



# DATA FORUM

2011 Season

**Great Miami River Watershed  
Citizens' Water Quality  
Monitoring Program**

**Citizens' Water Quality Monitoring Program  
is Run by Rivers Unlimited and FOGM and supported financially or with facilities**





18.05.2007

# Registering samples



# Turbidity

# Total Phosphorus



# Nitrate



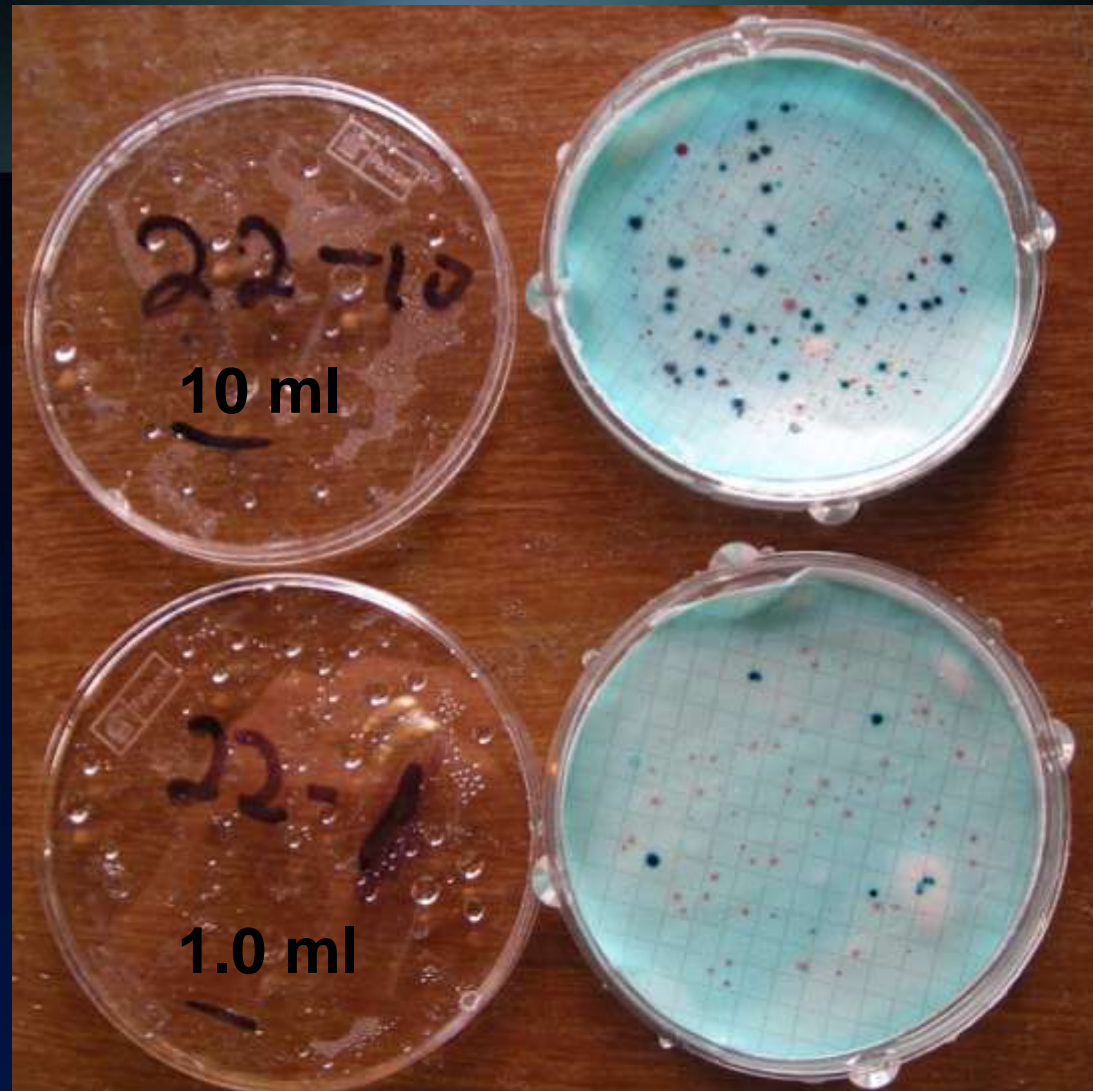
# Fecal Coliforms



# Conductivity meter



For 2011 we switched to a HACH priority medium that identifies E.coli (blue) and coliforms (red).



# From Idea to Program

## Collaboration Makes the Program Work



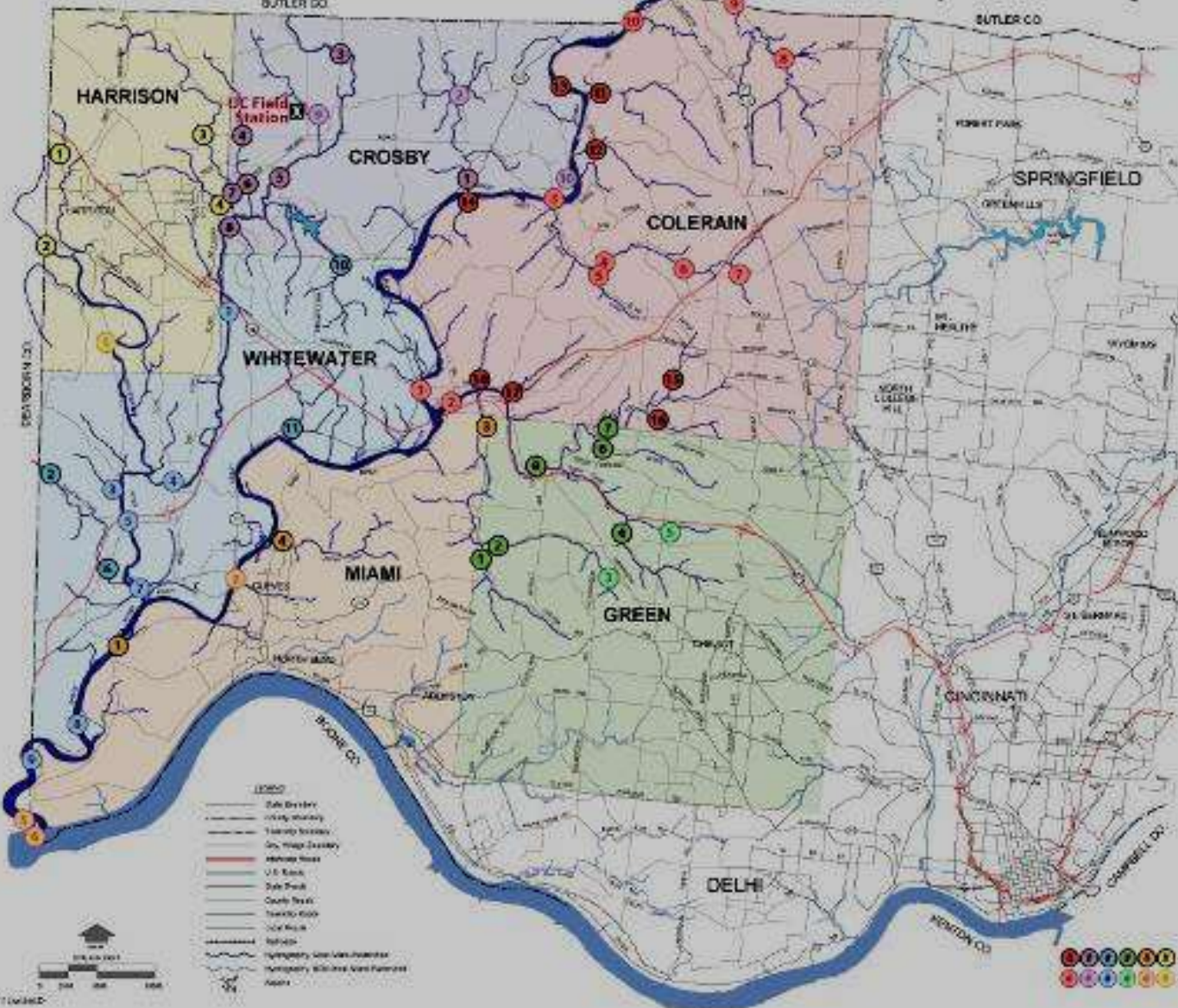
**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

<i><b>Waterway Sampled</b></i>	<i><b>Number of Sample Sites (73 Total)</b></i>	<i><b>Waterway Sampled</b></i>	<i><b>Number of Sample Sites (73 Total)</b></i>
<b>Banklick Creek</b>	<b>2</b>	<b>Lee Creek tributaries</b>	<b>2</b>
<b>Banklick Creek tributary</b>	<b>1</b>	<b>Mullen Creek</b>	<b>1</b>
<b>Blue Rock Creek</b>	<b>1</b>	<b>North Branch Blue Rock Creek</b>	<b>3</b>
<b>Brierly Creek</b>	<b>1</b>	<b>Ohio River</b>	<b>3</b>
<b>Dry Fork of Whitewater River</b>	<b>5</b>	<b>Owl Creek</b>	<b>1</b>
<b>Dry Fork of Whitewater River tributary</b>	<b>1</b>	<b>Oxbow Ponds</b>	<b>5</b>
<b>Eagle Creek</b>	<b>1</b>	<b>Paddys Run</b>	<b>3</b>
<b>Forfeit Creek</b>	<b>1</b>	<b>Sand Run</b>	<b>2</b>
<b>Fox Run</b>	<b>1</b>	<b>Sheed Creek</b>	<b>3</b>
<b>Great Miami River</b>	<b>12</b>	<b>Sheed Creek tributary</b>	<b>1</b>
<b>Great Miami River tributaries</b>	<b>2</b>	<b>Strimple Creek</b>	<b>1</b>
<b>Howard Creek</b>	<b>1</b>	<b>Taylor Creek</b>	<b>3</b>
<b>Indian Creek</b>	<b>1</b>	<b>Taylor Creek tributaries</b>	<b>2</b>
<b>Jameson Creek</b>	<b>1</b>	<b>Two-Mile Creek</b>	<b>1</b>
<b>Jordan Creek</b>	<b>1</b>	<b>Wesselman Creek</b>	<b>3</b>
<b>Kolb Creek</b>	<b>1</b>	<b>Whitewater River</b>	<b>4</b>
<b>Lee Creek</b>	<b>1</b>	<b>Whitewater River tributary</b>	<b>1</b>

# Mapping Out Our Work

## GREAT MIAMI RIVER WATERSHED HAMILTON COUNTY

<http://riversunlimited.org>



### PREFERRED SAMPLING SITES

- COLERAIN TOWNSHIP**
  - 1 Green Miami River at Harrison River
  - 2 Taylor Creek at E. Miami River Road Bridge
  - 3 Green Miami River at E. Park Road Bridge
  - 4 St. Charles River Fork at North Road - Blue Rock Road Intersection
  - 5 Mill Creek at Mill Creek
  - 6 St. Charles River Fork at Northern Fork Bridge
  - 7 St. Charles River Fork at Cedar Township Park
  - 8 Bamboo Creek Tributary at Bamboo Road - Bank Road Intersection
  - 9 Middle Creek at Mill Creek
  - 10 Green Miami River at E. Miami River Road Bridge
  - 11 Civi Creek at E. Miami River Road Bridge
  - 12 Green Miami River at Bridge Park
  - 13 Green Miami River at Chaperone Park (Formerly Deane Park)
  - 14 West Creek adjacent to West Road between Honey and Chestnut
  - 15 Middle Road Creek, bridge at end of Middle Road
  - 16 Carlin Run Creek at Carlin Run Road - Harrison Road Bridge
  - 17 Eagle Creek at Eagle Creek Road - Harrison Road Bridge
- CROSBY TOWNSHIP**
  - 1 Proby Run at Rt. 120 Bridge
  - 2 Proby Run at Rt. 120 Bridge
  - 3 Dry Fork Creek at Abner Road Bridge
  - 4 East of Lee Creek at Sargent Road Bridge
  - 5 Dry Fork Creek at Mt. Hope Road Bridge
  - 6 East of Lee Creek at Dry Fork Road Bridge
  - 7 Lee Creek at Dry Fork Road Bridge
  - 8 Dry Fork Creek at West Road Bridge
  - 9 Howard Creek at W. Hill Road
  - 10 Green Miami River at Fort Smith Community
- GREEN TOWNSHIP**
  - 1 Taylor Road Creek at Taylor Road Bridge
  - 2 Emerald Run Creek at junction with Taylor Road
  - 3 Emerald Run Creek at Taylor Road Bridge
  - 4 Taylor Creek upstream of Taylor Hill Road
  - 5 Taylor Creek at Taylor Hill Road
  - 6 Emerald Run Creek at junction with Shedd Creek
  - 7 Shedd Creek upstream of Sibley Creek confluence
  - 8 Taylor Creek at Harrison Road bridge adjacent to Shedd Road
- HARRISON TOWNSHIP**
  - 1 Korb Creek at Harrison Dam and Conjunction
  - 2 Whitewater River at Jackson Road Bridge
  - 3 Lee Creek at Karpig Road Bridge
  - 4 Lee Creek at Karpig Road Bridge
  - 5 Whitewater River at 1777 Jackson Road
- MIAMI TOWNSHIP**
  - 1 Green Miami River at Annenberg Road Bridge
  - 2 Green Miami River at Annenberg Bridge
  - 3 Emerald Run at Bridge Park Road Bridge
  - 4 Jackson Creek at E. Miami River Road Bridge
  - 5 Green Miami River at road fork, intersection of road with Old
  - 6 Civi River at confluence of Green Miami River right fork
- WHITEWATER TOWNSHIP**
  - 1 Dry Fork Creek at Harrison Road Bridge
  - 2 Sibley Run at Sibley Run Road Bridge
  - 3 Fox Run at junction of Fox Road Bridge
  - 4 Dry Fork Creek at E. Miami Road Bridge
  - 5 Whitewater River at Suspension Bridge Road Bridge
  - 6 Sibley Run at Sibley Run Road Bridge
  - 7 Whitewater River at W. Hill
  - 8 Green Miami River at Harrison Road at County Park
  - 9 Green Miami River at Harrison Road at County Park
  - 10 Miami Whitewater Fork at Sibley Run at Sibley Run Road Bridge
  - 11 Whitewater Fork at Sibley Run at Sibley Run Road Bridge

Legend for site availability:  
● available  
● taken



**Hamilton County Soil and Water District now have  
sampling equipment for big river bridge sampling.**



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

# Water Quality Monitoring

## Grab Sample Technique

- Sample as far from the stream bank as possible. Use a sampling wand if you have it.
- If entering the stream, enter downstream of where you plan to sample.
- Sample at a point within the regular monitoring reach where the stream is flowing, well mixed and at least 6 inches deep.
- Choose a spot with the least disturbance.
- Triple rinse the bottle prior to gathering sample.
- Do not set the cap of the bottle down.
- Sample midway between the bottom and water surface.
- Fill the bottle completely.
- Place sample bottle on ice or keep it cool as possible.



# What Data Do We Collect & Why?

- **Nitrates**
  - Sources: Agricultural and urban fertilizers, manure, septic tanks and vehicle exhaust.
  - Effects: Excessive algal growth, eutrophication (low oxygen conditions), Blue Baby syndrome and brown blood disease in fish.
- **Total Phosphorous**
  - Sources: Excess from WWTP, agricultural and urban fertilizers, manure, septic tanks and soil erosion.
  - Effects: Excessive algal growth and eutrophication (low oxygen conditions).
- **pH**
  - Sources: Natural stream bed minerals ( $\text{CaCO}_3$ ,  $\text{MgCO}_3$ ), WWTP discharge and soils ( $\text{NH}_3$  will elevate pH); elevated by algal photosynthesis.
  - Effects: Low pH allows toxic compounds to become more available to aquatic organisms. High pH is associated with warm waters and lower oxygen.
- **Conductivity (dissolved ions)**
  - Sources: Elevated by WWTP discharge, septic systems, agricultural discharge, road salt and warm water.
  - Effects: Toxic to aquatic organisms at elevated levels. Nature of toxicity dependent upon ionic presence.
- **Turbidity (cloudiness of water)**
  - Sources: Elevated by runoff erosion from row crops, pastures, stream bank erosion, construction sites and high algal content.
  - Effects: Inhibits growth of submerged aquatic plants and food supply of aquatic organisms and affects the ability of fish gills to absorb oxygen.
- **E-coli (bacteria)**
  - Sources: Elevated by human and animal feces from WWTPs, septic systems and storm water runoff.
  - Effects: Gastroenteritis, ear infections and Hepatitis A in humans. Low oxygen due to decomposition.

