g. land use data) – other supporting data can be just as important to obtain as hydrographic data.

## **DAY 2**

### **I. Welcome and Overview**

Bill Howland encouraged networking across borders in order to increase data sharing and collaboration. The group will need to plan a future harmonization workshop and consider

the challenges of harmonizing data. What are the next steps toward data harmonization within the Lake Champlain Basin?

## **II. Summary of Day 1 and Round Table Discussion**

Eric Howe, LCBP, reviewed the proceedings of Day 1, facilitated a group discussion of the next steps toward harmonization, and identified action items to complete this work. There are two very different resolutions of data being discussed for work in the Lake Champlain Basin – it will be a challenge to decide when to use coarser, national datasets or to use finer, local datasets for the identification of critical source areas of phosphorus pollution. The LCBP hopes to support the development of both types of datasets, but our focus is truly on supporting resource management – the LCBP needs to be able to provide and analyze data to support on-the-ground work in the Basin. After an informal discussion of data needs within the Basin and ways to support the harmonization process, the following action items were identified:

A **Binational Hydrographic Harmonization Workshop** for the Lake Champlain Basin was planned for September 2010, at a regional location such as Grand Isle, VT or Sherbrooke, QC. This workshop will focus on delineating drainage areas at the 10- and 12-digit HUC levels, based on US8-Can4 containers. The group decided not to postpone this work until the release of higher resolution Québec data, because the Task Force plans to update these datasets over time, as better data becomes available. The Task Force will utilize harmonized hydrographic linework to create concept proposals for new delineations to be discussed at the Workshop. Attendees should include drainage area data stewards and hydrologists from the relevant provinces and states (probably Ontario, Québec, New York, Vermont, and New Hampshire).

The LCBP will research an existing Memorandum of Agreement between Canada and the US on the **harmonization of Land Use/Land Cover (LULC) data** to determine the feasibility of a pilot project for this region following the completion of this stage of harmonization. During the September Workshop, the Task Force might be able to do a coarse evaluation of LULC datasets for the region.

USGS and LCBP representatives (Pete Steeves, Craig Johnston, Eric Howe) agreed to determine the feasibility of a **binational StreamStats application** for the Lake Champlain Region. StreamStats is a web-based application that can generate flow statistics at a particular point on a stream network by delineating a watershed and using local USGS stream gage data. StreamStats is currently state-centric, so most of the Lake Champlain Basin is covered; however, the application would require Québec gaging data and the creation of transboundary regression equations. Challenges to this project would be the lack of binational basin characteristic data (e.g. LULC) and dissimilar data types and resolution. Representatives should begin an evaluation of the feasibility of a StreamStats application by developing a list of datasets required for this work and then harmonizing these datasets. The first step may be to harmonize a digital elevation model within drainage area containers.

A **Web Mapping Service (WMS)** for Lake Champlain data would be a great way to maintain and share data related to the region with the public. The IJC is beginning to use cloud computing to provide the most current data for certain regions of the US – now a

graphical user interface needs to be developed to share this data with the public. IJC, USGS, LCBP, and EPA representatives agreed to explore WMS options.

A **LiDAR workshop** in the Lake Champlain Basin would help establish the need for, applications of, standards of, and sustainability of LiDAR datasets amongst users and data stewards. In other areas of the country, NHN and the WBD work utilizes LiDAR; Karen Hanson offered to provide a web presentation of this work at such as workshop. Erik Beck (US EPA), Martin Mimeault (MDDEP), Lin Neifert (USGS), and Eric Howe (LCBP) expressed interest in planning this workshop.

Finally, CTIS representatives assured that an upcoming call with the Ministère des Ressources naturelle et de la Faune will help them acquire **1:20,000 scale hydrographic data for Québec** to integrate into the NHN/NHD harmonized datasets as soon as possible. The MDDEP agreed to help establish priority for the preparation and release of data for this area of Québec in order to support harmonization efforts. For now, the CTIS will work to harmonize 1:50,000 scale data and then improve on this work once better data becomes available.

### **III. Thank you and Adjourn**

The Lake Champlain Basin Program was very pleased with the outcome of this assessment meeting. The workshop fostered good communication among the participants and strengthened existing lines of communication among necessary partners. The LCBP strongly supports the initiative of the Task Force and looks forward to hosting future regional workshops to improve data harmonization for binational waters.

### **Meeting Attendees:**

Michael T. Laitta	IJC
Tom McAuley	IJC
Robert Reynolds	IJC
Conrad J. Wyrzykowski	AAFC/AESB
Karen M. Hanson	USGS
Pete Steeves	USGS
Craig Johnston	USGS
Lin Neifert	USGS
Douglas Freehafer	USGS
Danielle Sabourin	CTIS/NRCan
Denis Boutin	CTIS/NRCan
Stephen Cote	MRNF
Martin Mimeault	MDDEP
Marc Simoneau	MDDEP
Alain Demers	MDDEP
Cathy Keenan	NRCS NY
Erik Beck	USEPA

Tom Giffen	USEPA
Bill Howland	LCBP
Eric Howe	LCBP
Meg Modley	LCBP
Nicole Grohoski	LCBP