Missisquoi Bay Basin Project:
Identifying Critical Source Areas of Pollution

Workshop on Data Availability and Data Needs
Tuesday, April 28, 2009
10:00 AM – 2:00 PM
Gordon Center House, Grand Isle, VT

Workshop Summary

I. Welcome and Introductions

II. Overview of the Missisquoi Bay Basin Project

Bill Howland, manager of the Lake Champlain Basin Program (LCBP), provided an overview of the Missisquoi Bay Basin Project to date. This workshop is the fourth in the series to guide the identification of critical sources areas of pollution. Previous workshop topics included defining a critical source area (CSA), reviewing possible approaches to CSA identification, and determining short term monitoring needs. The LCBP plans to establish new stream gage and water quality sampling sites as well as meteorological stations in conjunction with the United States Geological Survey (USGS).

This workshop, facilitated by Mike Winslow of the Lake Champlain Committee and Bill Howland, aims to discuss data availability, gaps in existing data, and the coordination of transboundary datasets within the Missisquoi Bay Basin. Participants will be asked to share the types of data their agencies or groups have publicly available for the LCBP and other interested users to acquire. Data requirements for potential models as well as for other research needs will be discussed and later help inform a Request For Proposals for the modeling effort.

III. Data Availability

Nicole Grohoski, LCBP technical associate, presented a spreadsheet of the database of geospatial data currently acquired to support this project. Major sources of data were the Vermont Center for Geographic Information (VCGI), the Missisquoi Areawide Plan, and the Spatial Analysis Lab in addition to water quality monitoring groups who shared sampling locations and parameters. The LCBP will obtain recent orthophotography and LiDAR data soon and looks forward to learning about additional data to acquire. The discussion was structured around different data categories, as outlined below.

Agriculture

At the Vermont Agency of Agriculture, Food & Markets (VAAFM), most collected data is input into spreadsheets and tagged with a Hydrologic Unit Code (HUC), though the scale of this code is not consistent (can be 8-, 12-, or 14-digit). Data that could be aggregated by HUC (depending on time, resources, and current format) and shared include:

- Acreage with VAAFM-funded Nutrient Management Plans (NMPs) with crop type noted
- Acreage in the Conservation Reserve Enhancement Program and contract type
- Farm Agronomic Practice Program annual data (total acres in no-till, cover crop, strip till, etc.)

- Type and number of contracted Best Management Practices (BMPs)
- Medium and Large Farm Operation annual reports (manure transfer and production, animal numbers, number of farms)
- Soil test data (not currently linked to a HUC code and not updated beyond 2007)
- Medium and some Small Farm Operation surveys (farm problems, silage, manure) (available at the 8-digit HUC level)
- Acreage of aeration or injector usage
- Complaints and violations of Accepted Agricultural Practices (linked to 17 basins statewide, not HUC code)
- Number of farms with written and/or updated NMPs
- Annual totals of fertilizer sold by county
- Groundwater nitrate, pesticide, and herbicide concentrations from sampled wells

The Natural Resources Conservation Service (NRCS) can share the following data:

- Crop insurance data, though these can be unreliable
- Watershed planning information
- Type of the BMPs supported by the NRCS (currently not easy to access)
- Areas of concern located by photo-interpretation (gully erosion, livestock fence issues)
- 2008 field locations and crop type in the US Rock River watershed (photo-interpretation)

The University of Vermont Soil Test Lab has soil phosphorus data than can be aggregated by the county, zip code, or town that the farm is in. The sampling methods for these tests vary and results exist electronically as far back as 1992. The test data is accompanied by a field questionnaire, which includes optional reporting on field acreage and cropping. It would also be possible for the lab to consider phosphorus trends by soil type. Additionally, private consultants such as Bourdeau and Bushey have NMPs with data about soils, crops, animal numbers etc. This data is confidential but could be aggregated and shared; individual soil phosphorus tests would require release forms from farmers.

In Quebec, the Department of Agriculture aggregates farm census data such that each grouping has a four-farm minimum. Soil phosphorus data can be accessed by farm postal codes and NMPs are mandatory. Crop insurance plans require digitized farm boundaries which farmers often opt to share.

