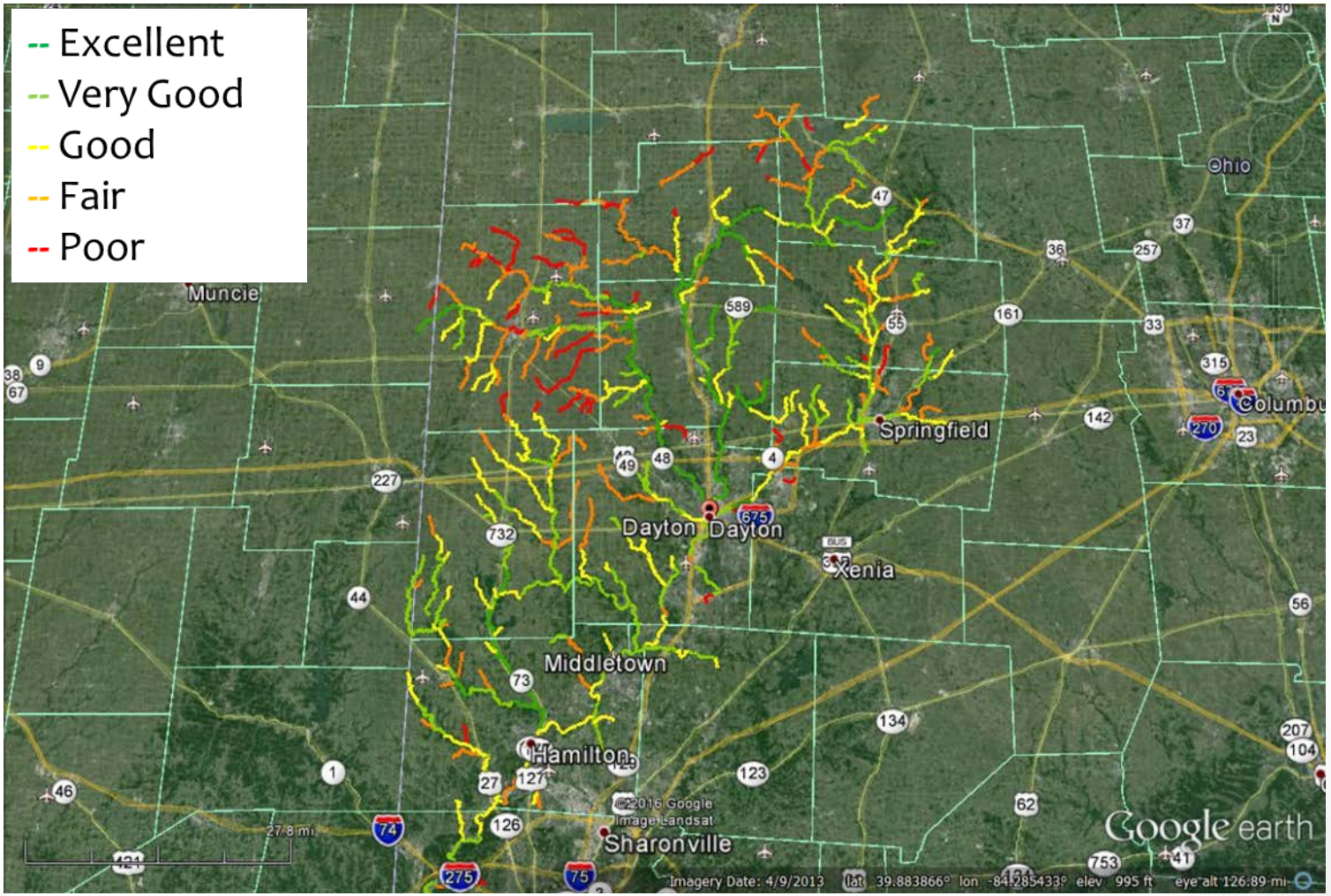
Nutrient Impairment of Surface Waters

Mike Ekberg, September 11, 2019, Great Miami River Network, Dayton Area Board of Realtors, Dayton, Ohio