**Citizens' Water Quality Monitoring**

Great Miami River Watershed



# How Do We Measure the Data Parameters?

- **Nitrates**

- Instrumentation: Portable Spectrophotometer
- Method: Cadmium Reduction Method – Hach 8171

- **Total Phosphorous**

- Instrumentation: DR 2800 Portable Spectrophotometer
- Method: Acid Persulfate Digestion – Hach 8190

- **pH**

- Instrumentation: Oakton 650 pH Meter
- Range: 0-14
- Accuracy (0.002), Precision (0.001-0.1)

- **Conductivity (dissolved ions)**

- Instrumentation: Hach sensION5 Conductivity Meter
- Range: 0-19,999 uS/cm
- Accuracy (0.5%), Precision (1 uS)

- **Turbidity (cloudiness of water)**

- Instrumentation: Hach 2100Q Turbidity Meter
- Method: U.S. EPA method 180.1
- Accuracy (2%), Precision (0.01 NTU)

- **E-coli (bacteria)**

- Method: Total Coliform and E-coli screening using Membrane Filtration, Hach 10029, U.S.EPA 1603



# 2011 Accomplishments



- **Funding Acquired**
  - Hamilton County Storm Water District Grant
  - Oxbow Inc. Grant
  - CSX Grant
  - Season Good Foundation Grant
- **Grants Applied For**
  - Ohio EPA OEEF Grant
  - U.S. EPA Urban Waters Grant
- **Sample Sites**
  - 73 sites: range 38 (March) – 64 (September)
  - 499 samples total, 55 average per month
  - 2994 sample analyses performed
  - 34 waterways
- **Volunteer/Service Hours**
  - 255 total, 28 average per month
- **Volunteer Hours and Contribution**
  - Approx. 1,020 hours valued at \$15,300
- **Data Presentations**
  - Ohio EPA
  - Greater Cincinnati MSD
  - Hamilton County Environmental Action Commission
  - Land Lab for Price Hill Middle School students
  - Oxbow Inc.
  - Green Umbrella
  - University of Cincinnati Planning Students



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

# 2011 Results

- A. Analysis of some tributary hot spots**
- B. Summary of tributary outflows to Great Miami R.**
- C. Summary of Great Miami River Mainstem longitudinal data 2011**
- D. Summary of three points on GMR and Whitewater River 2006-2011.**





18.05.2007

# Water Quality Parameters

- **Nitrates—excess from row crops**
- **Total Phosphorous—excess from WWTP, row crops soil erosion.**
- **pH—elevated by algal photosynthesis**
- **Conductivity—elevated by WWTPs & septic systems**
- **Turbidity-elevated by runoff erosion from row crops and construction sites.**
- **Fecal Coliforms—elevated by human and animal feces.**



# Great Miami River Watershed = 4,124 mi<sup>2</sup>

Discharge 2010 = min 461 cfs, avg. = 3441, max = 39100

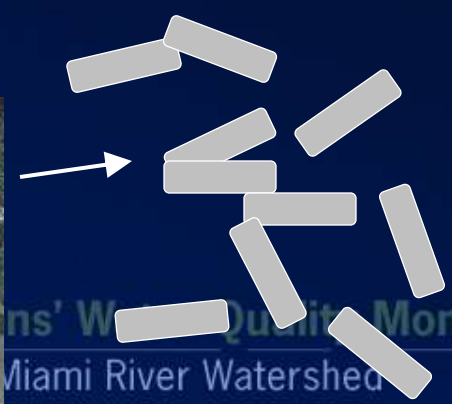
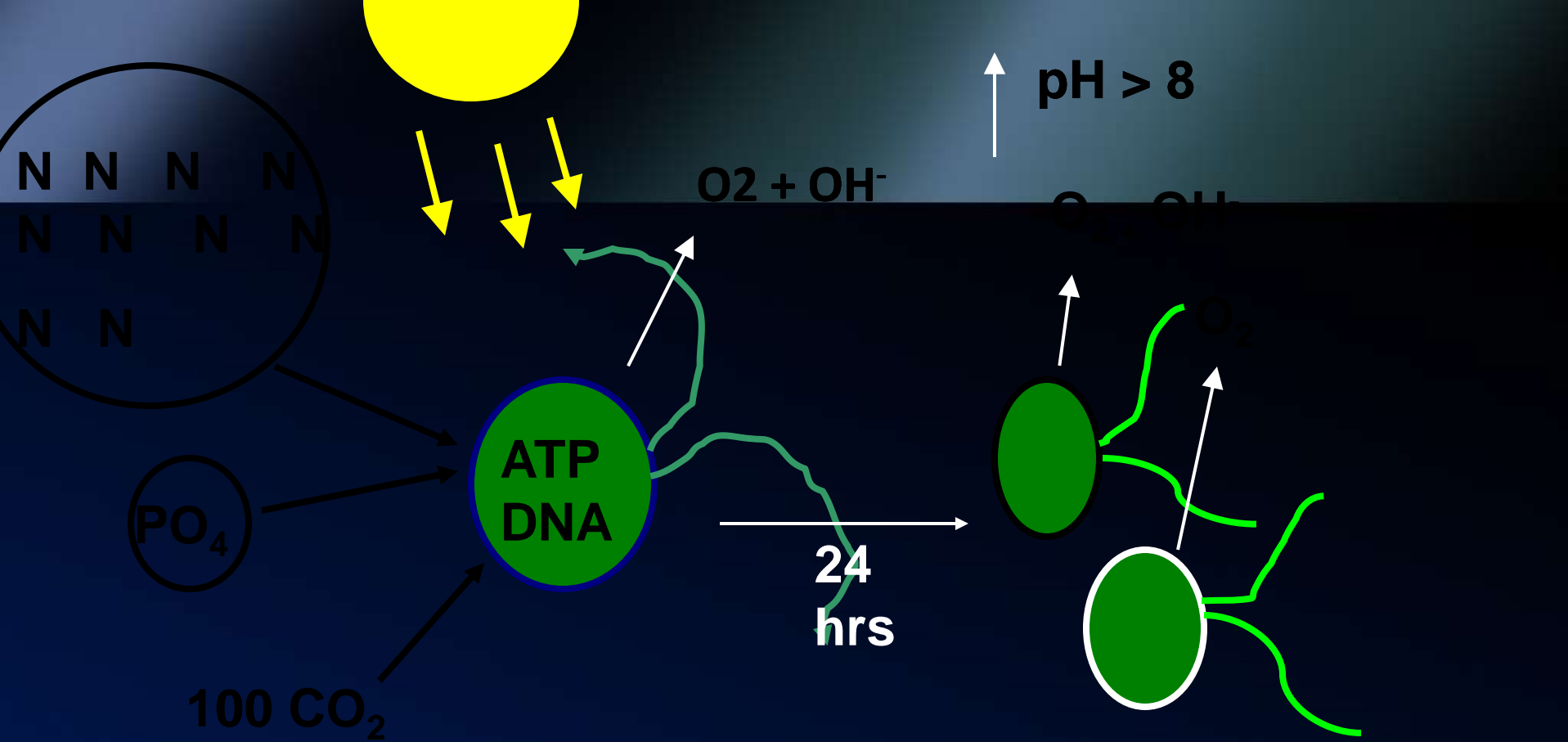
## Subwatersheds:

- Whitewater River-- 1,474 mi<sup>2</sup>
- Mad River -- 657 mi<sup>2</sup>
- Stillwater River -- 676 mi<sup>2</sup>

An estimated 2.8 million people lived in watershed in 1995. Major cities are Cincinnati and Dayton, Ohio. Approximately 79 percent of the total land area is used for agricultural activities, primarily row-crop production of corn, soybeans, and alfalfa. Residential, commercial, and industrial land uses comprise 13 percent of the area whereas the remaining area consists of forests (7 percent) and water bodies or wetlands (1 percent)



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed



*E. Coli* +  
*Cryptosporidium* +  
*Giardia* +  
*E.coli* O157:H7

>210/100ml no swimming  
>2000/100ml no boating

ns' W... Quality Monitoring  
Miami River Watershed

Turbidity clears

Silt + Clay → Clear → Algae → Algae



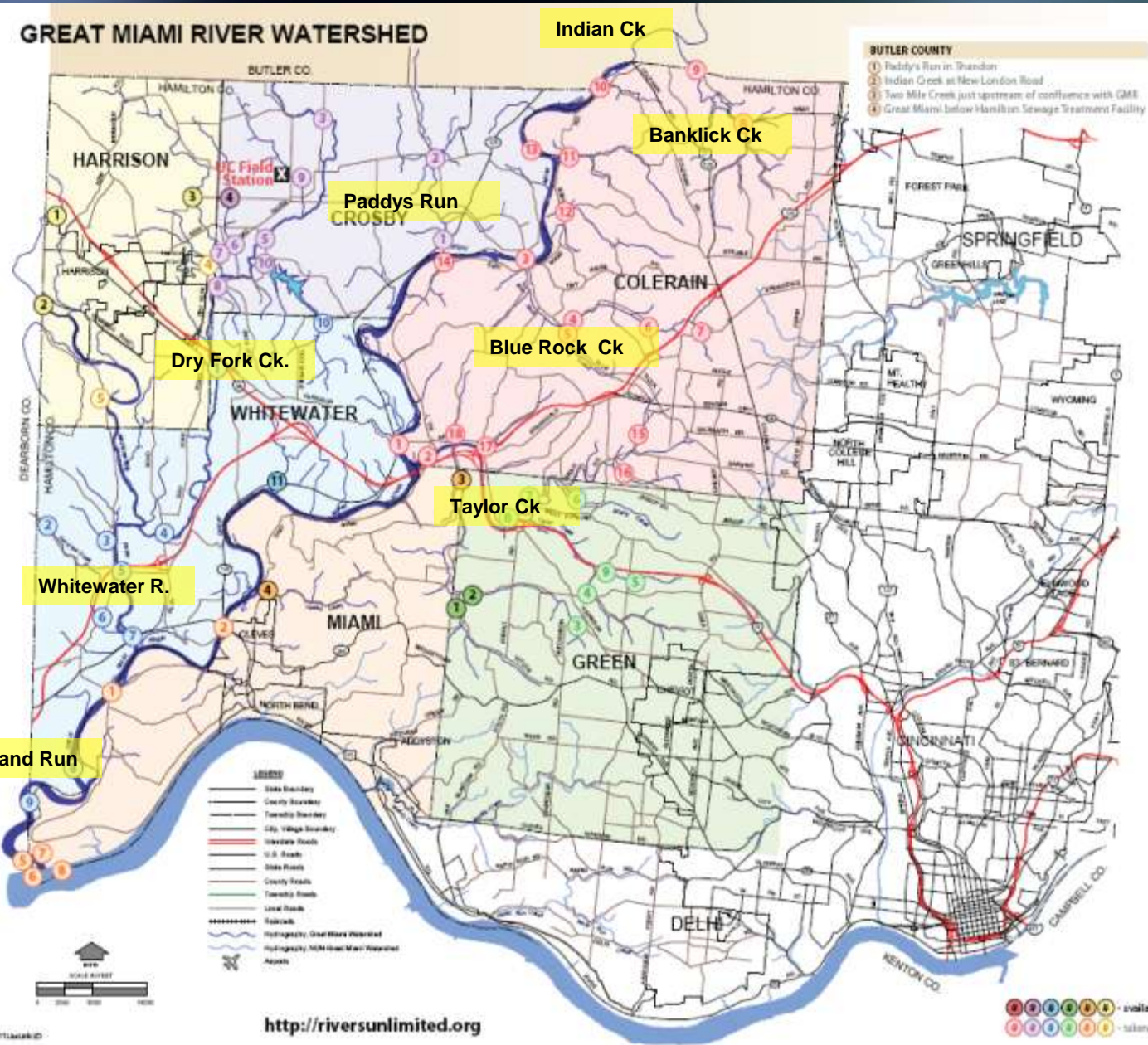
Flood runoff  
 Dencutting  
 Construction  
 Row crop

Discharge declines

Nutrient Enrichment

# Sample locations on mainstem and tribs of GMR

## GREAT MIAMI RIVER WATERSHED



### BUTLER COUNTY

- 1 Paddy's Run in Thandon
- 2 Indian Creek at New London Road
- 3 Two Mile Creek just upstream of confluence with GMR
- 4 Great Miami below Hamilton Sewage Treatment Facility

### PREFERRED SAMPLING SITES

#### COLERAIN TOWNSHIP

- 1 Great Miami River at Harrison Avenue
- 2 Taylor Creek at E. Miami River Road Bridge
- 3 Great Miami River at Blue Rock Road Bridge
- 4 N. Branch Blue Rock Creek at Shells Road / Blue Rock Road Intersection
- 5 Blue Rock Creek at Shells Road
- 6 N. Branch Blue Rock Creek at Newberry Wildlife Refuge
- 7 N. Branch Blue Rock Creek at Colerain Township Park
- 8 Banklick Creek Tributary at Kemper Road / Bank Road Intersection
- 9 Banklick Creek at Richardson Preserve
- 10 Great Miami River just upstream of Old Colerain Avenue Bridge
- 11 Dunlap Run at E. Miami River Road Bridge
- 12 Owl Creek at E. Miami River Road Bridge
- 13 Great Miami River at Heritage Park
- 14 Great Miami River at Oberginger Park (formerly Drevo Park)
- 15 Sheel Creek adjacent to Sheel Road between Hanley and Desiergold
- 16 Hubble Road Creek just before confluence with Sheel Creek
- 17 Forks Creek at Forks Run Road / Harrison Road Bridge
- 18 Eagle Creek at Eagle Creek Road / Harrison Road Bridge

#### CROSBY TOWNSHIP

- 1 Paddy's Run at Rt. 128 Bridge
- 2 Paddy's Run at Willey Road Bridge
- 3 Dry Fork Creek at Ouford Road Bridge
- 4 East of Lee Creek at Baughman Road Bridge
- 5 Dry Fork Creek at Mt. Hope Road Bridge
- 6 East of Lee Creek at Dry Fork Road Bridge
- 7 Lee Creek at Dry Fork Road Bridge
- 8 Dry Fork Creek at West Road Bridge
- 9 Howard Creek at UC Field Station

#### GREEN TOWNSHIP

- 1 Taylor Road Creek at Taylor Road Bridge
- 2 Emerald Run Creek at junction with Taylor Road
- 3 Emerald Run Creek at 4575 Hutchinson Road
- 4 Taylor Creek at intersection of Beerdin and Johnson Roads
- 5 Wesselman Creek at 7107 east of S280 Race Road
- 6 Bitery Creek adjacent to 6222 Bitery Creek Road
- 7 Sheel Creek at 5555 Sheel Road
- 8 Taylor Creek at Harrison Avenue Bridge adjacent to Sheel Road
- 9 Wesselman Creek at 6915 Wesselman Road

#### HARRISON TOWNSHIP

- 1 Kolb Creek at Harrison Gun and Conservation
- 2 Whitewater River at State Street Bridge
- 3 Lee Creek at Baughman Road Bridge
- 4 Lee Creek Tributary at Dry Fork Road Bridge
- 5 Whitewater River at 7777 Lawrenceburg Road

#### MIAMI TOWNSHIP

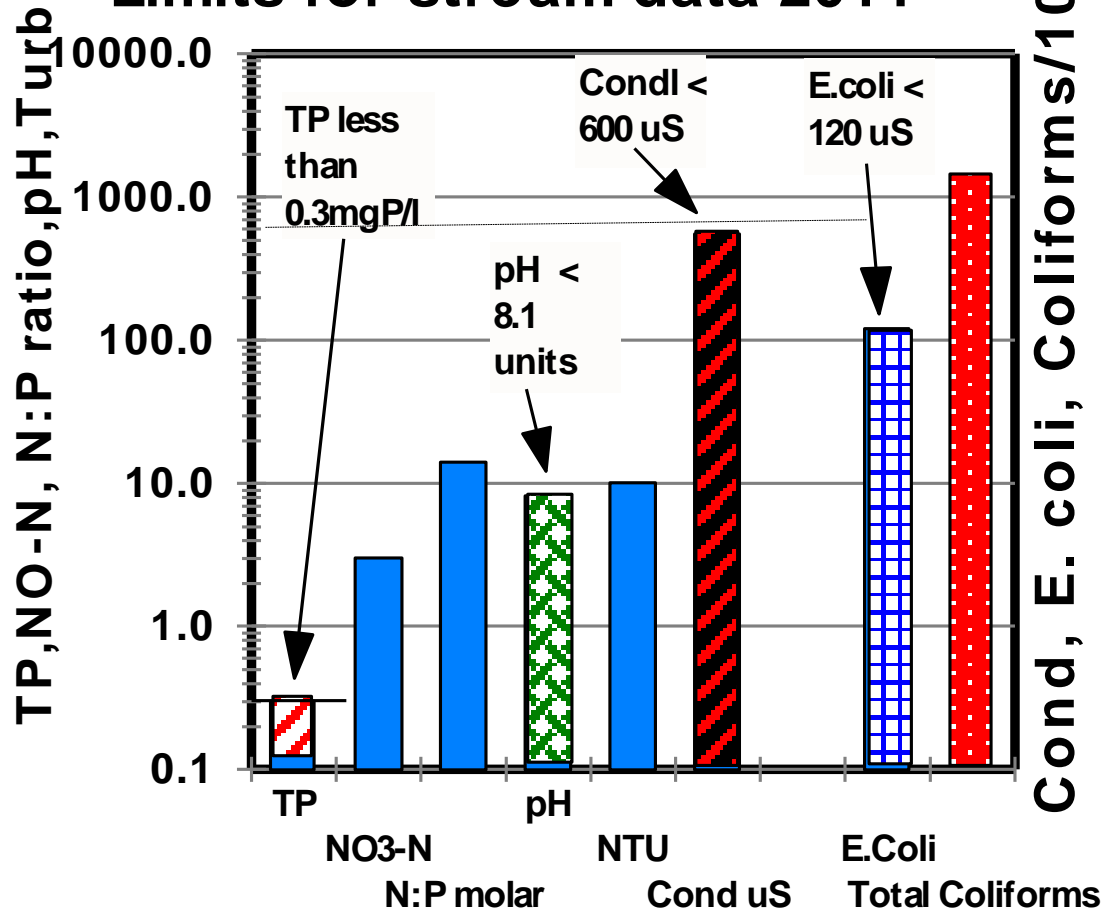
- 1 Great Miami River at Lawrenceburg Road Bridge
- 2 Great Miami River at Rt. 50 Bridge
- 3 Emerald Run at Bridge Point Pass bridge
- 4 Jordan Creek at S. Miami River Road Bridge
- 5 Great Miami at right fork railroad trestle upstream of confluence with Ohio
- 6 Ohio River at confluence with Great Miami River (downstream fork)
- 7 Great Miami at left fork railroad trestle upstream of confluence with Ohio
- 8 Ohio River upstream of confluence with Great Miami

#### WHITewater TOWNSHIP

- 1 Dry Fork Creek at Harrison Avenue Bridge
- 2 Sand Run Creek at Sand Run Road Bridge
- 3 Fox Run at Lawrenceburg Road Bridge
- 4 Dry Fork Creek at Kilby Road Bridge
- 5 Whitewater River at Suspension Bridge Road Bridge
- 6 Sand Run Creek at Lawrenceburg Road Bridge
- 7 Whitewater River at Rt. 50
- 8 Great Miami River at Skawsee Lookout County Park
- 9 Great Miami River at Skawsee Lookout Outflow
- 10 Miami Whitewater Forest Lake tributary at Strimple Road Bridge
- 11 Interstate Exchange Creek at 128 Bridge

● ● ● ● ● ● ● ● ● available  
○ ○ ○ ○ ○ ○ ○ ○ ○ taken

## Limits for stream data 2011



## Expectations for Stream Chemistry.

1. TP < 0.3 mg P/l OEPA to control algal growth.
2. NO<sub>3</sub>-N mg/l < 3.0 mgN/l to control algal growth.
3. N:P ratio = 14 or higher to avoid cyanobacteria.
4. pH < 8.1; if higher driven up by algal growth.
5. Conductivity < 600 uS for dissolution of limestone; higher = effluent.
6. E. coli < 120/100 ml for drinking water.