Boundaries

There is a statewide initiative being led by VCGI to create a parcel boundary dataset. This information could be useful in conjunction with land cover data. As of now, very few towns in the Basin have digital parcel boundaries, though the Natural Resources Conservation District intends to do this.

Conservation

Extents of forestry value-use parcels are being mapped for Franklin County. The rare, threatened, and endangered species dataset is used to guide management decisions and could be combined with model outputs to locate areas of special concern. Internally, the ANR has a more detailed and sensitive version of this dataset that may be accessible in a buffered format (sites of archaeological interest are similar).

Hydrography

In rural areas, locating tile drainage would help to understand the hydrologic network and modifications to it. Some drainage might be visible in photographs or extracted from a summer vegetation index, since its implementation is unregulated and undocumented. Its presence could also be predicted by considering land cover and soil drainage characteristics.

In urban areas, the ANR is compiling information this summer about stormwater infrastructure and practices as well as performing some sewer mapping. Impervious surface recognition will be automated in areas with LiDAR data by the SAL. Locations of stormwater permits and discharge concentrations should also be added to the database. The Environmental Protection Agency (EPA) has an online national database of water treatment plants.

Land Use/Land Cover
The National Oceanic and Atmospheric Administration (NOAA) Coastal Change Analysis Program developed a land cover dataset in 2006 and performed change detection analysis. The SAL will also complete land cover mapping for areas with LiDAR data.

Photography
High resolution aerial photos, taken at oblique angles, have also been collected by the Agency of Natural Resources (ANR) over the past three years. These cannot be georectified, but they can be used as a reference for identify CSAs. Historical photos dating back to the 1930s could be scanned and then compared digitally to current photos.

Soils
In Franklin County, soils were classified in the 1940s and 1950s and are not accurate. The NRCS has sampled along the Rock River corridor to better characterize soils and establish a native phosphorus level.

Other Data
Geological information is available through the Vermont Geological Survey. The USGS can provide phosphorus and nitrogen predictions from a 1995 SPARROW model. They also have an enhanced EPA point source database and related nutrient load estimates. National assessments of both streambed sediment quality and agricultural fertilizer and manure application are available. The USGS has estimates of water use by census tract, though this does not include agricultural use, as well as information on where sewer lines extend.

IV. Data Gaps

Mike Winslow facilitated a discussion to identify other data that could be useful for the critical source area analysis. Determining the scale of the analysis would help to understand what assumptions can be made and what data would be helpful to collect. For instance, if we are trying to determine critical subbasins, then the current hydrography resolution is adequate; however, if we are looking for critical fields, LiDAR-derived hydrography would be necessary.

There is currently no data on field crop rotation schedules, which would be useful for understanding land use over time. Depending on the scale of modeling, this information may not be necessary or assumptions may be suitable. If rotations are done between fields, then there is little change in production at the farm level. However, recent data has shown that although the acreage of fields has remained the same, the production of corn and hay has changed, indicating crop rotation. NMPs

require a universal soil loss equation evaluation, which includes a planned field rotation in order to meet tolerable soil loss requirements.

Extending the hydrologic network to include tile drains and ditches and then comparing this network to historical photos would help determine changes in the system.

The Phosphorus Index establishes a relative understanding of field-level transport and source, but that info is owned by the farmer and not available for this effort. It probably does not make sense to aggregate this data because of the way that it is calculated, though aggregating based on land-use type might make sense. Grouping these field-based values can also obscure hydrographic boundaries. Quebec uses a quantitative index which might be helpful in validating phosphorus estimates.

V. Transboundary Data

Bill Howland led a discussion about datasets that would benefit from transboundary data unification and what this process might involve. Access limitations and differences in data type, accuracy, precision, and classification between Quebec and Vermont were considered. It is important that datasets be consistent for modeling, but this data should also be created for use in future, unrelated projects. Considerations were based around different data categories, as outlined below.

Agriculture

Land cover data in Quebec differentiates between crop types and is available in an aggregated basis. Using standard aggregation methods would help with transboundary comparisons. Animal unit data is detailed in Quebec but only available for dairy cows in the U.S.; each country estimates phosphorus outputs per animal unit differently and manure exportation is also an important consideration. NMP requirements and BMP expectations are also not equivalent across the border.

