Watershed Assessment of Detroit River Nutrient Loads to Lake Erie

Advisory Group Conference Call

2 - 4 p.m., Thursday, October 5, 2017

Call Agenda:

- Introduction - *Jen Read*
- Lake St. Clair Modeling - *Serghei Bocaniov*
- Watershed Modelling Update - *Awoke Teshager*
- Scenario Approach and Discussion
    - Regional Watershed Model - *Awoke Teshager*
    - Detroit Urban Model - *Branko Kerkez*
    - Polling and Discussion about Initial Runs - *Lynn Vaccaro*

Q&A and Discussion Notes

Lake St. Clair Modeling

Questions and Team Responses:

- Q: How will you use scenarios for Lake St. Clair?
  A: We plan to develop response curves for each major tributary by varying the loads of each tributary and recording the modeled nutrient flux leaving the lake.

- Q: Explain your frame of reference for "export" in your implications slide.
  A: By export we mean the flux of nutrients out of Lake St. Clair and into the Detroit River.

- Q: Is there a net accumulation of nutrients in the lake? Is the lake become more eutrophic? Could the lake become a bigger source of nutrients in the future or during extreme weather conditions?
  A: We cannot answer this directly with our model because of its inability to simulate the winter, ice-covered months, which could be important for determining long-term accumulation. We are exploring alternative ways to assess this.

- Q: Are you limited by the quality of your input data?
  A: We have two good years of comprehensive data and we feel these are sufficient for calibration and validation. However, additional data from our Canadian partners would be useful for further calibration, validation, and testing.

- Q: How sensitive is the system to variations in annual rainfall? This could be an important consideration when thinking about climate change impacts. Could you test changes in annual flow from tributaries? I assume St. Clair River flows are large and steady.

- A: Yes, we could explore the impacts of variations in tributary flows, but it important to understand that climate change has many impacts in addition to changes in flow.

Other Comments:

- On the US side, residents are very concerned about the health of Lake St. Clair, increased organic debris on the shoreline and apparent changes in the lake. Michelle and Phil recently attended a large town hall meeting on this topic.

Watershed Modeling (SWAT) Update

- Tillage survey is still open and Farm Bureau plans to do a couple more reminders.

- Q: For model calibration will you look at TP and DRP? At what time interval?
  A: Will use both TP and DRP for calibration based on daily data. Will assess model's ability to predict, daily, monthly and annual loads.

Scenario Discussion - Agricultural and SWAT scenario ideas

- Hard to pick between practices when only some are familiar.
- Fertilizer rates and subsurface placement have been shown to reduce loads in Maumee River modeling.
- Controlled drainage is of interest. MI has a number of field experiments underway to look at drainage management.
- Wetlands are or interest. Ontario is empathizing wetland conservation, see: wetlands and climate change story
- In Michigan, point sources are a big focus of the state's domestic action plan. Take this into account if trying to model the impacts of DAPs.
- Be careful about introducing bias if you select a small set of practices to test now without looking at effectiveness data for a complete set of actions.

- Q: Do you know enough about current practices for manure to run scenarios? Remind me of what input/baseline data is being used in the watershed model for livestock operations and manure application? (On the U.S. side) Is it limited to permitted operations or do you have data on number or locations for the smaller operations as well? At the county level the SWCDs and land use planning entities would know where they are even if under permit limits.
- Team Response:
  - We can run informative scenarios by changing assumptions about amount of manure applied, timing or placement and look at the relative change on loads.
  - In Ontario OMAFRA has shared information about areas with manure management plans that have improved our baseline assumptions.
  - We have very few permitted livestock operations in and near the US side of the watershed and no information about where the smaller operations are. Hence, currently for the US side of the watershed, we decided to use county level USDA NASS livestock

counts to calculate manure generated in each county per livestock type. The manure generated for each county was then distributed across all croplands and pastures within that county.