# Hamilton, Oh above lower low-head dam showing Pershing, High, and Black St. Bridges RM 35-37



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

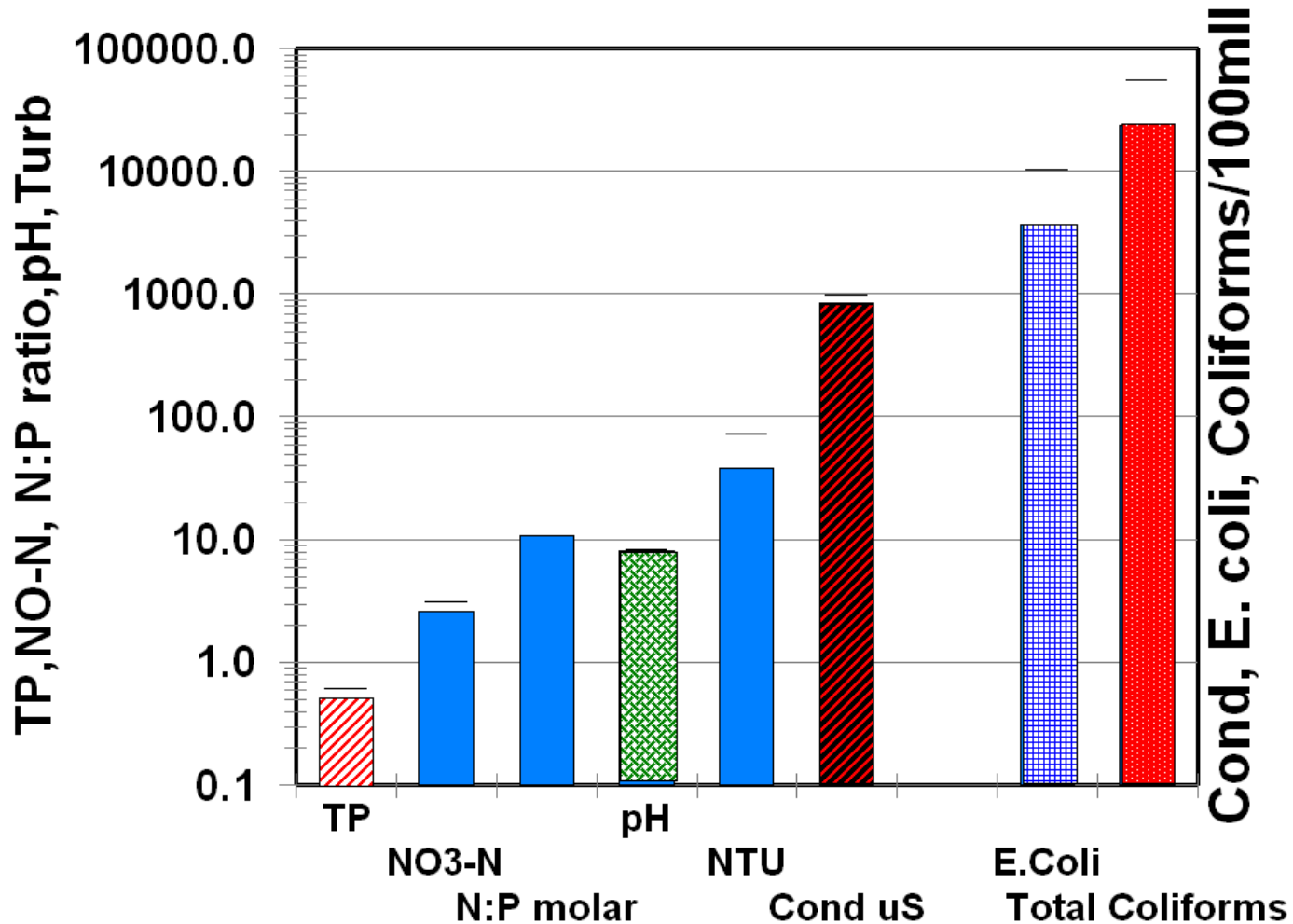


**Fairfield WWTP RM  
31.2**



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

# GMR below Hamilton 2011



Graphs are plotted with data a log10 and horizontal line above bar is 1 standard deviation of variance over the year.