Ecological Health of Rivers and Streams

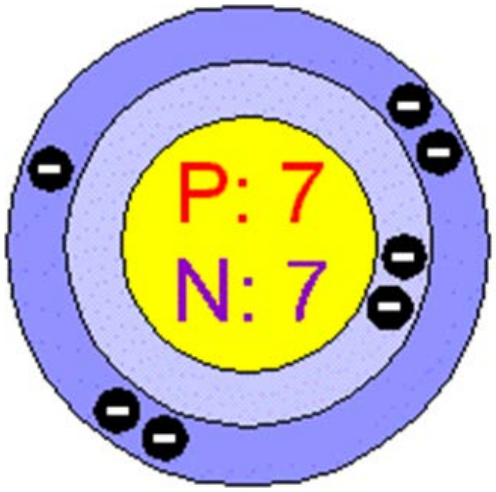


Top Causes of Impairment

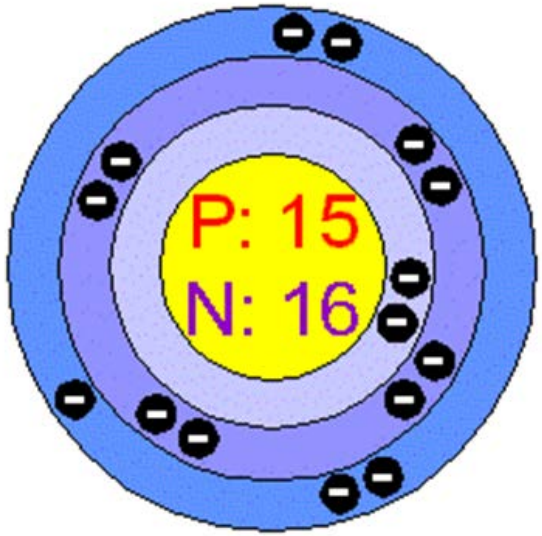
- ***Hydromodifications*** – low dams, channelization, loss of riparian vegetation
- ***Increase in Impervious Surfaces*** – related to development of previously undeveloped areas
- ***Nutrient enrichment*** – point and nonpoint sources of nitrogen and phosphorus

