What we know about

Phosphorus Loading to Lake Erie

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What was wrong with Lake Erie?

Western Basin Algae Problems

Microcystis

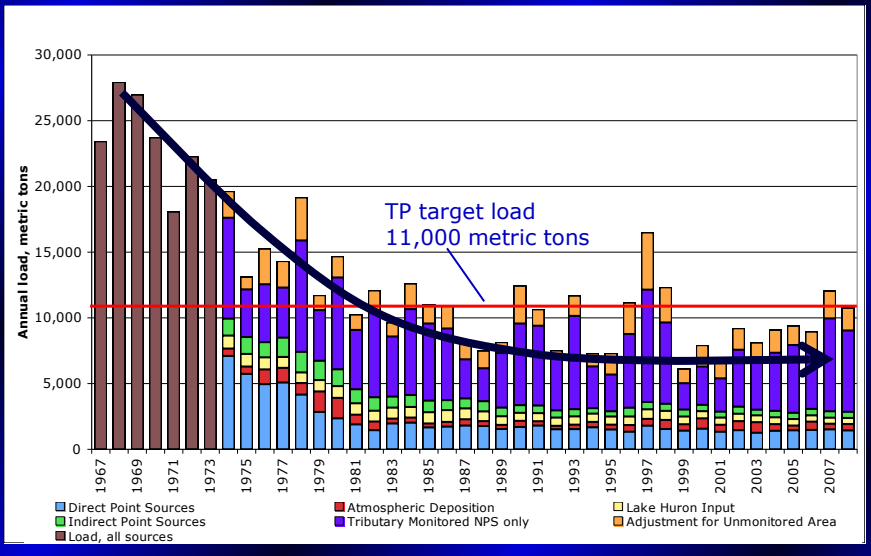
Some basic things we know

- Excessive algae reflect excess nutrients
- When an essential nutrient (N, P) gets used up, algal growth stops
- HABs can be reduced or eliminated by controlling phosphorus (P)
- In the 1970s, most of the P came from sewage treatment plants
- At present, most of the P entering the Western Basin comes from the landscape - non-point source origin

Remediation

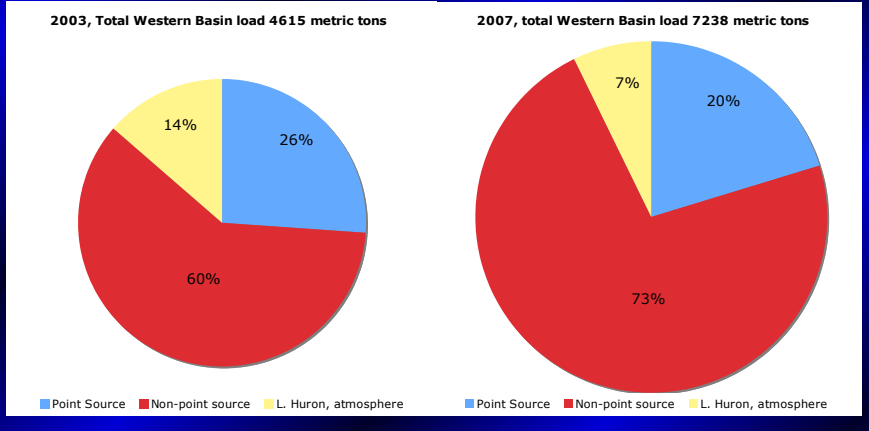
- Make phosphorus the limiting nutrient
- Reduce phosphorus inputs
  - Detergent phosphorus ban
  - Sewage Treatment Plant upgrades
  - Nonpoint source management
    - Fertilizer and manure management
    - Erosion prevention
      - Conservation tillage
      - Buffer strips

Lake Erie Total Phosphorus Loading, 1967-2008

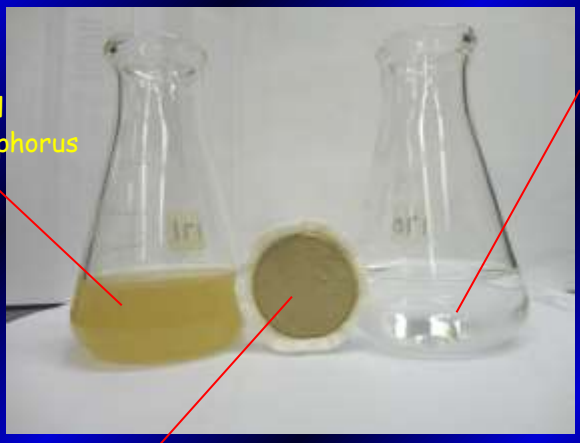


Data from Dave Dolan, UWGB

Western Basin Total Phosphorus Loading



Forms of P



Total Phosphorus (TP)