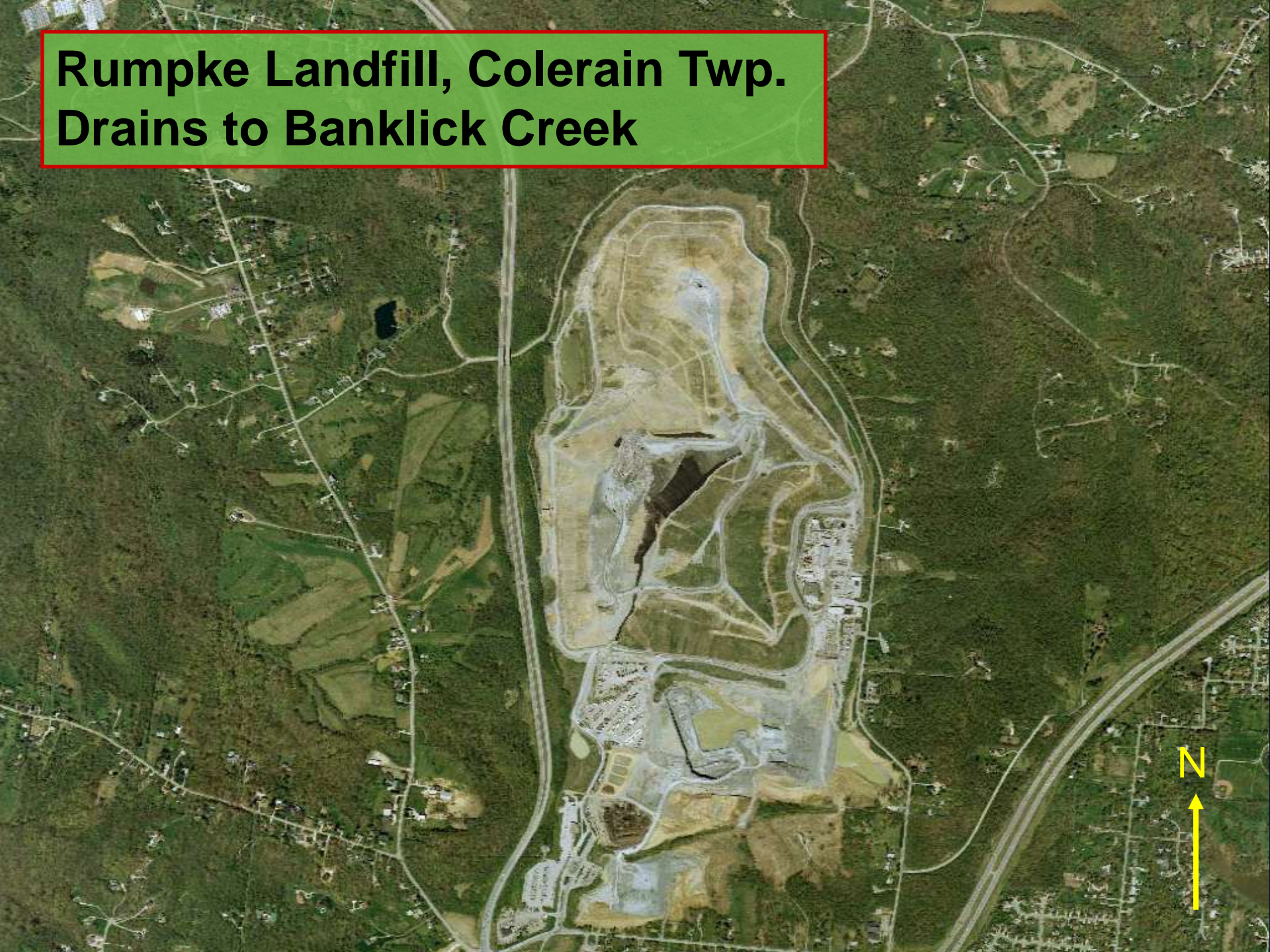


# Mouth of Banklick Creek RM 28.4

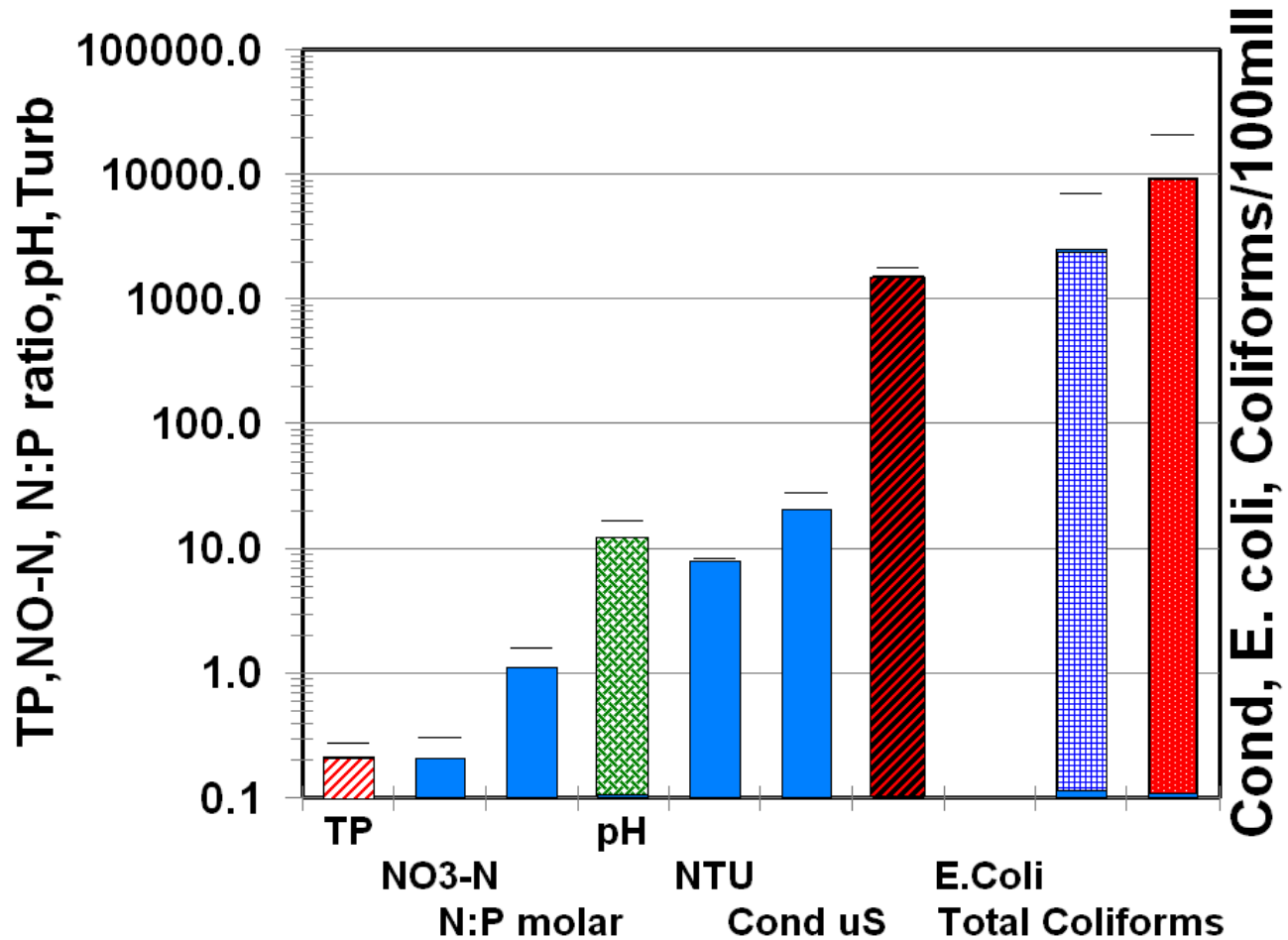


**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

**Rumpke Landfill, Colerain Twp.  
Drains to Banklick Creek**



# Banklick Ck 2011



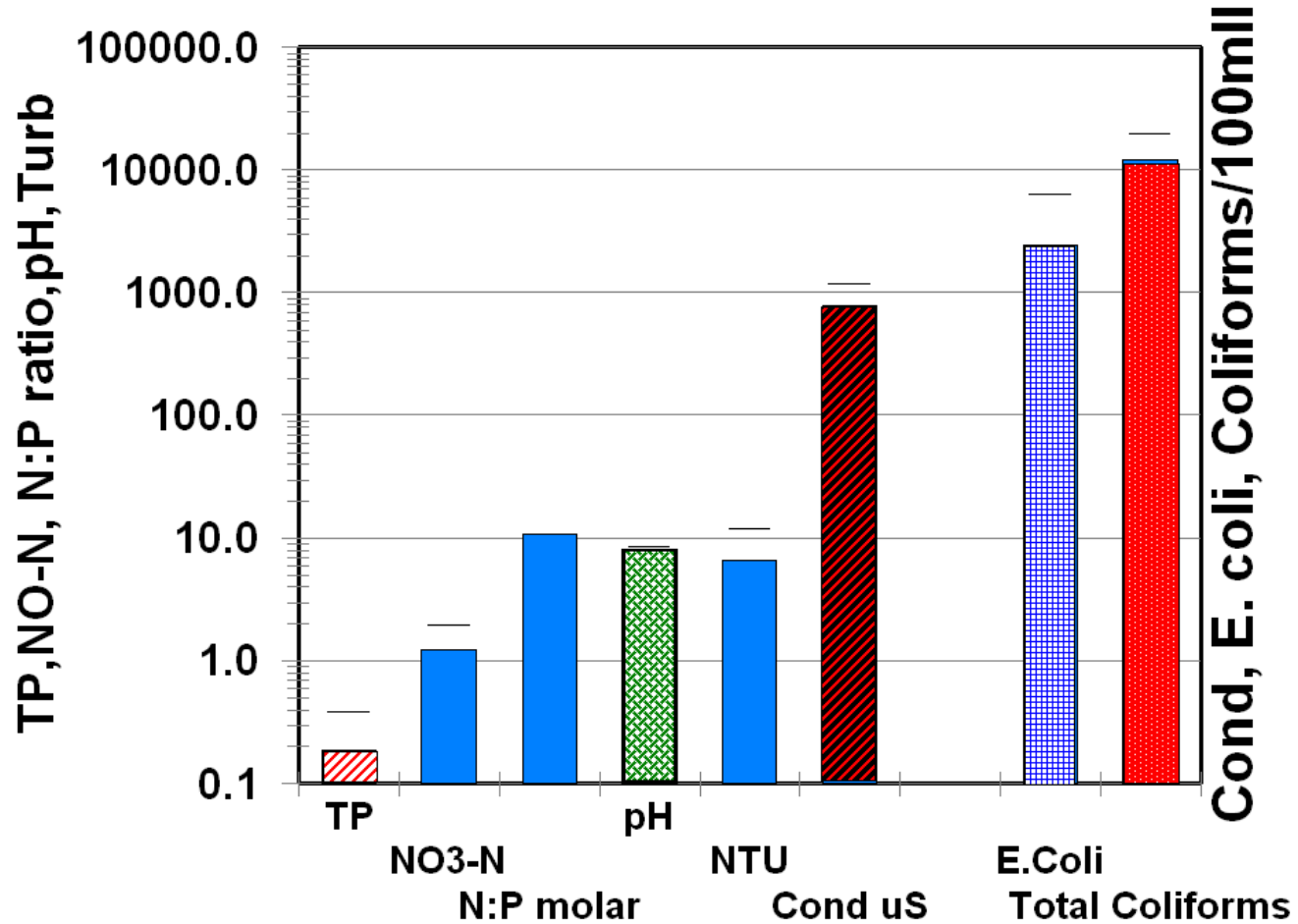
**Mouth of Indian Creek N of US 27**

**RM 27.7**

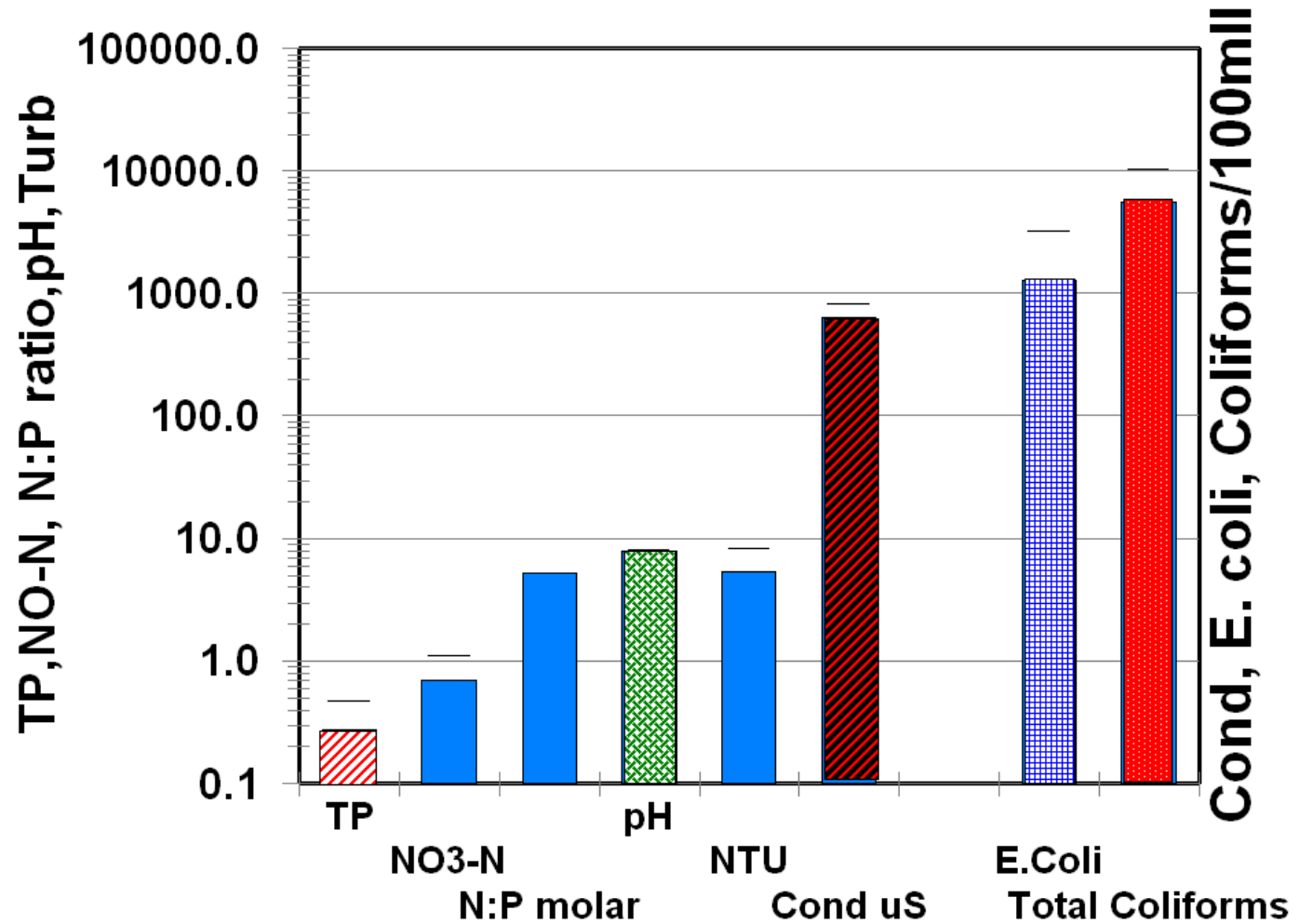


**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

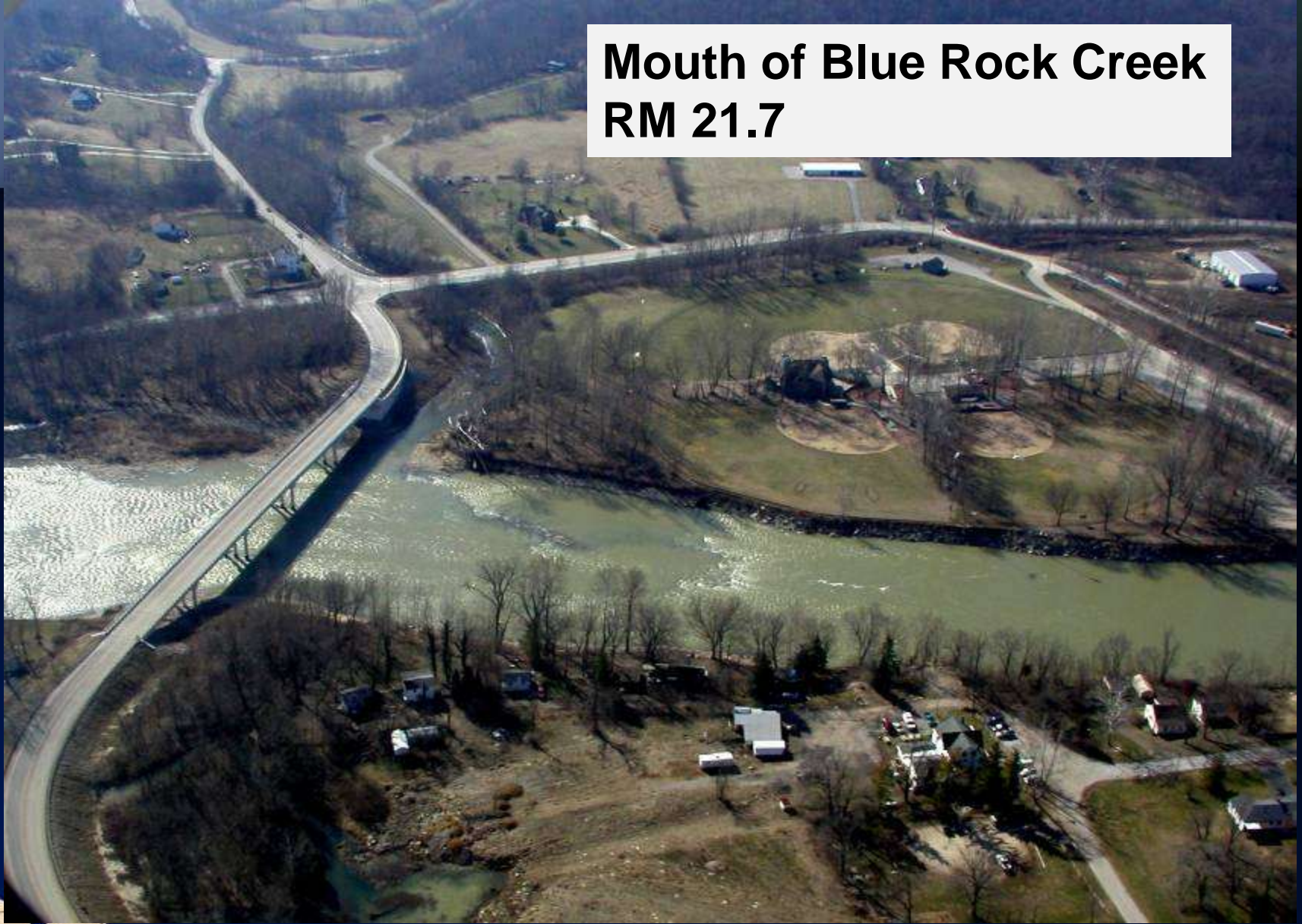
# Indian Ck 2011



# Two Mile Ck 2011

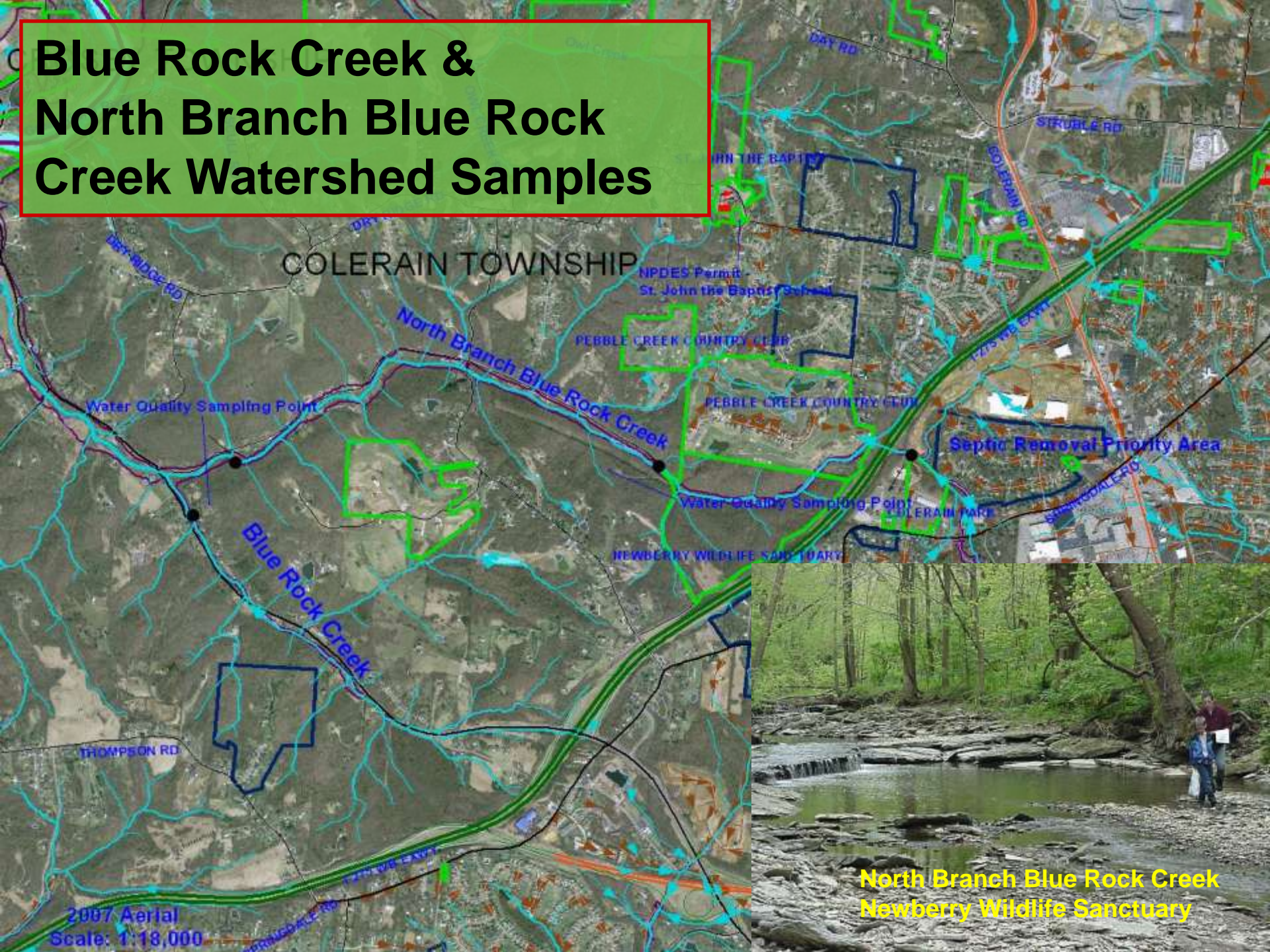


# Mouth of Blue Rock Creek RM 21.7



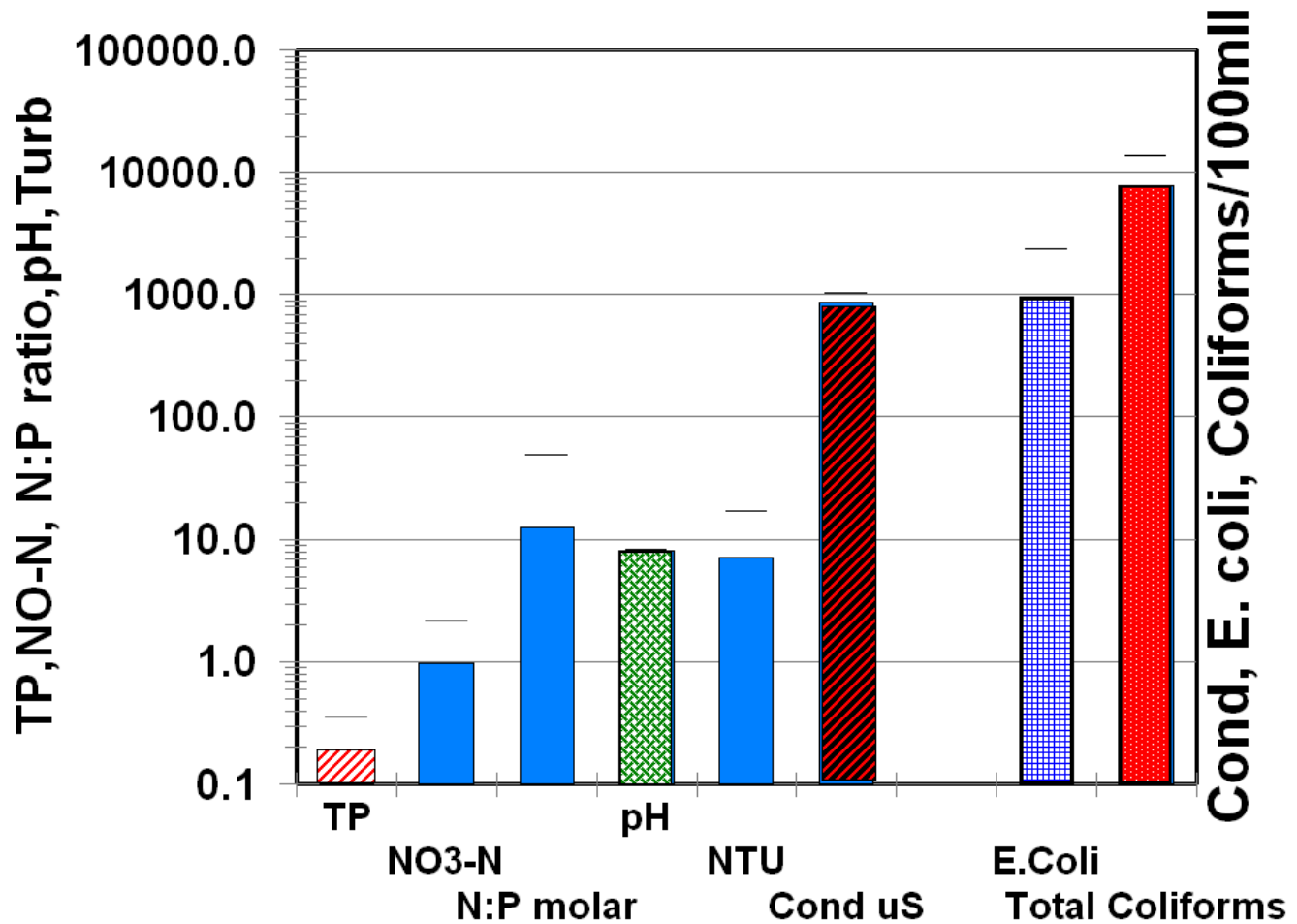
**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