Nutrients

Nitrogen

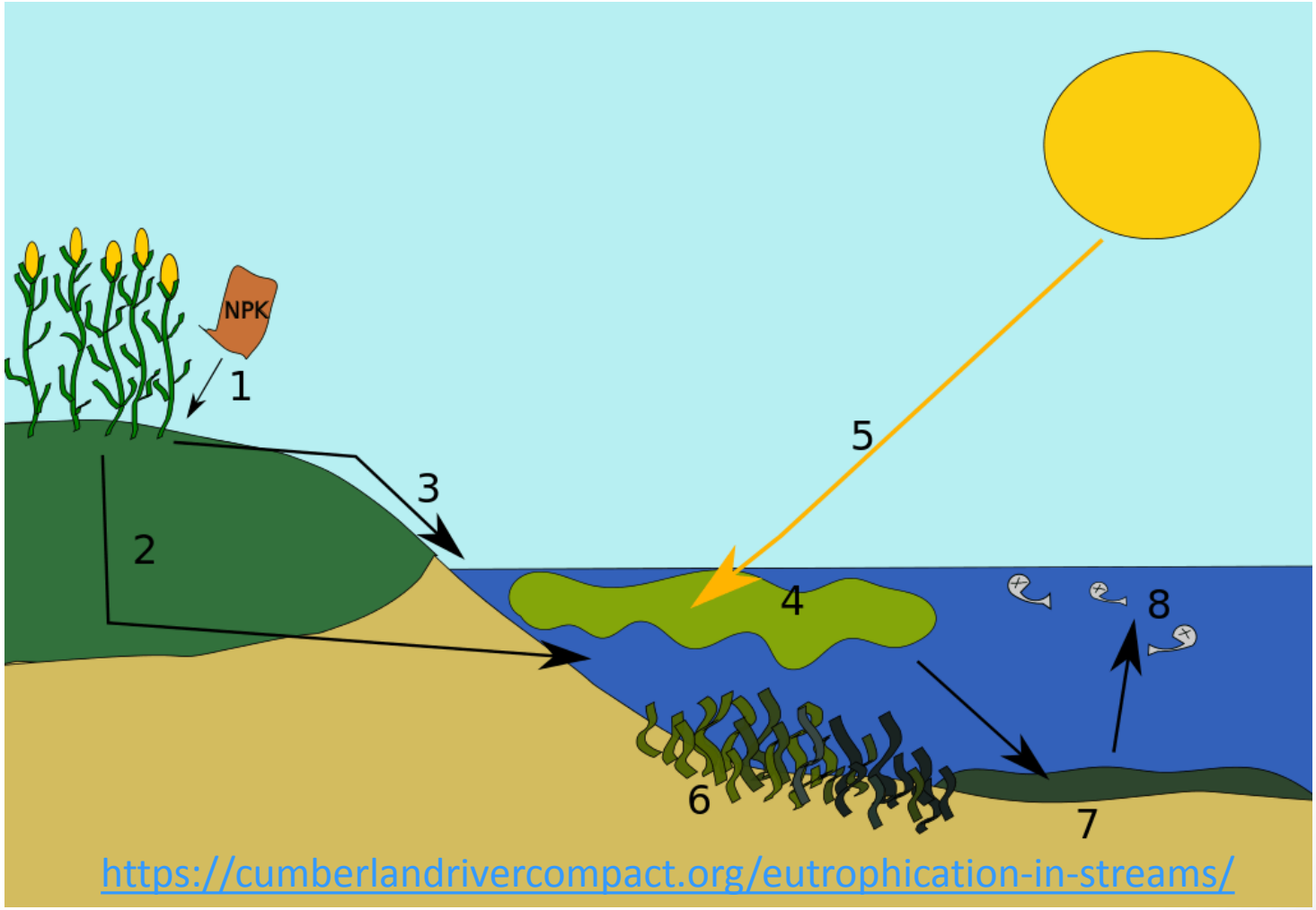


Phosphorus