(Total) Dissolved P
- 90% of it is Dissolved Reactive P (DRP)
- "Reactive" because…

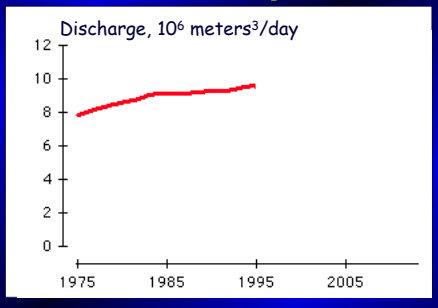
Particulate P (PP)

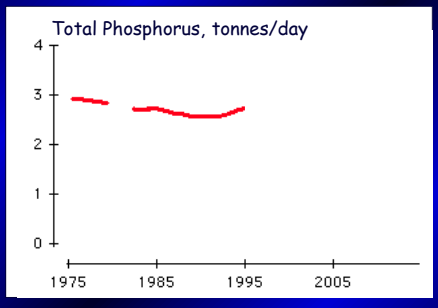
Importance of DRP

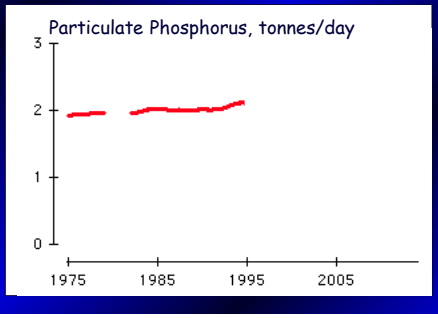
(Total) Dissolved P
- 90% of it is Dissolved Reactive P (DRP)
- DRP is 100% bioavailable

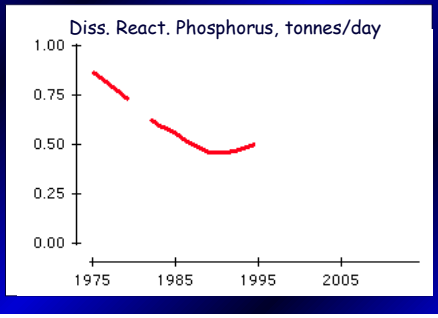
Particulate P (PP)
- ~30% bioavailable
- Tends to settle to bottom

Tributary P trends 1975-1995

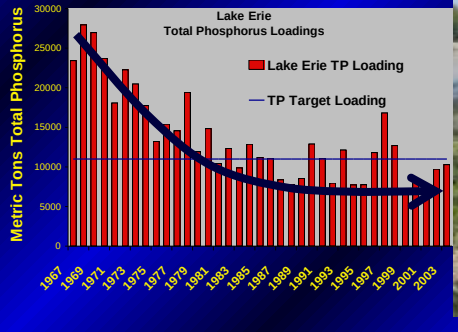


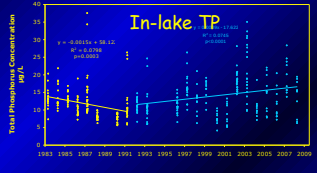






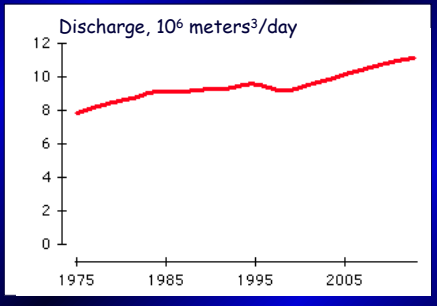
Shift in lake response

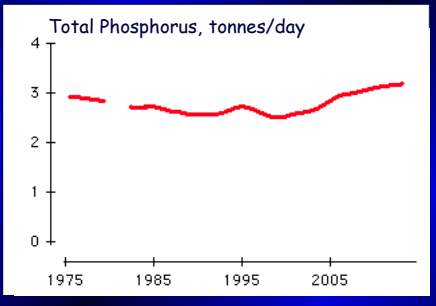


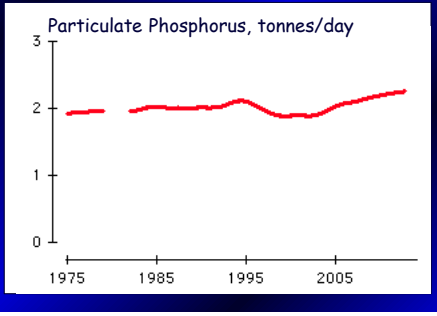


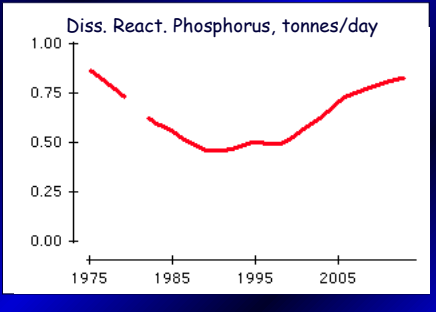
WHY?