# Blue Rock Creek & North Branch Blue Rock Creek Watershed Samples

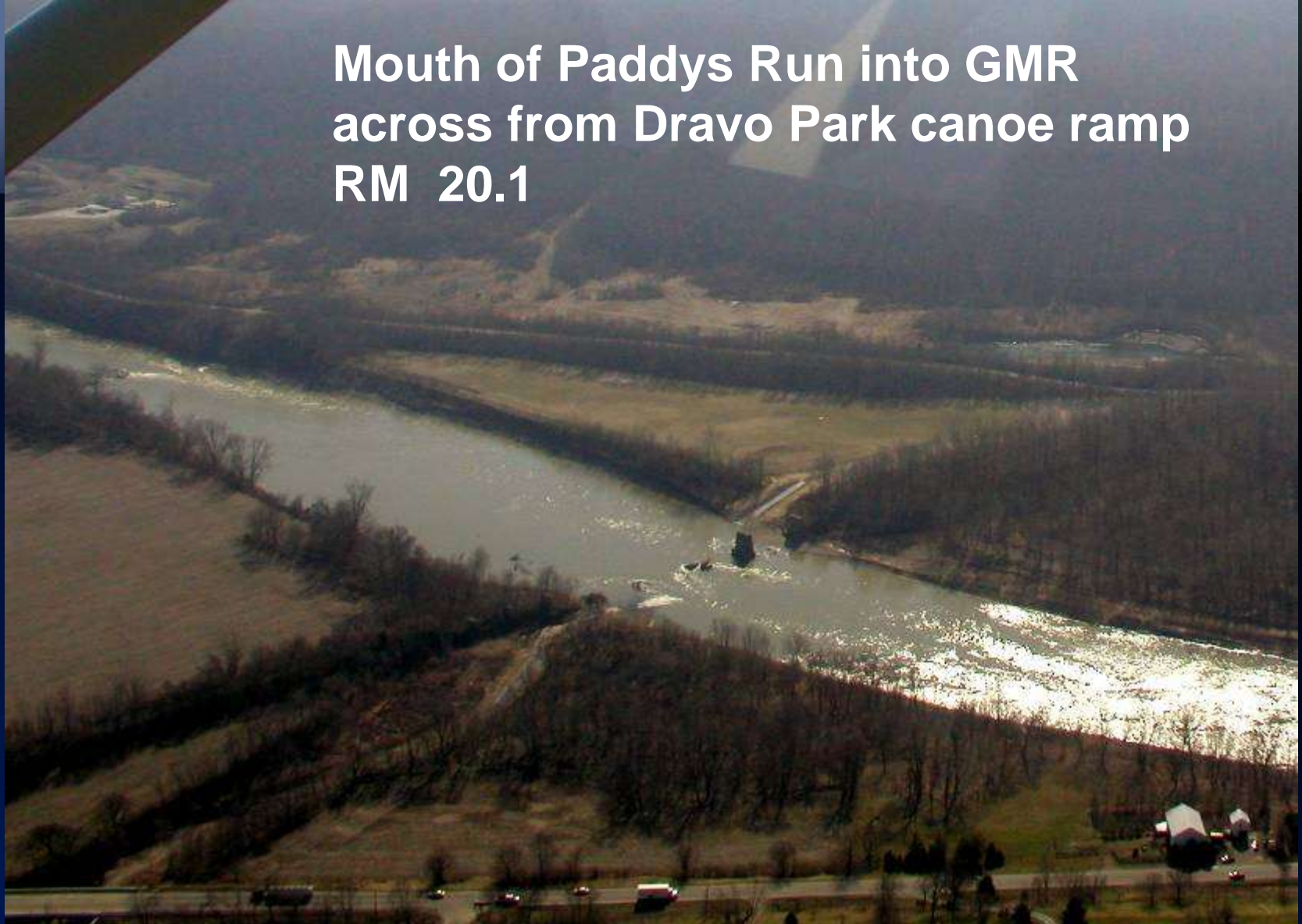


North Branch Blue Rock Creek  
Newberry Wildlife Sanctuary

# Blue Rock Ck 2011



# Mouth of Paddys Run into GMR across from Dravo Park canoe ramp RM 20.1



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

# Paddys Run Watershed

CROSBY TOWNSHIP

Agricultural Conservation Practices  
Grass Waterways Installed

Restored Fernald Preserve

NPDES Permit - USDOE Fernald Plant

Water Quality Sample Point

NPDES Permit - PCS Purified Phosphates

NPDES Permit - Nease Corporation

St. Miami River

NEW HAVEN RD

Water Quality Sample Point

EDGE ROCK RD

Drain Tile Erosion

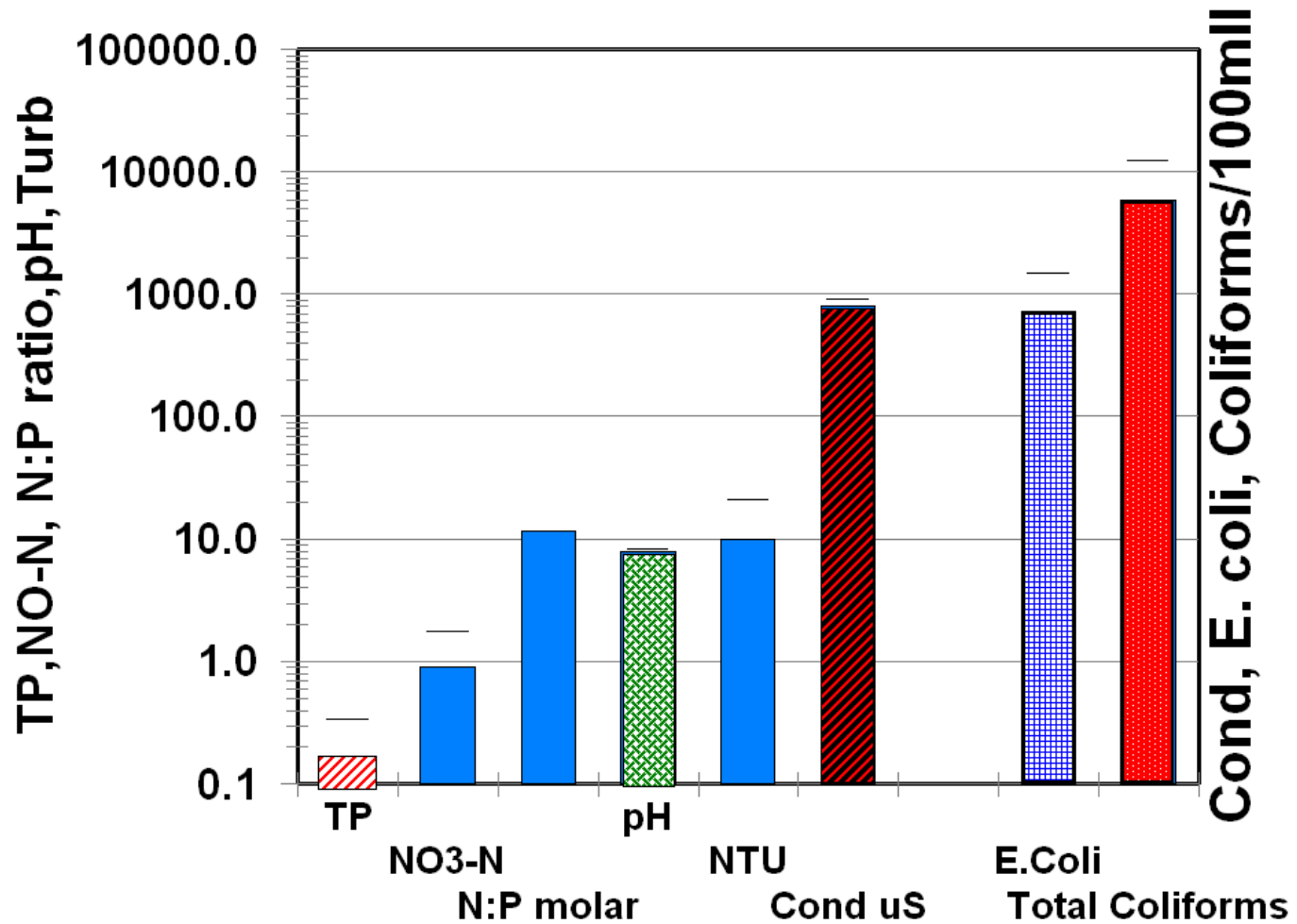
Buffer along waterway

2007 Aerial  
Scale 1:24,000

COLERAIN TOWNSHIP



# Paddys Run 2011

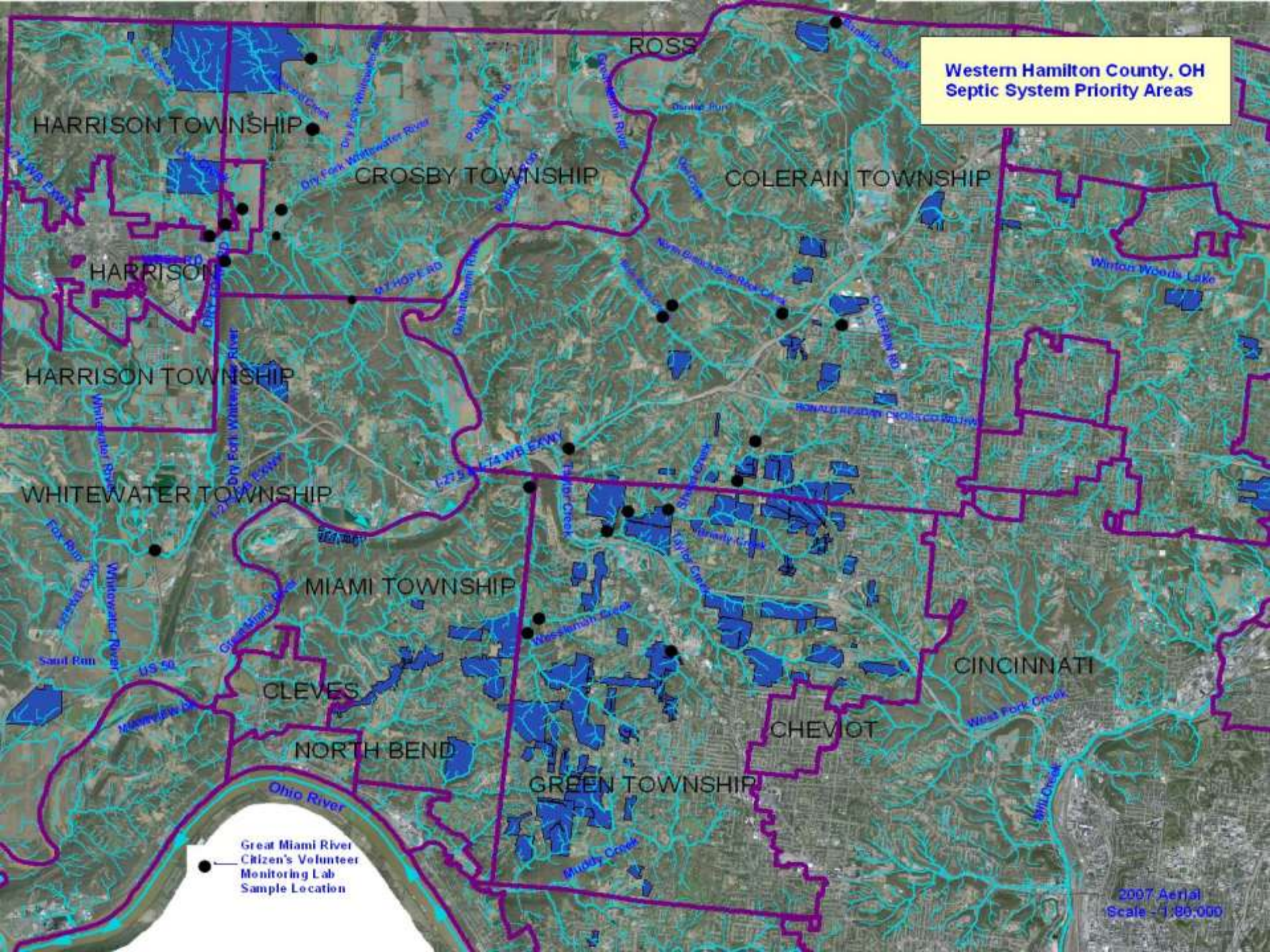


# Taylor Creek Mouth above I74 Bridge RM 14.7



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

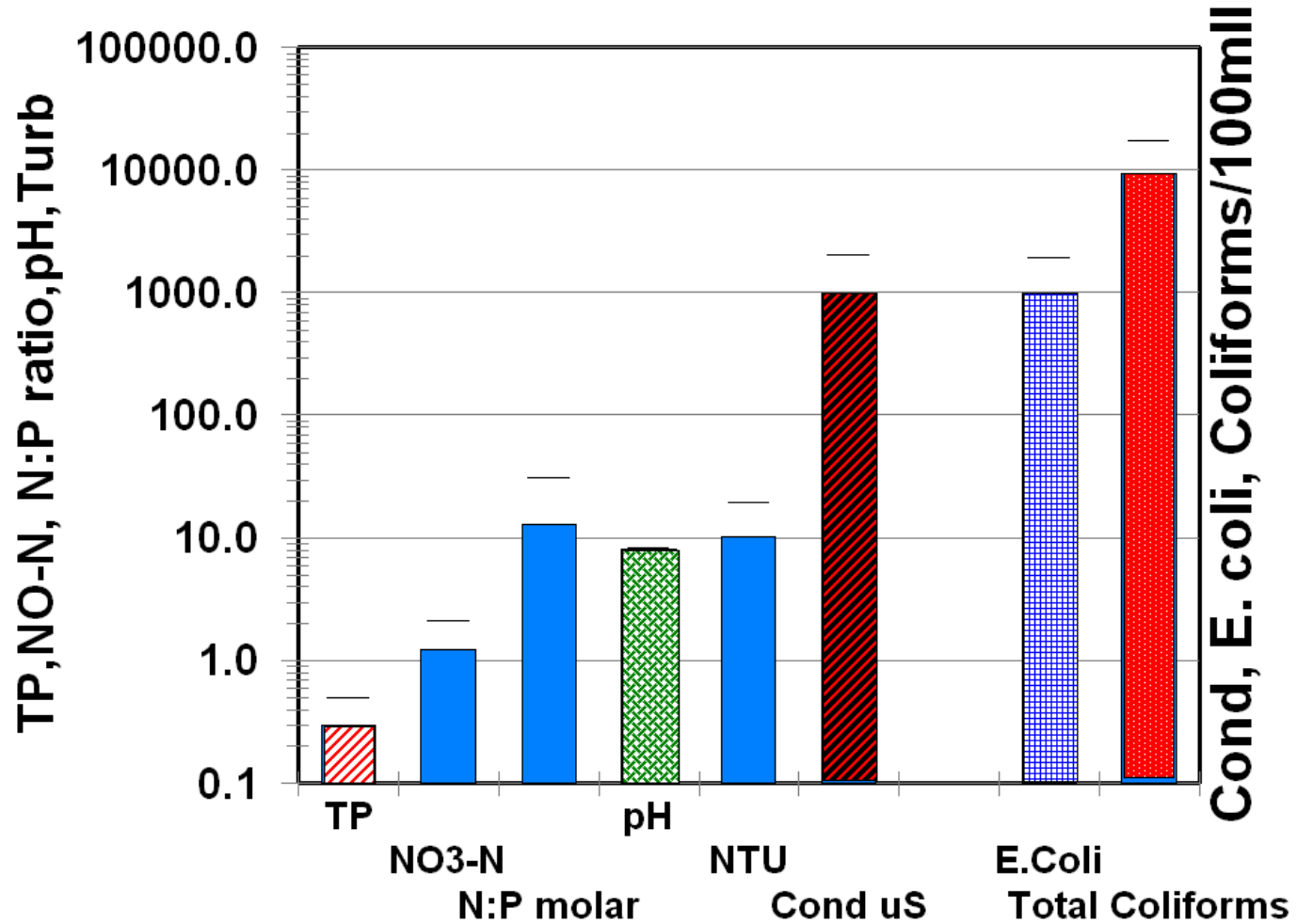
**Western Hamilton County, OH  
Septic System Priority Areas**



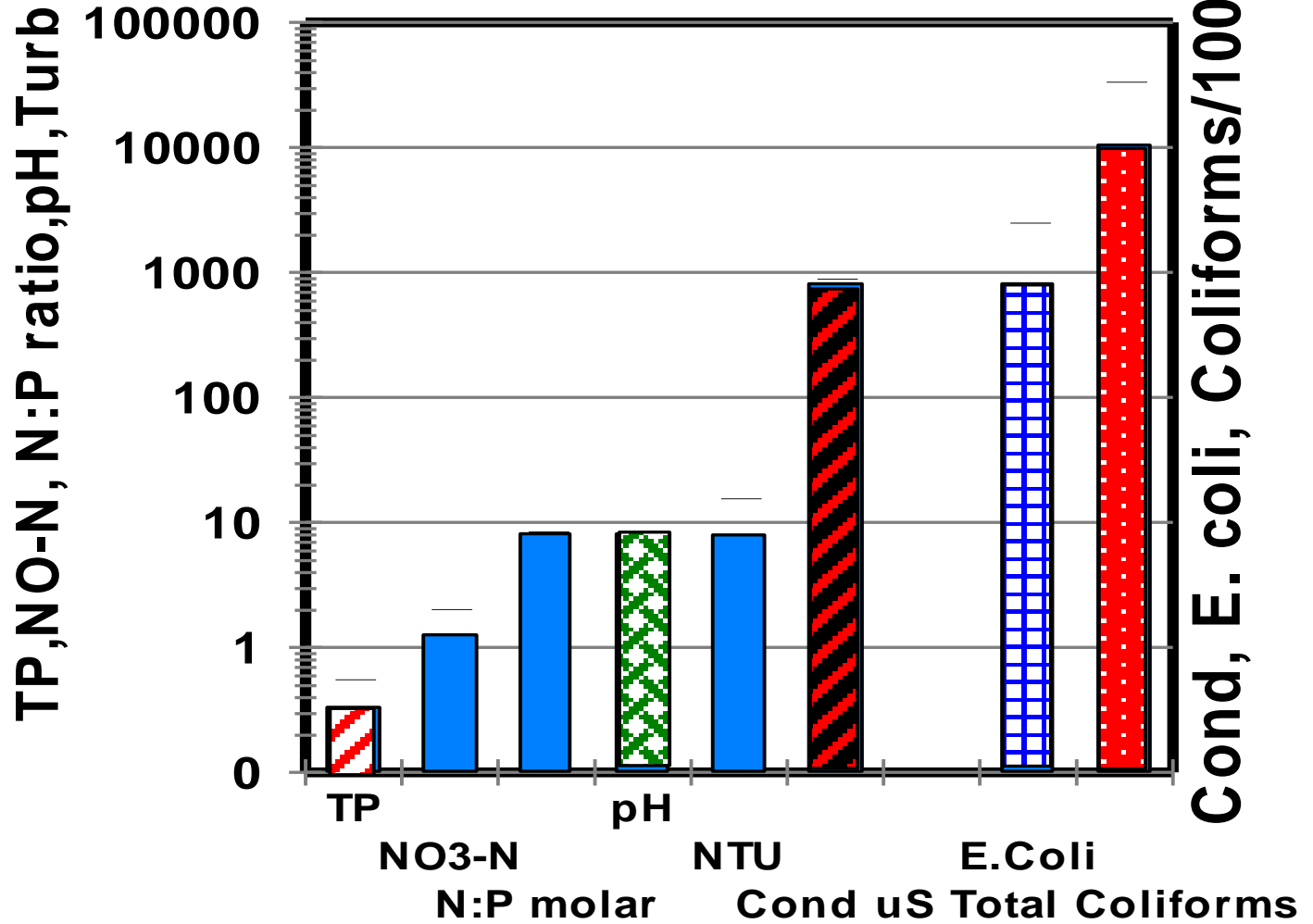
● Great Miami River  
Citizen's Volunteer  
Monitoring Lab  
Sample Location

2007 Aerial  
Scale - 1:80,000

# Taylor Creek 2011



# Wesselman Creek 2011



**Mouth of  
Whitewater  
River into GMR  
RM 6.1**



**Citizens' Water Quality Monitoring**  
Great Miami River Watershed

# Whitewater River

Sampling Downstream

Of 3 NPDES dischargers



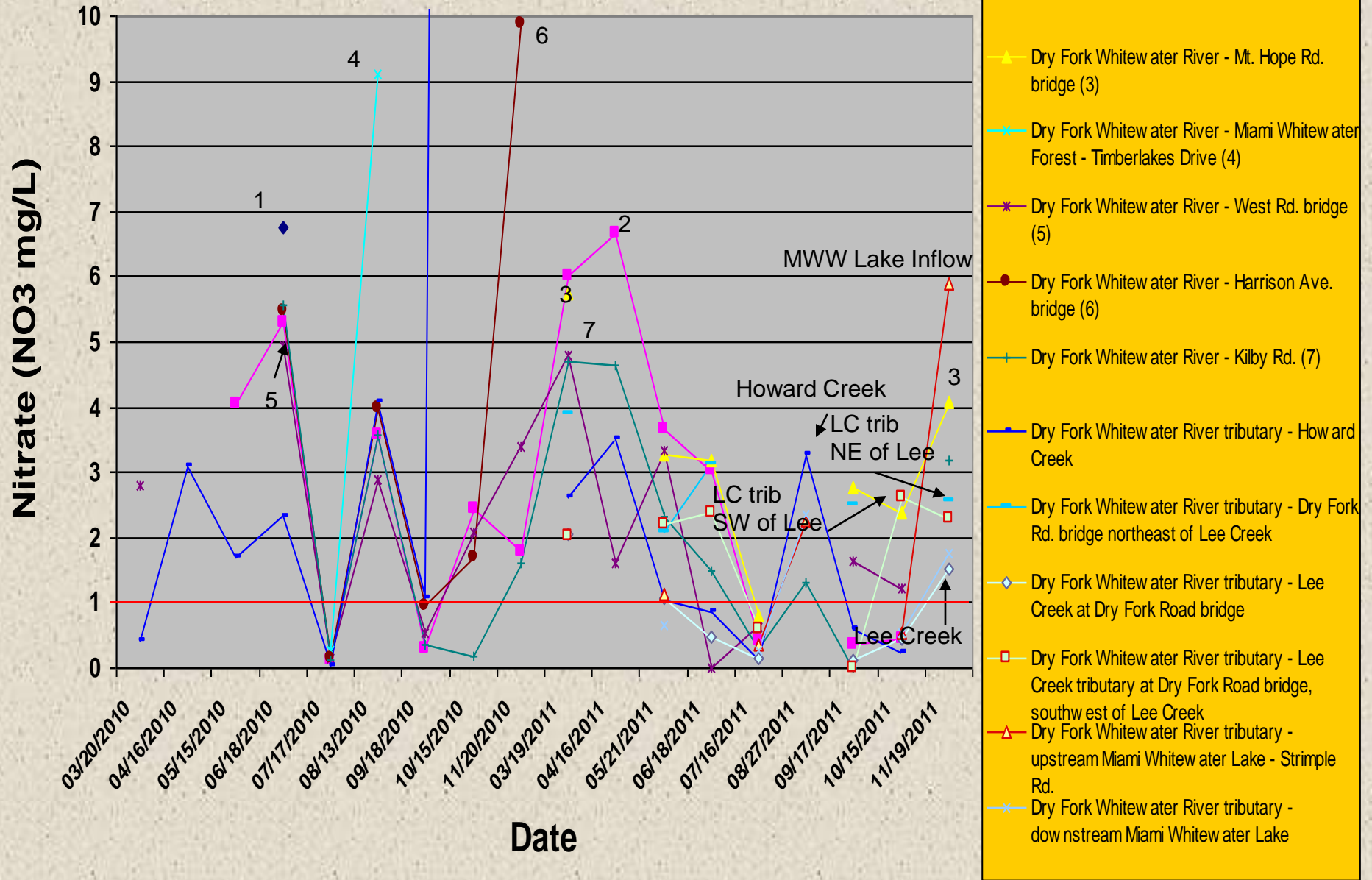
- JTM
- Harrison WWTP
- Whitewater Processing