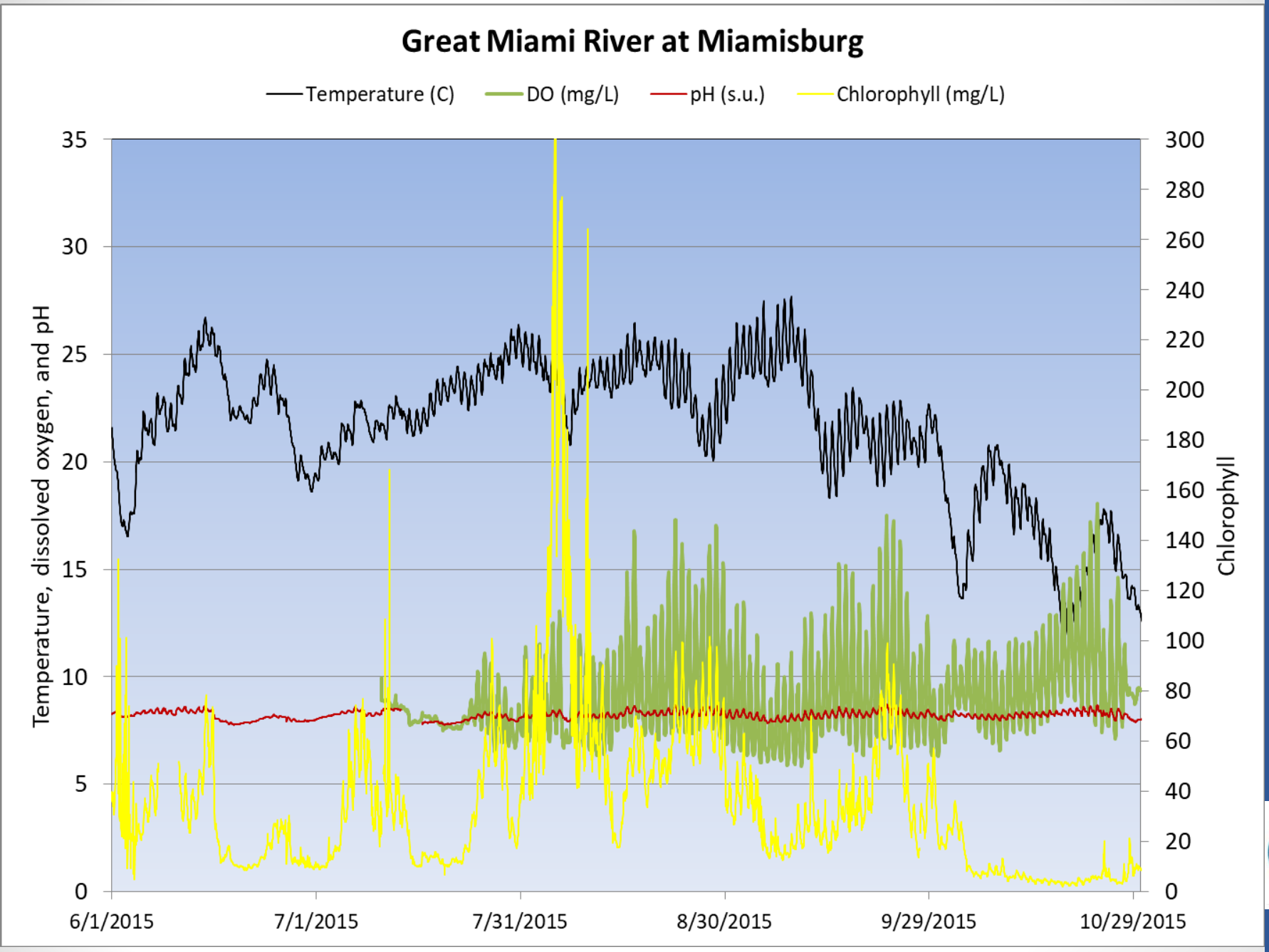


Nutrient Enrichment

Eutrophication