Tributary P trends 1975-2012

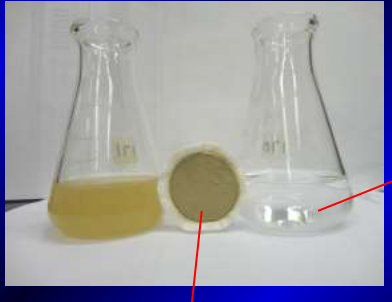








Importance of DRP

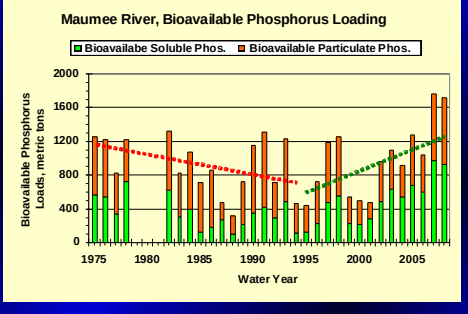


Dissolved P

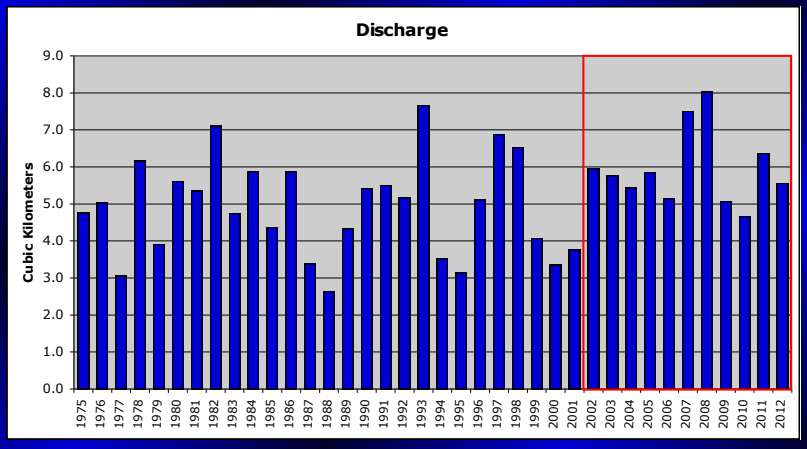
- 90% DRP
- DRP is 100% bioavailable for algal growth

Particulate P

- ~30% bioavailable
- Tends to settle to bottom

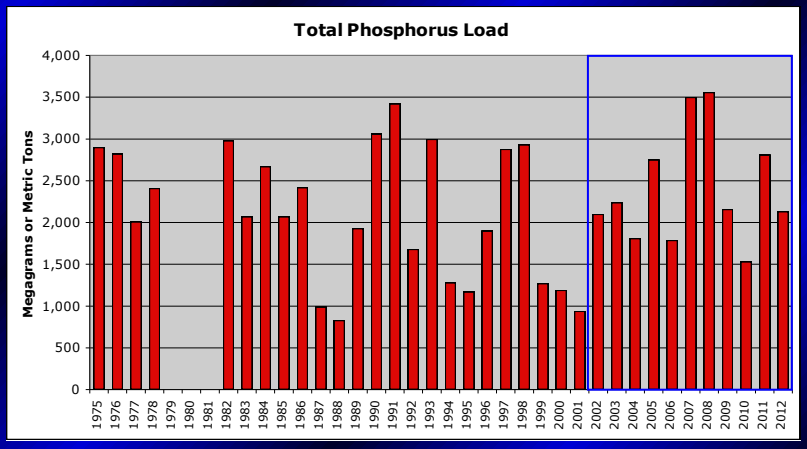


Maumee Annual Discharge



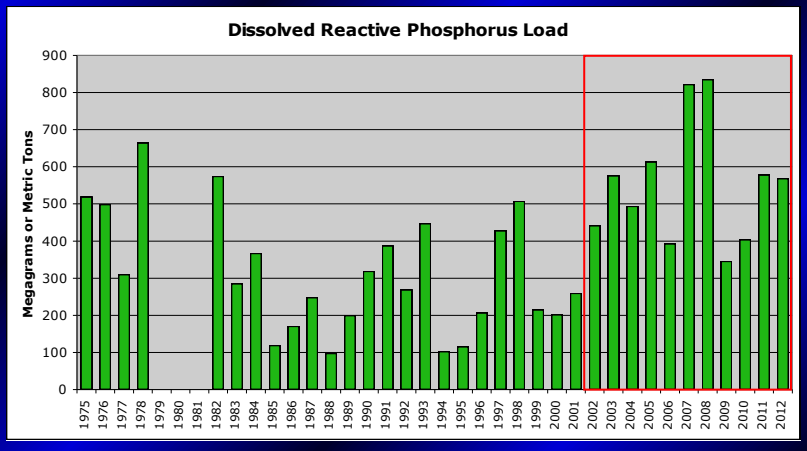
2011 and 2012 sort of medium, not too different