Citizens' Water Quality Monitoring  
Great Miami River Watershed

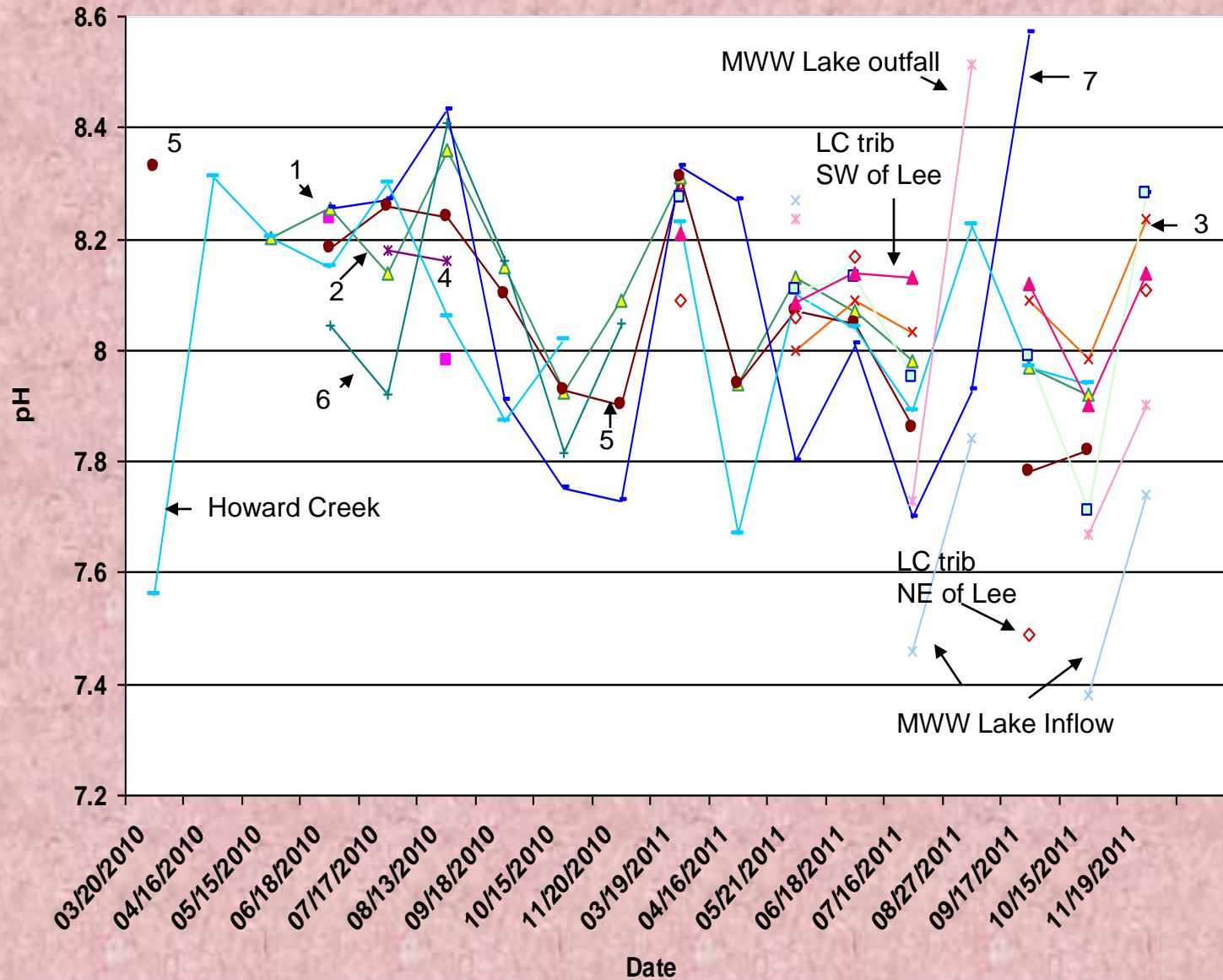


# Dry Fork Whitewater River Watershed Samples - Nitrate



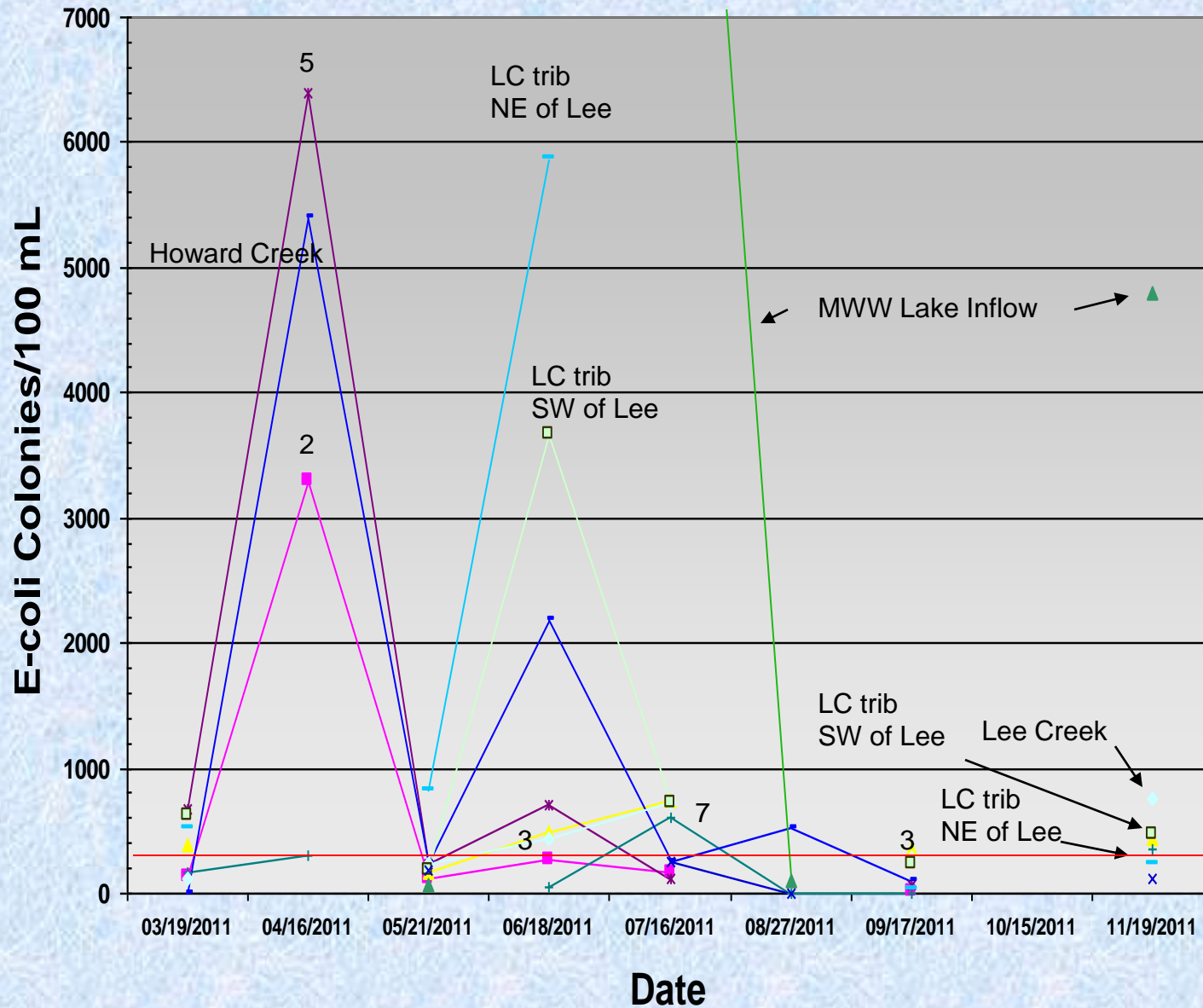


# Dry Fork Whitewater River Sample Sites - pH



- Dry Fork Whitewater River - Hamilton-New London Rd. to Race Line Rd. (1)
- ▲ Dry Fork Whitewater River - Oxford Rd. (2)
- × Dry Fork Whitewater River - Mt. Hope Rd. bridge (3)
- ✱ Dry Fork Whitewater River - Miami Whitewater Forest - Timberlakes Drive (4)
- Dry Fork Whitewater River - West Rd. bridge (5)
- + Dry Fork Whitewater River - Harrison Ave. bridge (6)
- Dry Fork Whitewater River - Kilby Rd. (7)
- Dry Fork Whitewater River tributary - Howard Creek
- ◆ Dry Fork Whitewater River tributary - Dry Fork Rd. bridge northeast of Lee Creek
- Dry Fork Whitewater River tributary - Lee Creek at Dry Fork Road bridge
- ✱ Dry Fork Whitewater River tributary - upstream Miami Whitewater Lake - Strimple Rd.
- ✱ Dry Fork Whitewater River tributary - downstream Miami Whitewater Lake

# Dry Fork Whitewater River Watershed Samples - E-coli



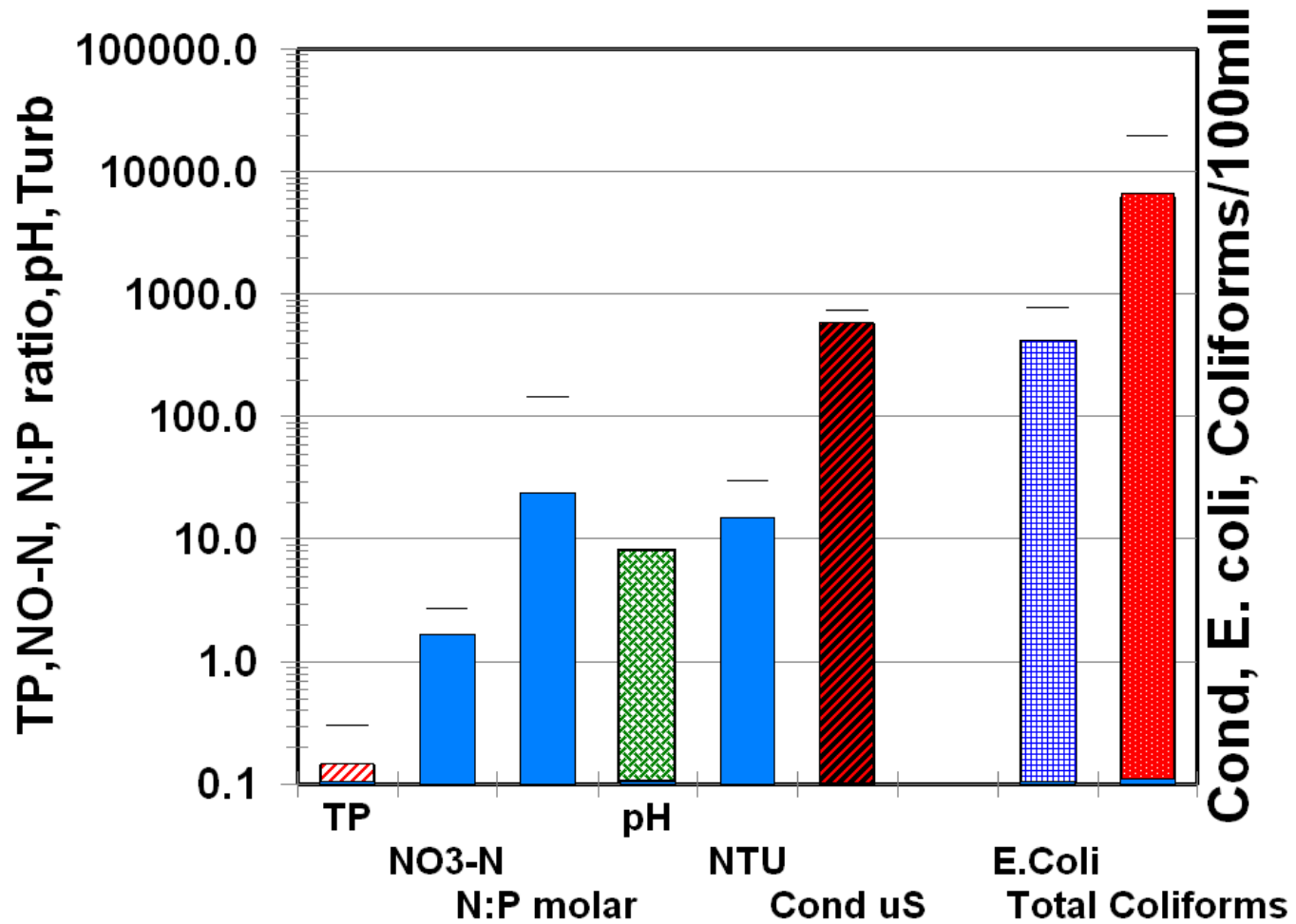
- ◆ Dry Fork Whitewater River - Hamilton - New London Rd. to Race Line Rd. (1)
- Dry Fork Whitewater River - Oxford Rd. (2)
- ▲ Dry Fork Whitewater River - Mt. Hope Rd. bridge (3)
- ✕ Dry Fork Whitewater River - Miami Whitewater Forest - Timberlakes Drive (4)
- ✱ Dry Fork Whitewater River - West Rd. bridge (5)
- Dry Fork Whitewater River - Harrison Ave. bridge (6)
- + Dry Fork Whitewater River - Kilby Rd. (7)
- Dry Fork Whitewater River tributary - Howard Creek
- Dry Fork Whitewater River tributary - Dry Fork Rd. bridge northeast of Lee Creek
- ◆ Dry Fork Whitewater River tributary - Lee Creek at Dry Fork Road bridge
- Dry Fork Whitewater River tributary - Lee Creek tributary at Dry Fork Road bridge, southwest of Lee Creek
- ▲ Dry Fork Whitewater River tributary - upstream Miami Whitewater Lake - Strimple Rd.
- ✕ Dry Fork Whitewater River tributary - downstream Miami Whitewater Lake

# Dry Fork Whitewater River Watershed Sample Observations

1. Excessive spring peaks in E-coli (>6,000 colonies/mL) and total phosphorus (>0.8 mg/L) along the Dry Fork at West Rd. bridge.
2. Elevated spring phosphorous levels upstream of the West Rd. bridge and nitrate levels upstream at Oxford Rd. (6 mg/L) Extremely high turbidity levels (978 NTU) in April 2011.
3. High nitrate levels along the Dry Fork Whitewater River at Timberlake Drive and Harrison Ave. in August and November 2010 correspond to low flow levels compared to 2011 (no samples at West Rd.)
4. Contaminant source above Miami Whitewater Lake at Strimple Rd. were revealed in August and November 2011 due to elevated e-coli, nitrate and turbidity levels.
5. Consistently higher dissolved oxygen levels in the Dry Fork at Oxford Rd. compared to less vegetated sites downstream.
6. Three peaks in pH throughout the year. A high spring peak and a late summer/fall increase with a minor mid-summer peak. The farthest downstream site on the Dry Fork (Kilby Rd.) yielded the highest pH values in 2010 and 2011.
7. Elevated conductivity, e-coli, total phosphorus and nitrates at various locations and times at Lee Creek and/or adjacent tributary sites. Lee Creek e-coli and nitrate data lower than tributaries.



# Whitewater River 2011





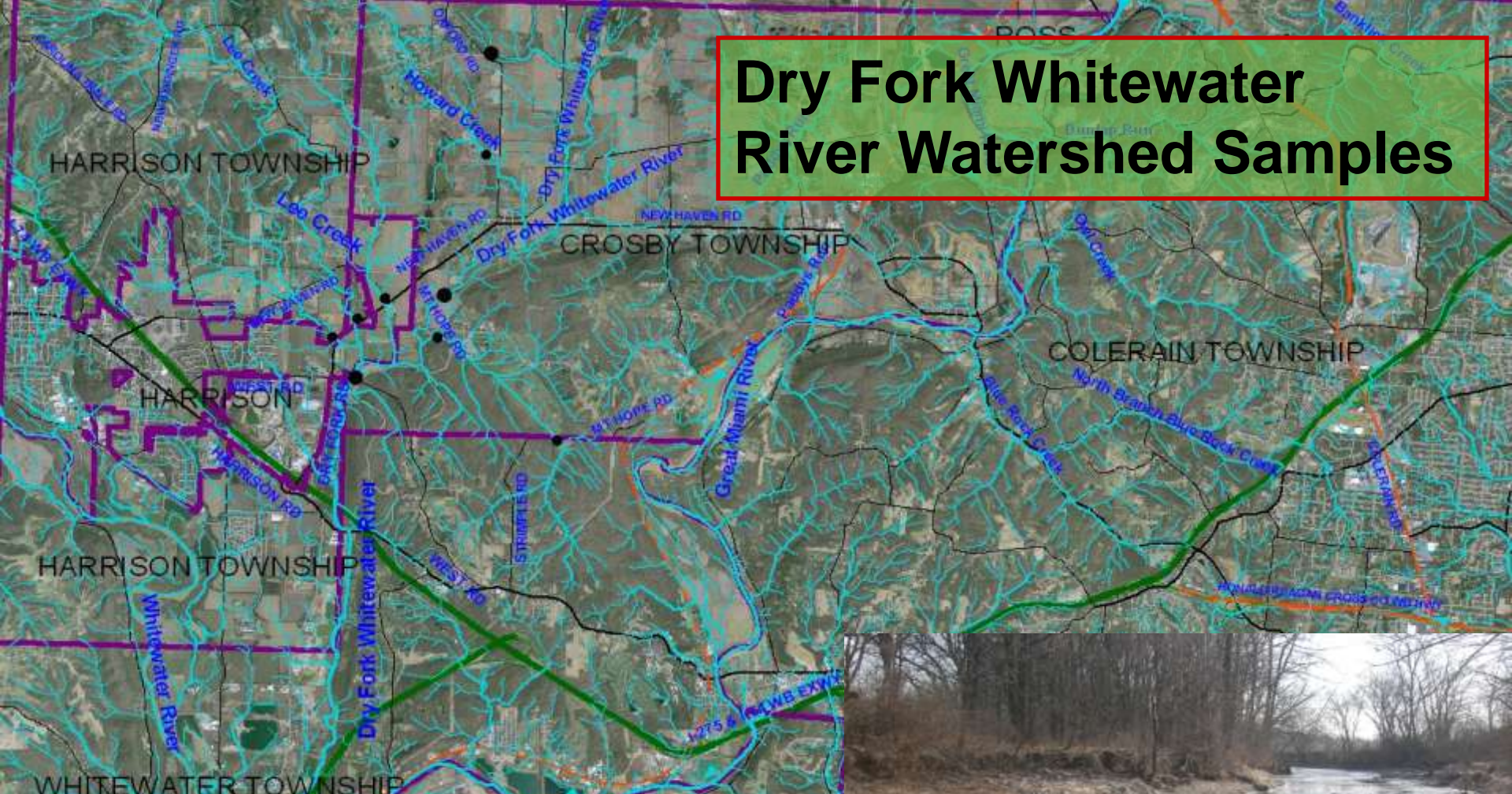
# Dry Fork Creek RM

6.3 GMR+ 2.9 Whitewater



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# Dry Fork Whitewater River Watershed Samples