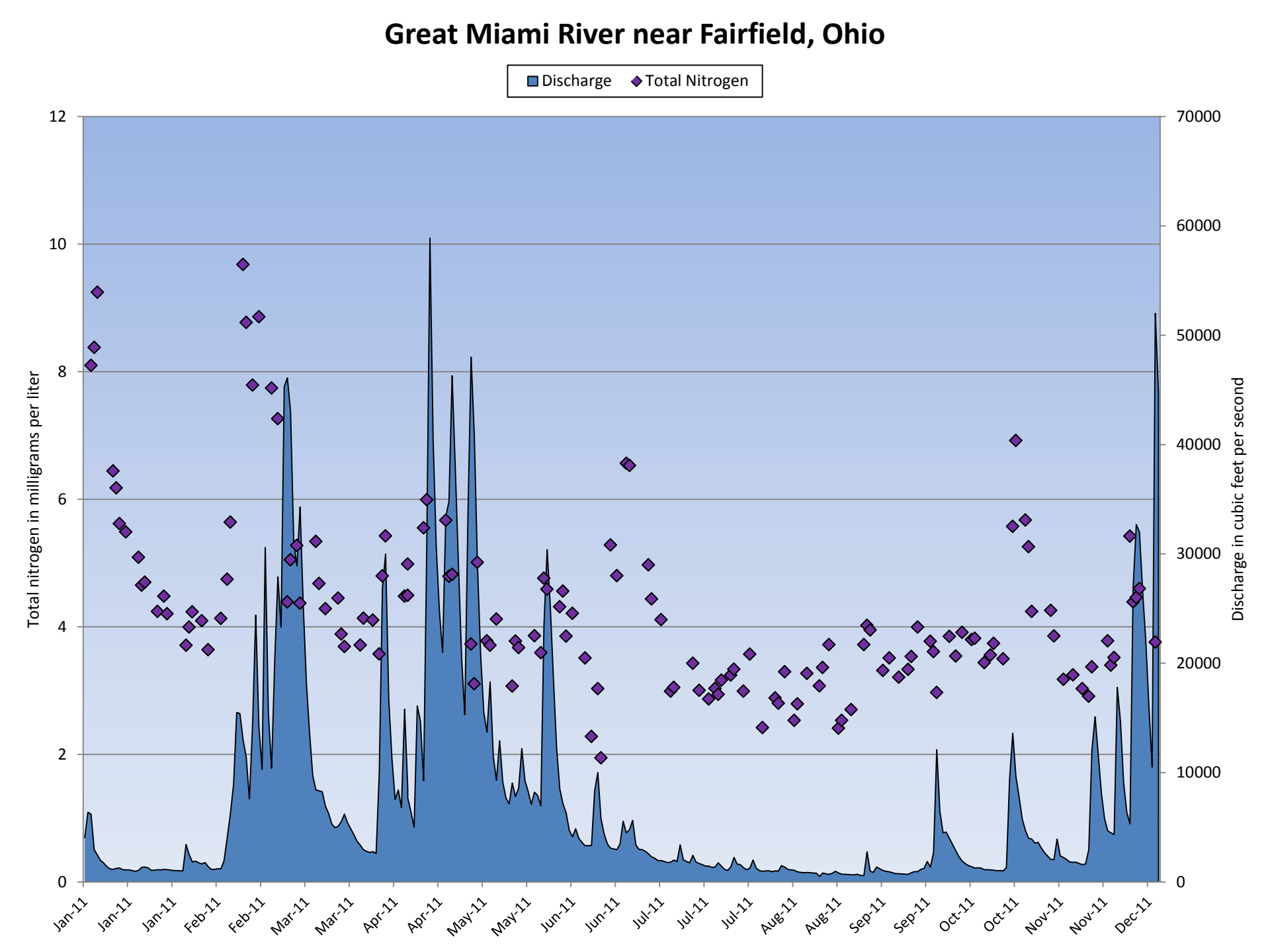
https://cumberlandrivercompact.org/eutrophication-in-streams/