Hydrography

Currently, public hydrography data is at different scales on either side of the border. Quebec is in the process of adding 1:20,000 data to Canada's National Hydrographic Network, and the USGS plans to merge this data with the U.S. National Hydrographic Dataset. The Missisquoi Bay Basin will hopefully become a priority in this national endeavor. Alternatively, the IJC might consider joining U.S. data with the current 1:50,000 Quebec data sooner. If necessary, a contractor may need to edge match datasets for modeling. Having accurate subwatershed boundaries derived from the same elevation model (or ones of the same precision) will be important. Another goal is to standardize stream order classifications and understand how surface water impairment classes relate across the border (Quebec uses a scoring index, but Vermont determines if a stream reach meets defined standards for different types of pollutants).

Land Use/Land Cover

The 2001 SAL dataset covers the entire Lake Champlain Basin, but the 2006 NOAA dataset does not. It is possible to complete a new classification using a common image, so that there is consistency for modeling. Cropping differs from that of the U.S. so creating a common classification system is important.

Soils

Soil surveys differ significantly across the border; on the U.S. side, map units do not capture the true variability of soils in river corridors. Common slope, erodibility, and drainage classifications are needed. The Quebec survey was done in 1991 and has a different resolution than U.S. data. The NRCS may be able to sample soils across the border in order to make comparisons between soil series classifications.

Water Quality Monitoring

Quebec flow gage information is not currently available online; it would useful to have one webpage where monitoring data for the entire basin is available. There has been interest in this from the Quebec side – perhaps the IJC could help in this process. More information about phosphorus loads, by stream segment or subbasin, is also an ongoing goal. Currently, Quebec uses a different test for phosphorus concentration which can be related to Vermont tests, but might be advantageous to harmonize. Considering bioavailable phosphorus and sediment concentrations may also be important. There are also differences in bacteria monitoring and beach closure policies.

Other Data

Right now, the orthophotography cuts off along the border, but the new Department of Homeland Security imagery should correct this issue. Quebec has a comprehensive roads layer similar to the E911 data, though whether or not it contains information on road surfaces is unknown. E911-type point data referencing building locations would be helpful in generating a basin-wide density surface. This data could theoretically be used in conjunction with sewer line extents to determine where septic systems are located.

VI. Next Steps and Adjourn

Bill Howland thanked everyone for attending and providing input. This project database will continue to grow and become more comprehensive in the coming months, based on the information learned here. After datasets are reviewed in accordance with quality assurance protocols, the LCBP will make this data available to the public. The LCBP is considering how to distribute large datasets and how to inform people as new or updated data becomes available. It will notify attendees of the workshop series of data publication when the time comes, as well as provide workshop summaries and attendee lists online.

Workshop Attendees

Name	Organization
Caroline Alves	Natural Resource Conservation Service
Erik Beck	Environmental Protection Agency
Alexandra Dichter	Environmental Protection Agency
Laura DiPietro	Vermont Agency of Agriculture Food & Markets
Sally Flis	Bourdeau Brothers
Lula Ghebremichael	University of Vermont
Alexandra Haselton	VT EPSCoR Streams Project
Bill Hegman	Middlebury College
Buzz Hoerr	VT Citizens Advisory Committee, LCBP Education & Outreach
Richard Kiah	United States Geological Survey
Aubert Michaud	Institut de Recherche et Développement Agroenvironnement
Julie Moore	Vermont Agency of Natural Resources
Lin Neifert	United States Geological Survey
Jarlath O'Neil-Dunne	University of Vermont Spatial Analysis Lab
Kip Potter	Natural Resource Conservation Service
Keith Robinson	United States Geological Survey
Reed Sims	Natural Resource Conservation Service
Eric Smeltzer	Vermont Agency of Natural Resources
Joel Tilley	University of Vermont Soil Test Lab
Carl Waite	Vermont Monitoring Cooperative
Mike Winchell	Stone Environmental, Inc.
Mike Winslow	Lake Champlain Committee

Lake Champlain Basin Program Staff:
Nicole Grohoski, Bill Howland, Kris Joppe-Mercure, Meg Modley