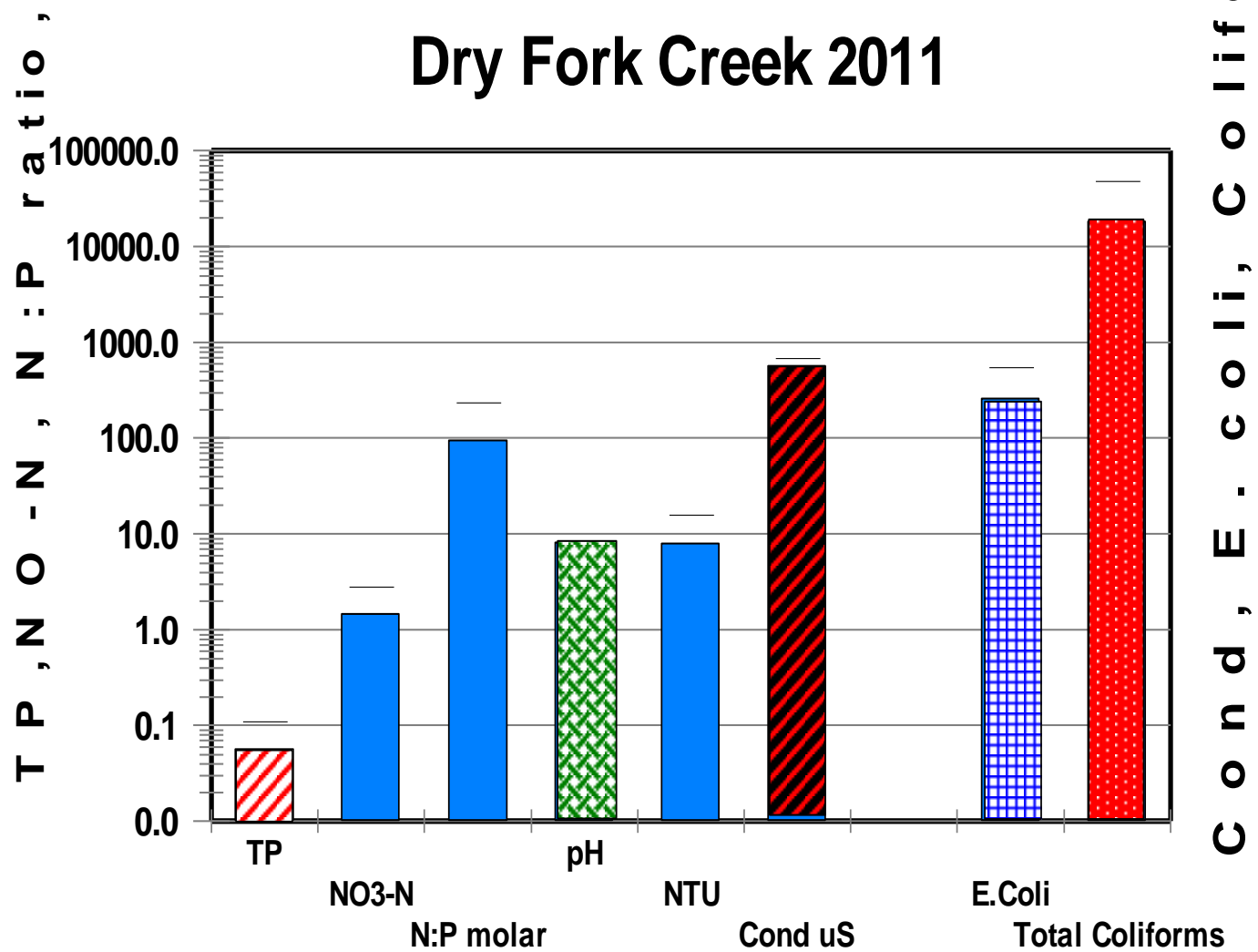


Dry Fork Creek – West Rd.  
October 2010

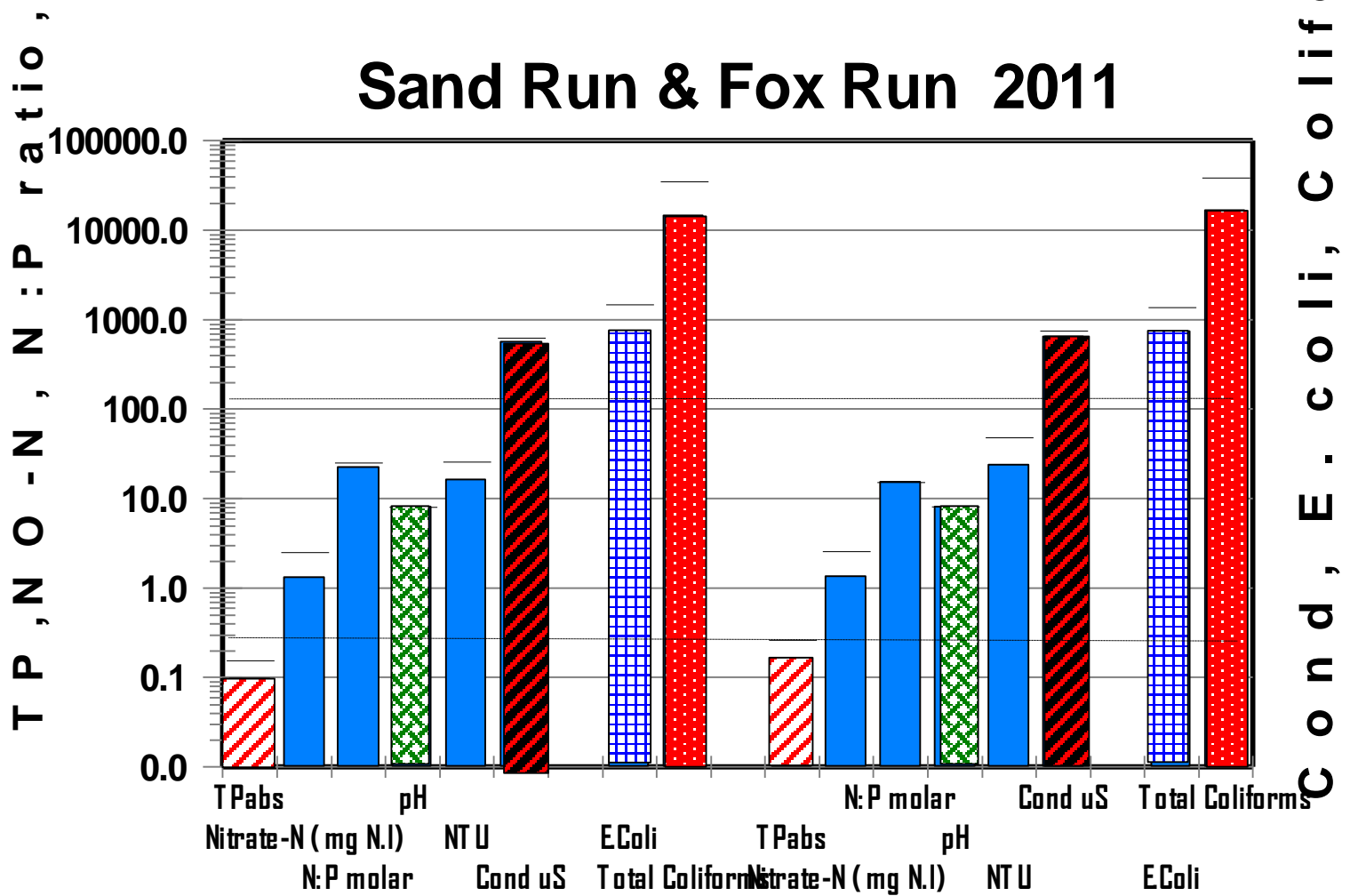
Dry Fork Creek – West Rd.  
November 2011

Dry Fork Creek – Oxford Rd.  
Stream Restoration Site

# Dry Fork Creek 2011



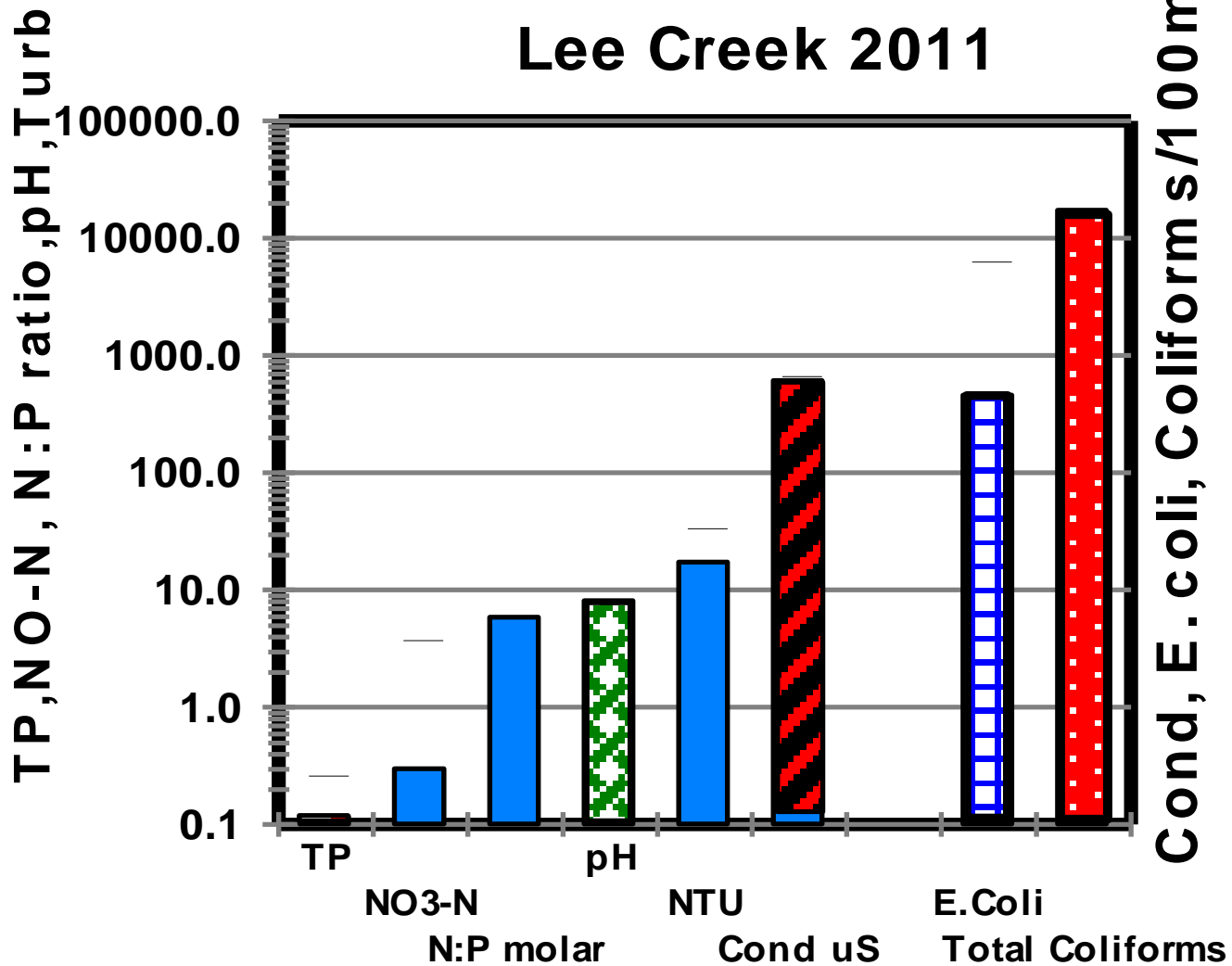
# Sand Run & Fox Run 2011



# Lee Creek Watershed Sampling Downstream of Agricultural and Stream Bank Protection Conservation Practices



# Lee Creek 2011



Lee Creek had one of the lowest TP and NO3-N seen. The pH conductivity and E.coli look like bottom land agriculture is not damaging to water quality.



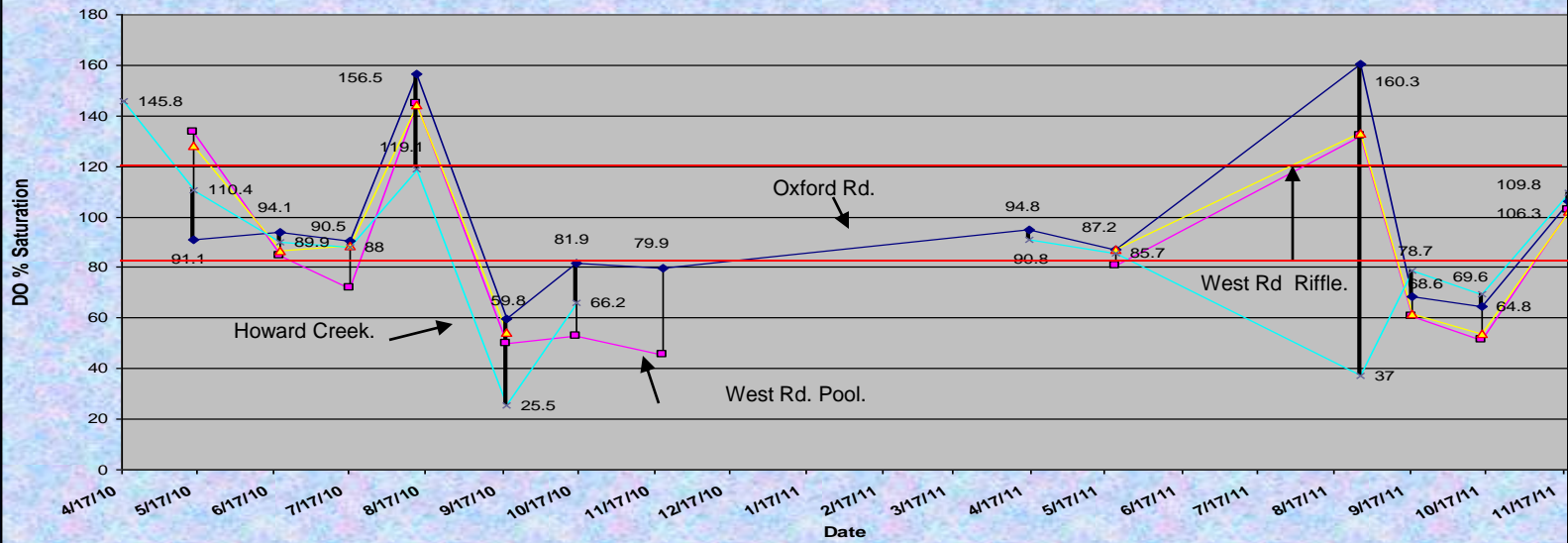


- **Howards Creek entering Dry Fork Creek**
- **RM 10.8 from Whitewater R**

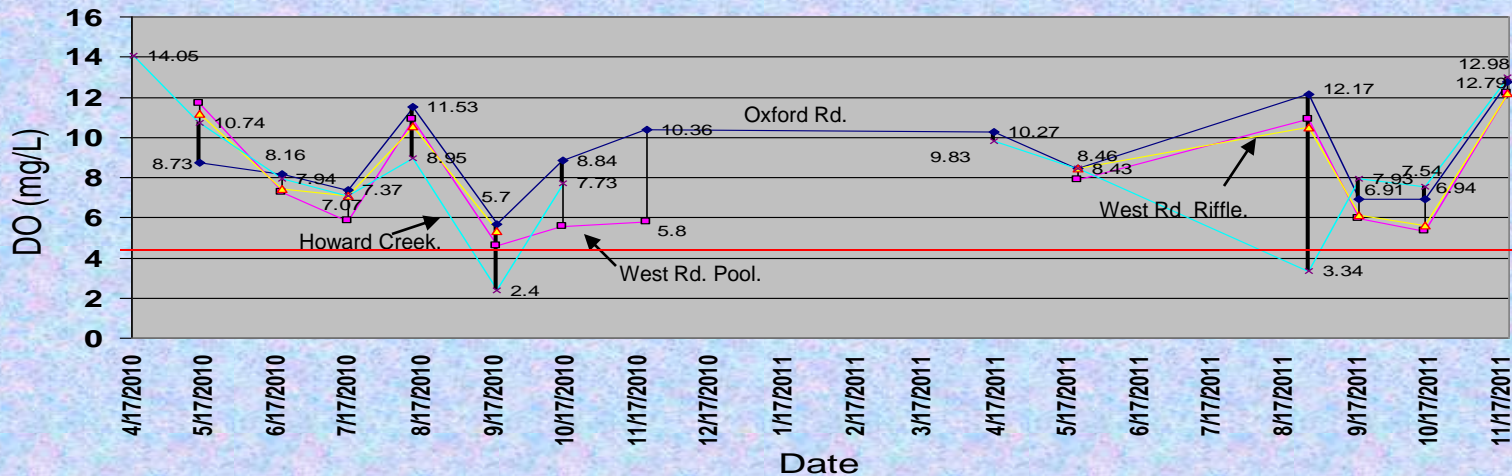


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## 2010-2011 Dry Fork Whitewater River-Howard Creek Dissolved Oxygen (DO) % Saturation



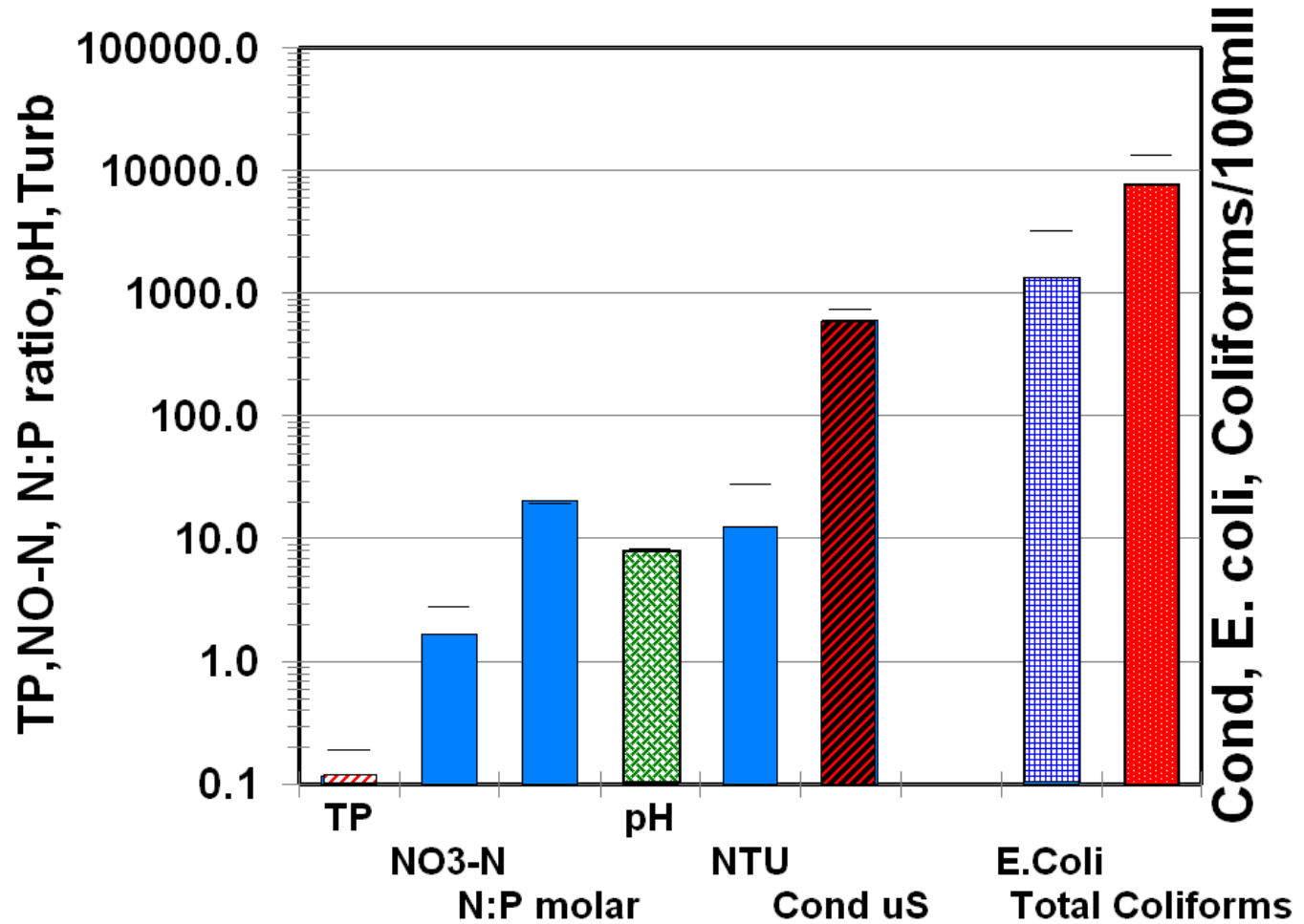
## 2010-2011 Dry Fork Whitewater River - Howard Creek Dissolved Oxygen (DO) Concentrations



- ◆ Dry Fork Whitewater River - Oxford Rd.
- Dry Fork Whitewater River - Pool Upstream West Rd. Bridge
- ▲ Dry Fork Whitewater River - Riffle Downstream West Rd. Bridge
- ✱ Howard Creek at River Lab