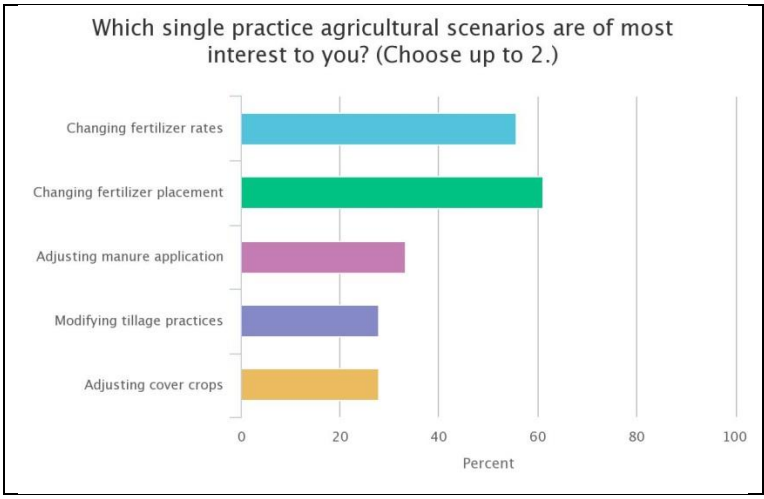
- We have been exploring use of satellite data to identify smaller operations to help us distribute manure better. However, the method we are using to identify those animal operations seems to work differently in different places due to variation in satellite data and other technical reasons. We are trying to calibrate it or come up with a better approach.

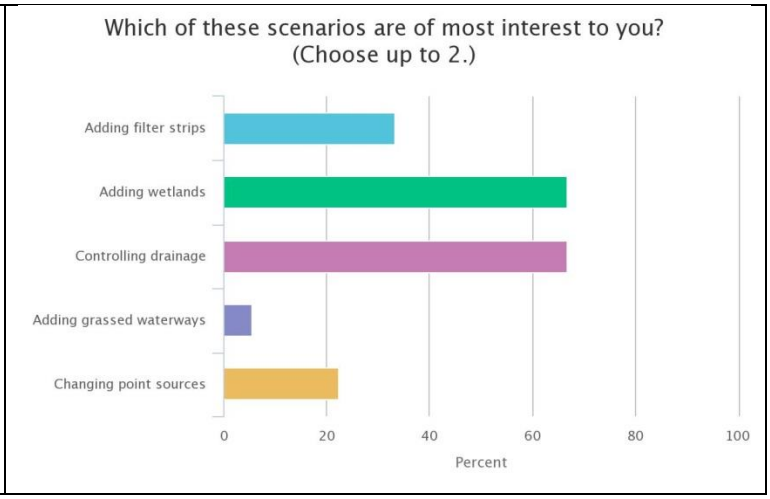
- Q: Will you consider tradeoffs for your ag scenarios, like loss of productive acres or reduced crop yields?
- A: Yes, our SWAT model simulates crop yields so we can assess relative changes under different scenarios.

- Q: For the scenarios -- what is the source for the amount of phosphorus in manures and fertilizers and biosolids that are available to run off and the availability of them if they do runoff during rain events? Additionally, what is availability to crops for spread products ---- for example, in biosolids some of the phosphorus is bound in ferric ppt., does that ever become bioavailable?

  Team Response:
  - This is a complicated question and might require more discussion to understand what information would be useful.
  - Our watershed model, SWAT, simulates both inorganic and organic content in fertilizers and manures to allow inorganic forms to be more easily taken up by crops. In contrast, organic forms will have to be converted through different biogeochemical processes to become available.
  - Our model documentation on page 13 includes a table outlining the nutrient content assumed for different types of manure. We also know that manure storage times and application practices will influence nutrient content and availability to crops.
  - We don't' simulate biosolids in the model, but if of concern we can take a look and estimate how much P is added from biosolids in the area. It will likely be small.
  - You can read more about how SWAT models nutrient process, update by crops and run-off, here:
    - SWAT Input/Output documentation, pages 100 - 106, http://swat.tamu.edu/documentation/2012-io/
    - Also see our Detroit R. model documentation, especially page 13: http://graham.umich.edu/media/files/SC-DR_Watershed_modeling_data_and_assumptions.pdf

