Phosphorus Loading to Lake Erie: An Update (Mostly Maumee)

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• The horrendous HAB conditions in Western Lake Erie in 2011 are driving our activities
• ...but we now have 2012 nearly complete.
• It is instructive to compare these two years with each other and with the long-term record.
• I'll try to do that from a tributary loading perspective, focusing on the Maumee River.
Topics

- Whole lake TP loads from all sources
- Annual loads, recent and earlier, Maumee R.
  - Discharge and P forms
- Spring loads similarly, particular focus on 2011 & 2012
- Levels (post 2007) and trends (1975-2011) on a seasonal basis
  - Discharge and nutrients
- Summary

Lots of detail here - for future reference - you won’t get it all....
Lake Erie Total Phosphorus Loading, 1967-2008

TP target load 11,000 metric tons

Data from Dave Dolan, UWGB
Annual (Water Year) Graphs, Maumee River
Maumee Water Year Discharge

2011 and 2012 sort of medium, not too different
Water Year TP Load

2011 high medium, 2012 low medium
2011 and 2012 very comparable, sort of medium
Spring Discharge (April-June)

2011 and 2012 are the extremes - 2012 is 8.2% of 2011!

This is the time that seems to drive HAB production
2011 and 2012 are the extremes - 2012 is 2.5% of 2011!
Spring DRP Load

2011 and 2012 are the extremes - 2012 is 2.6% of 2011!
Seasonal Level and Trend Graphs, Maumee River
Maumee Levels 2008-2012

LOAD


FWMC


Data Workup: NSF WSC UM 2128/Maumee load time series and analysis/Maumee seasonal loads through 2012.xls
Maumee Trends 1975-2012: Discharge

Maumee River 1975-2012

Discharge (millions of cubic meters)

- Fall
- Spring
- Summer
- Winter

Linear (Fall)
Linear (Spring)
Linear (Summer)
Linear (Winter)
Maumee Trends 1975-2012: TP Loads
Maumee Trends 1975-2012: TP FWMC
Maumee Trends 1975-2012: DRP Loads

Big seasonal differences!
Maumee Trends 1975-2012: DRP FWMC

Not so much! Implies an important discharge effect.
Maumee Trends 1975-2012: Nitrate N Loads

Maumee River 1975-2012

Nitrate Nitrogen Load (tonnes)

- Fall
- Spring
- Summer
- Winter

Linear (Fall)
Linear (Spring)
Linear (Summer)
Linear (Winter)
Maumee Trends 1975-2012: Nitrate FWMC
Maumee Trends 1975-2012: Total N Loads
Maumee Trends 1975-2012: Total N FWMC
Maumee Trends 1975-2012: TN/TP Ratio
Maumee Trends 1975-2012: NO3/SRP Ratio
Maumee Trends 1975-2012: NO3/SRP Ratio
Major Points

- 2008 a record setter on a water year basis
- Loads: winter > spring > fall > summer
- Concentrations: same but less consistent
- Loads: discharge ↑ TP ↓ DRP ↑ NO3, TN ↑
- Conc’s: discharge TP ↓ DRP ↑ NO3, TN ↓
- 2011: extremely high spring loading
- 2012: extremely low spring loading
- Western Basin algal response...
Big Contrast!