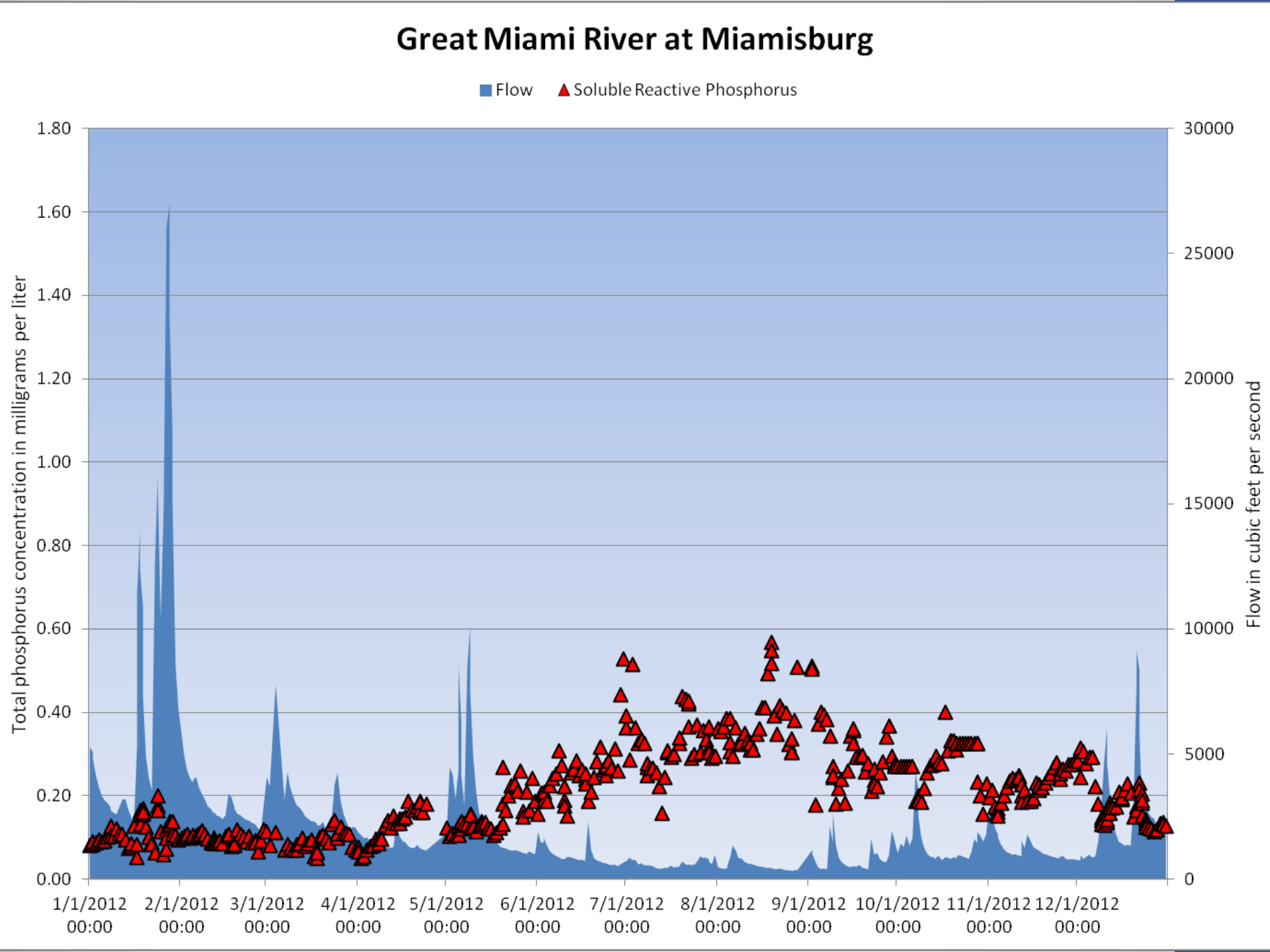

Great Miami River at Miamisburg
Temperature (C)
DO (mg/L)
pH (s.u.)
Chlorophyll (mg/L)
Temperature, dissolved oxygen, and pH
Chlorophyll
35
30
25
20
15
10
5
0
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
6/1/2015
7/1/2015
7/31/2015
8/30/2015
9/29/2015
10/29/2015

Sources

Nonpoint Sources

Point Sources


Great Miami River near Fairfield, Ohio
Discharge
Total Nitrogen
Total nitrogen in milligrams per liter
Discharge in cubic feet per second
0
2
4
6
8
10
12
0
10000
20000
30000
40000
50000
60000
70000
Jan-11
Jan-11
Jan-11
Feb-11
Feb-11
Mar-11
Mar-11
Apr-11
Apr-11
May-11
May-11
Jun-11
Jun-11
Jul-11
Jul-11
Jul-11
Aug-11
Aug-11
Sep-11
Sep-11
Oct-11
Oct-11
Nov-11
Nov-11
Dec-11