Polling Results





Scenario Discussion – Urban scenario ideas

Comments:

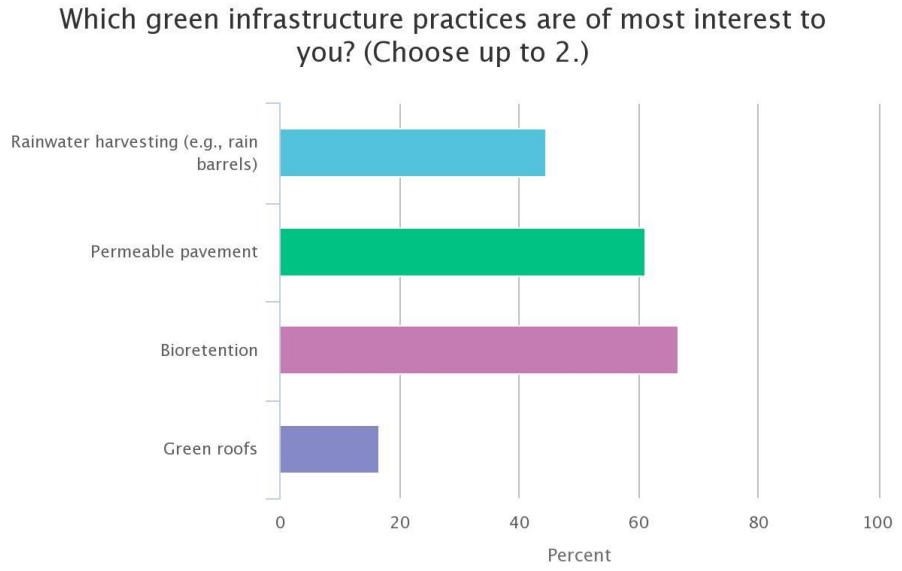
- Nearly 90 organizations are involved in promoting green infrastructure in Detroit! Lots of work is being driven by new drainage fee. Even though there are targeted areas for CSO reductions, it would be great to incorporate a wide range of locations and practices to be relevant to the range of approaches and organizations involved in green infrastructure and show the impact of distributed efforts. Is there a way to use GI work underway to develop a modeling scenario? Also flooding is a big deal - can this be looked at?
- The Amtrack station in Dearborn could be an innovative example to look to.
- Green streets (bio-retention) and lots of rain harvesting are happening in the city.
- Green roofs make sense if space is limited, and for new construction.
- NPDS permits specify where GI is needed, use this as a guide for scenarios or a comparison for results.
- Better to ask questions about how much is needed and where. All GI practices are basically the same in terms of outcomes, some are just easier to implement in different situations. The How question should come later, and maybe answered by someone else.
- Be careful with sewer separation. It could have tradeoffs. Sending stormwater into streams can lead to more pollutants in surface water, especially metals and maybe P too.
- Stormwater that flows through the waste water treatment plan will get the most treatment. Reducing or stabilizing flows to plant could push more water out through CSO basins that do not get full treatment. This is not the direction the city is moving. City and state do want to eliminate CSOs, especially untreated, but this could/should mean more water flows to plant.
- CSOs are a neighborhood, local problem.
- 95% of CSO discharges are treated in Detroit.
- Look at areas that are being targeted to minimize CSOs. You could develop ideas for that area. This includes upper Rouge areas. Northwest and Central parts of Detroit.

Questions and Team Responses:

- Q: In the end will the model tell us how much P reduction could occur through stormwater volume reduction?
  A: Yes, the model will be able to predict impacts to P due to the volume reduction (CSOs and stormwater retention/GI). We'll do this by estimating reductions in CSO volumes and loads to the treatment plant.

- Q: The P reductions associated with GI are very small but could the model show us where stormwater is a large source, the use of retention practices could help reduce the load by reducing the volume of stormwater discharged to the lake?
  A: Yes, the current model can show which storms and sub-watersheds have the most significant contribution to specific CSOs. This can help us pin down the most effective locations for GI and retention practices (those that have the biggest reduction to nearby CSOs).

Polling Results



Participants on Call:

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