Annual TP Load



2011 high medium, 2012 low medium

Annual DRP Load

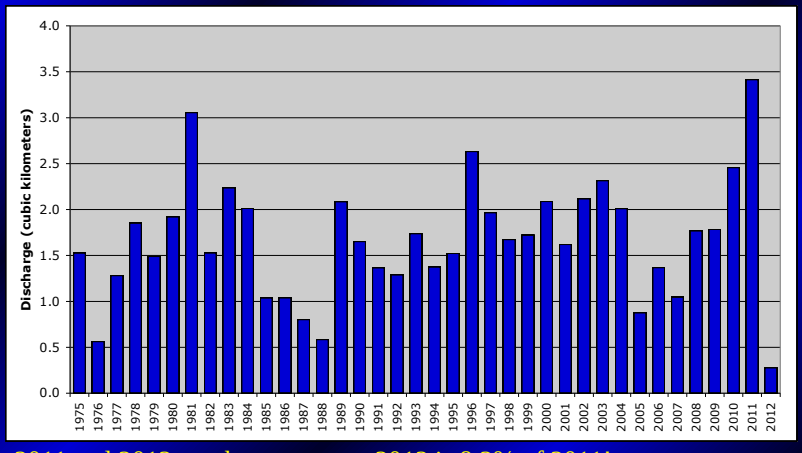


2011 and 2012 very comparable, sort of medium

Seasonal Loading

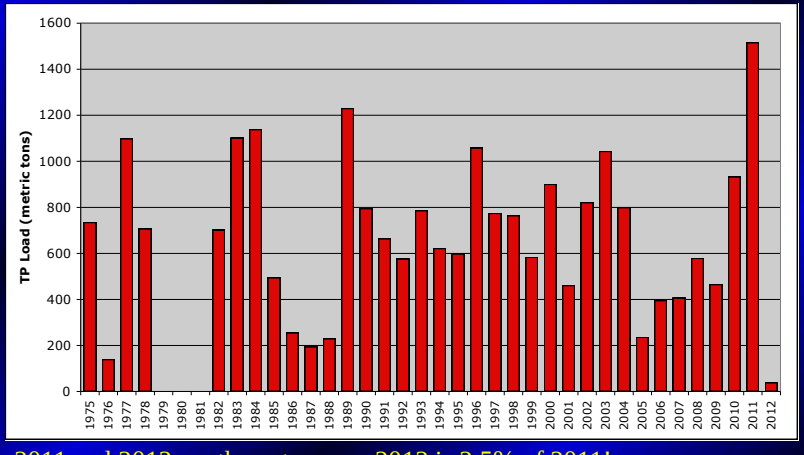
- P loading drives algal growth
- HABS occur in late summer
- Perhaps P loads in some seasons are more important than loads in others
- Several lines of research point to spring loading as most important

Spring Discharge (April-June)



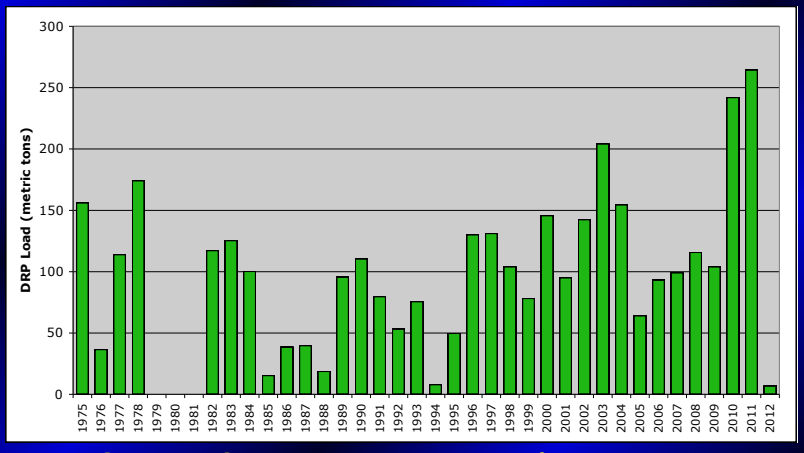
2011 and 2012 are the extremes - 2012 is 8.2% of 2011!

Spring TP Load



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!

Prediction, anyone?!!!

Stay tuned for next talk….