Great Miami River at Miamisburg
Flow
Soluble Reactive Phosphorus
Total phosphorus concentration in milligrams per liter
Flow in cubic feet per second
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
30000
25000
20000
15000
10000
5000
0
1/1/2012 00:00
2/1/2012 00:00
3/1/2012 00:00
4/1/2012 00:00
5/1/2012 00:00
6/1/2012 00:00
7/1/2012 00:00
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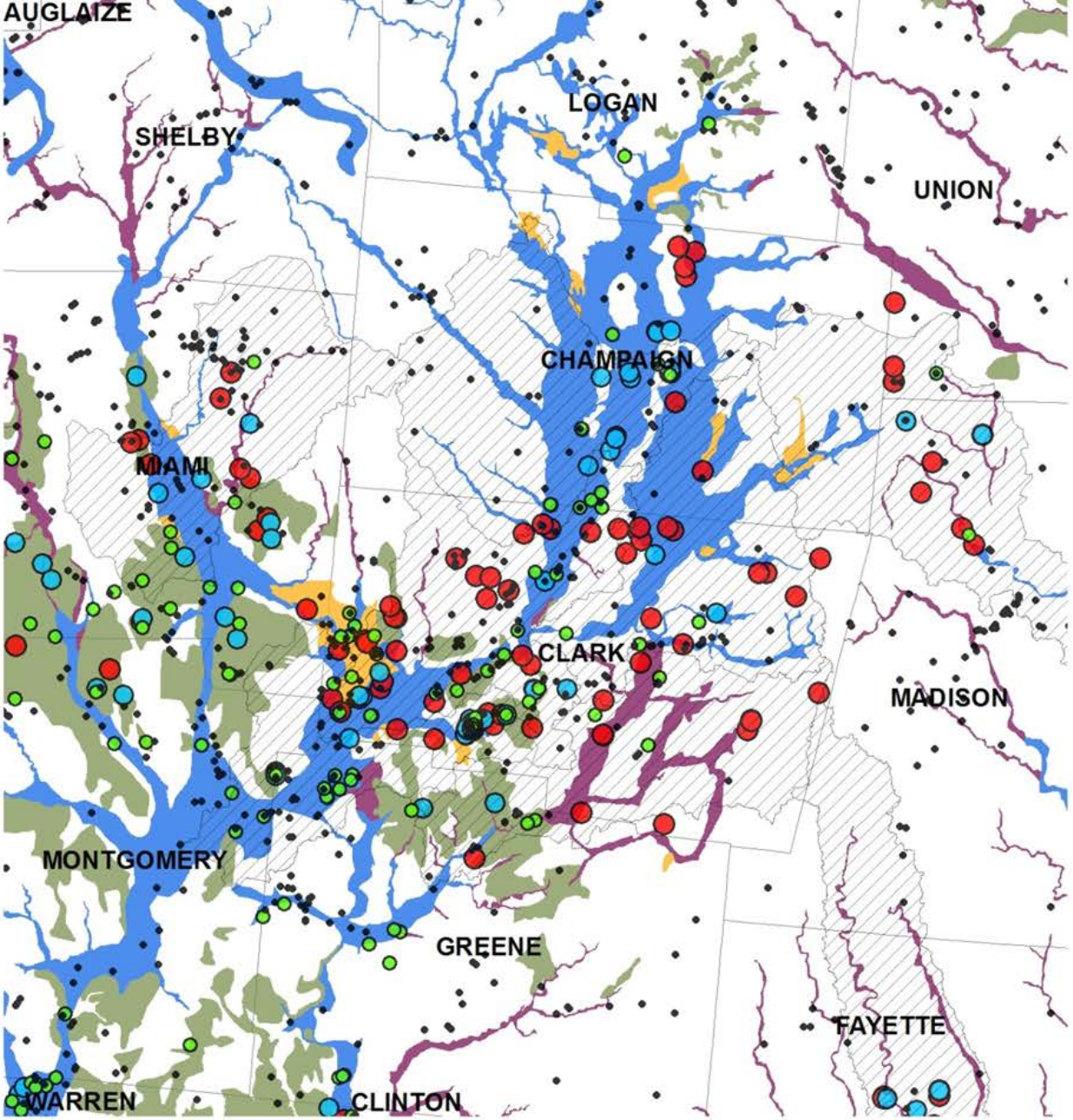
10/1/2012 00:00
11/1/2012 00:00
12/1/2012 00:00



SDWIS, Ambient, ODH, MCD, USGS Nitrate

Glacial Aquifer Settings

- Alluvial
- Buried Valley
- Valley Fill
- Outwash/Kame
- Thin Upland

HUC10s w/ highest mean NO3

- > 180

Nitrate as N, mg/L

- < 2
- 2 - 5
- 5 - 10
- > 10

0 5 10 20 Miles

N

Ohio Environmental Protection Agency

Division of Drinking and Ground Water

Challenges

- No silver bullet solution – Reductions in both point and nonpoint sources are probably necessary.
- Nutrient enrichment integrated with other causes of impairment.
- There may be some technology hurdles to overcome.
- Climate change may make the problem worse.
- Solutions aren't cheap!