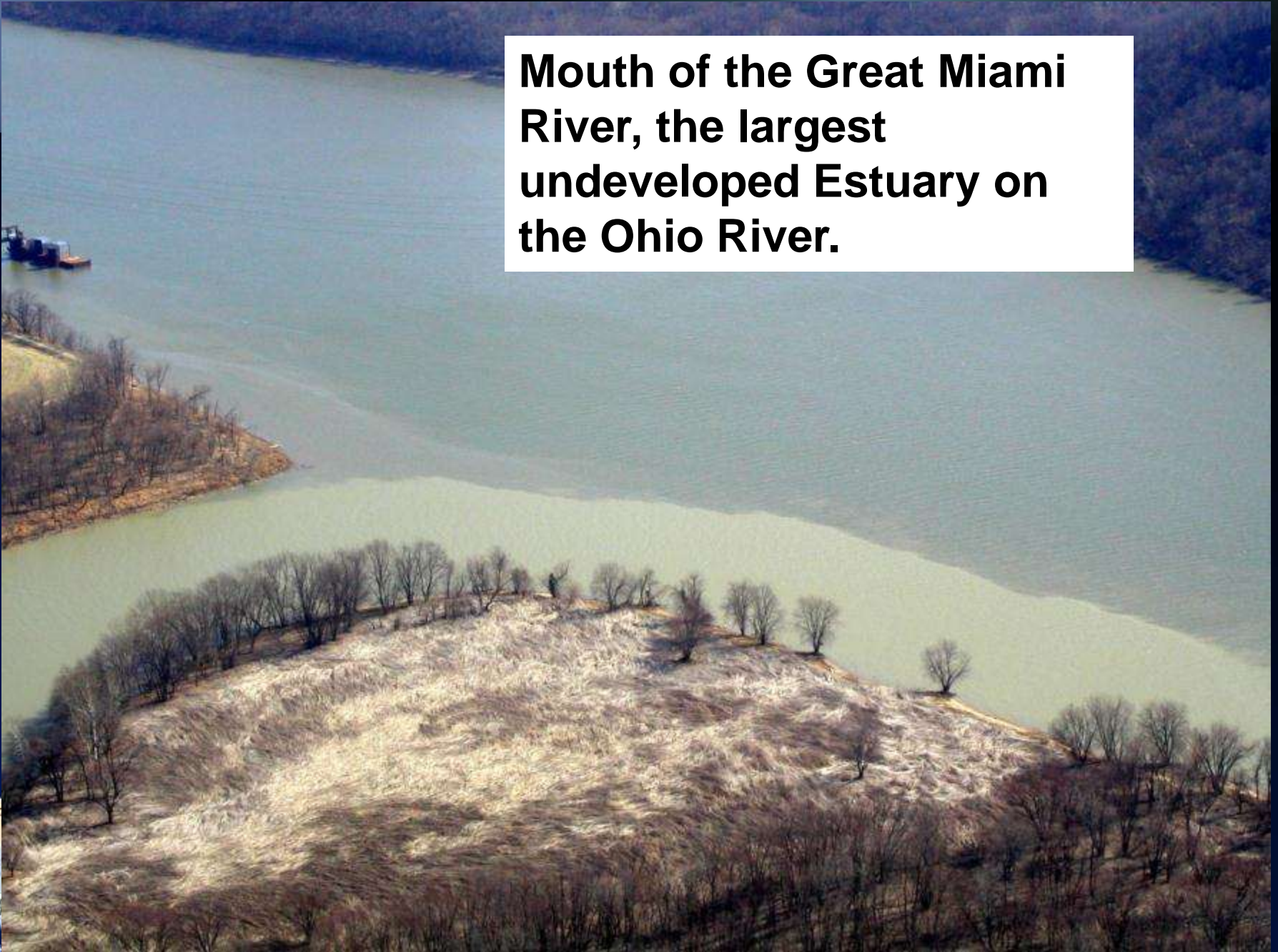
# Howards Ck 2011



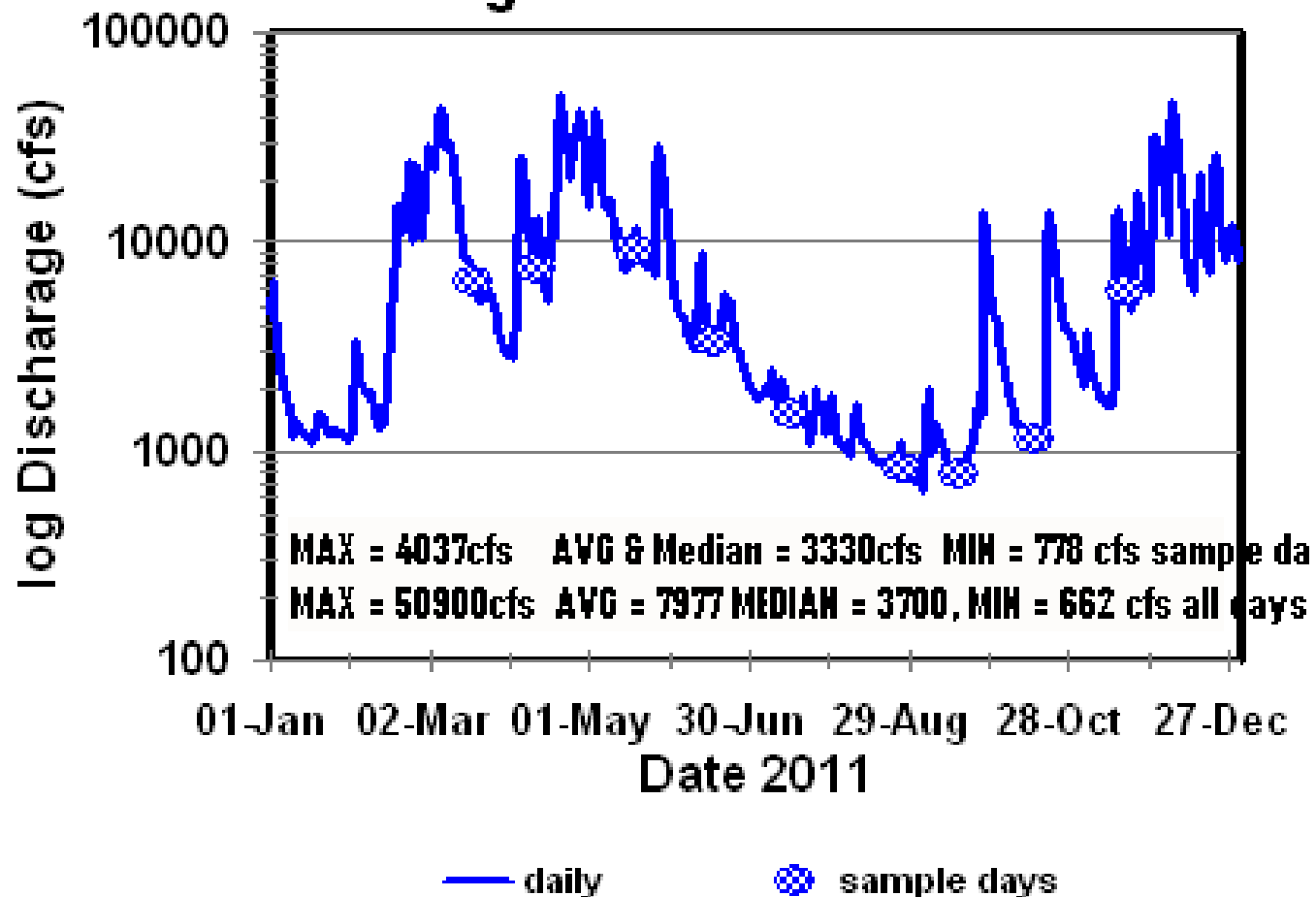


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**Mouth of the Great Miami  
River, the largest  
undeveloped Estuary on  
the Ohio River.**



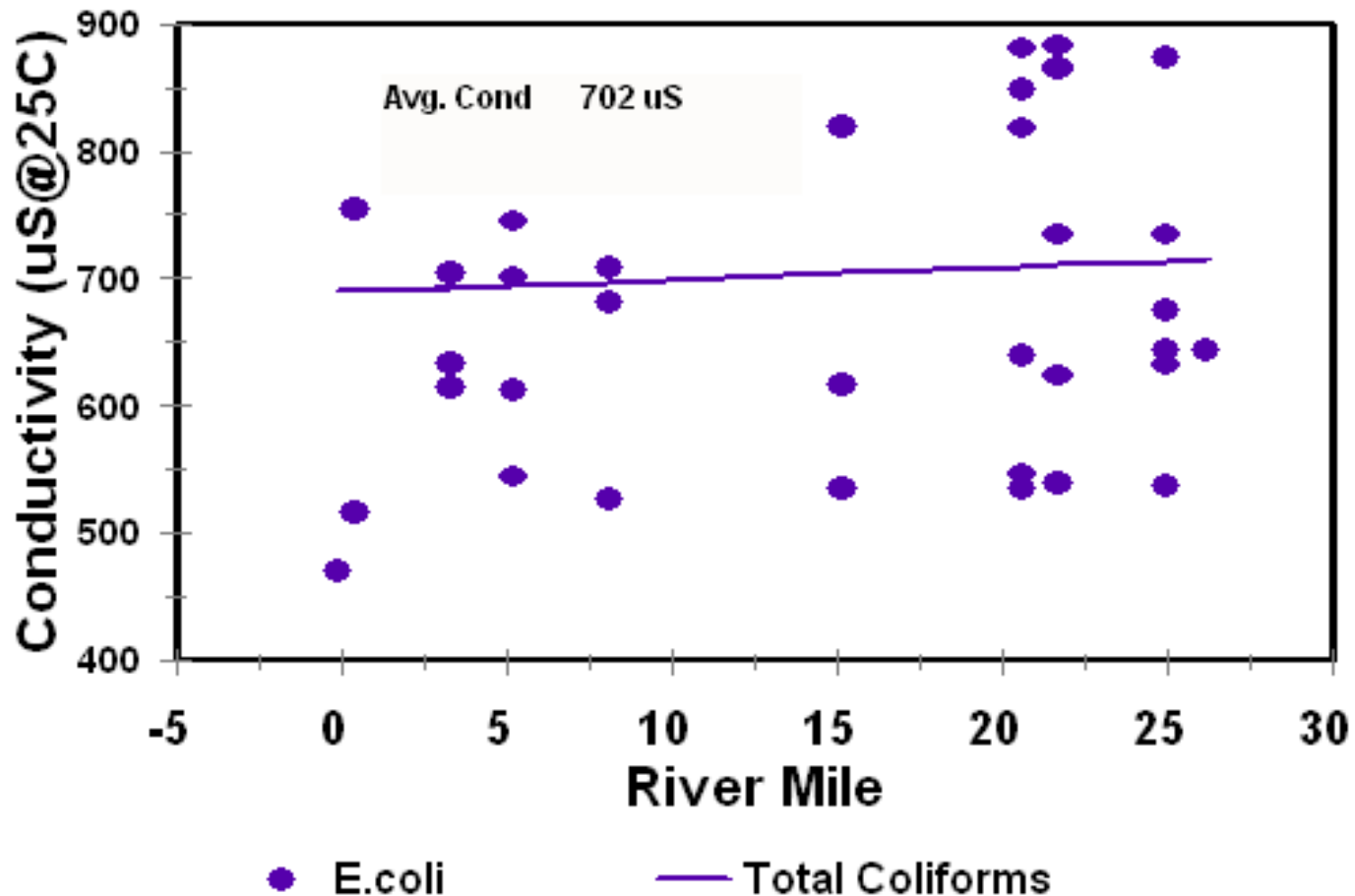
## Discharge GMR Hamilton OH 2011



- Avg 3773 cfs 20 yrs, 2983 cfs on sample days 2010. Despite record rain median cfs is only modestly higher



# Conductivity GMR Mainstem 2011

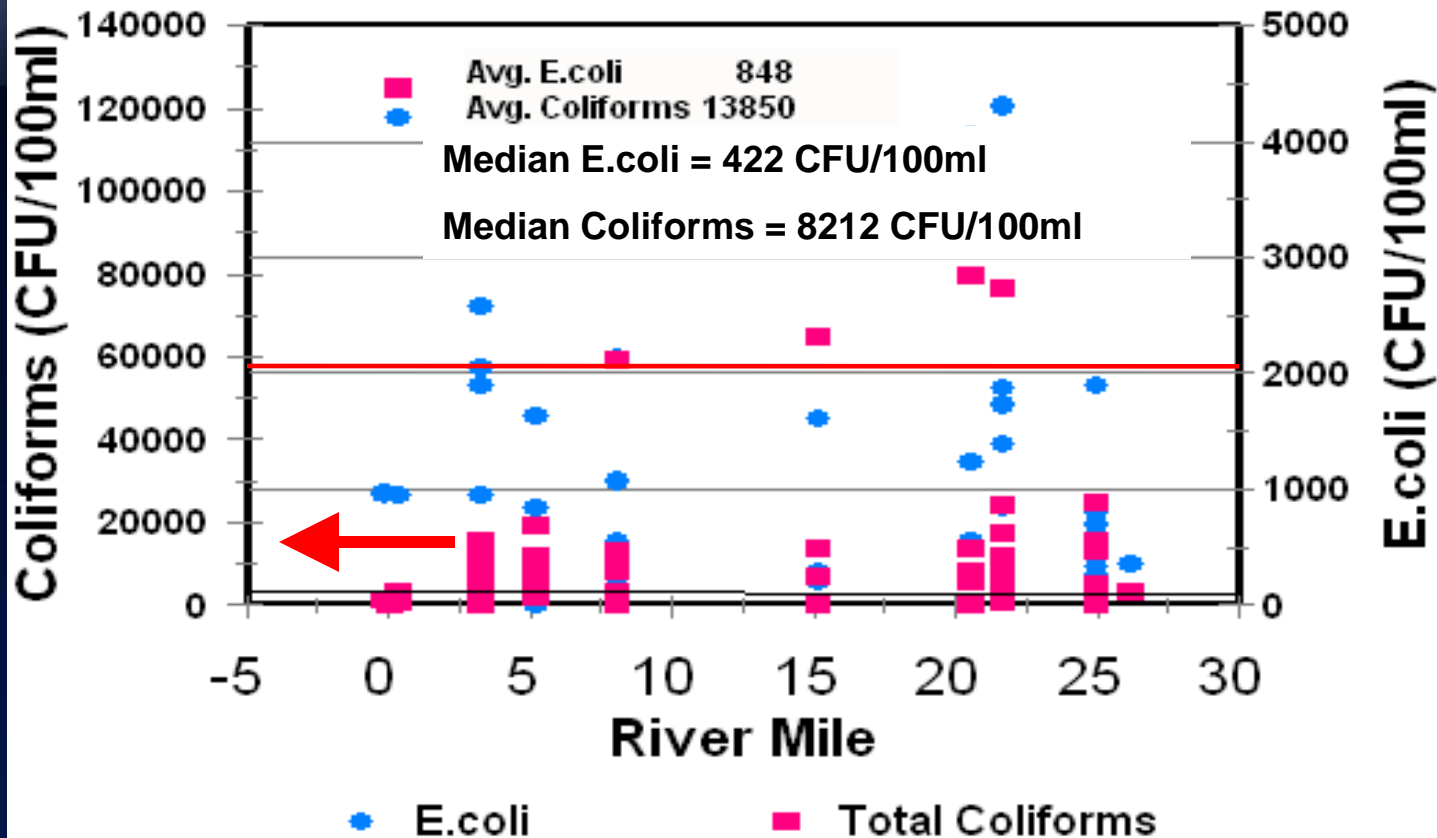


**Conductivity may decrease a little from upstream (RM 25) to the Ohio River (RM 0) but the values >600 uS show some WTP effluent loading.**

Quality Monitoring  
Great Miami River Watershed



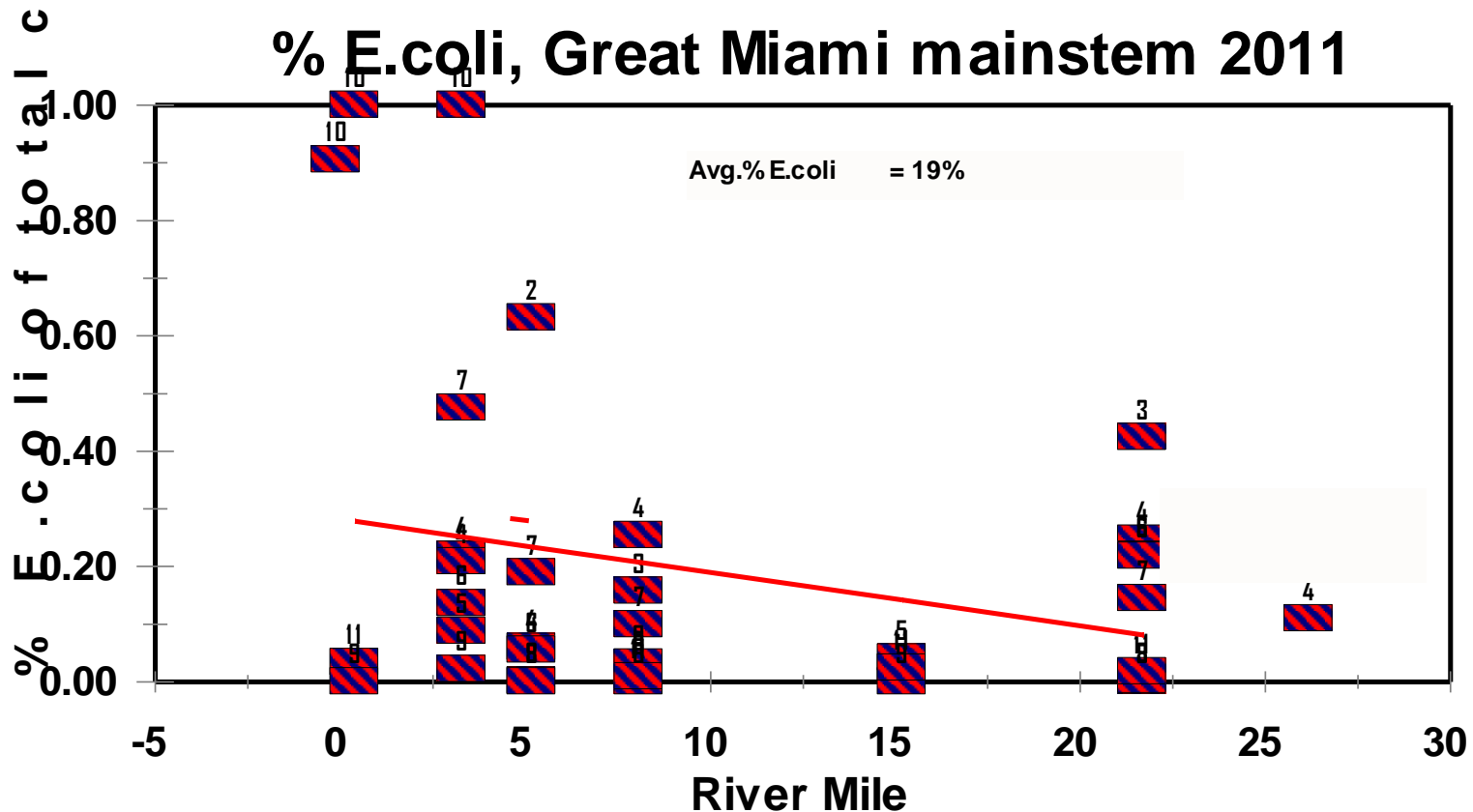
# E.coli & Coliforms GMR Mainstem



In 2010 fecal coliforms had a median =100 cfu/100ml  
Geomean = 114/100ml Avg. 567 cfu/100ml. In 2011  
using E. coli the median (422) and average (848 CFU)  
were higher with the higher flows.



# % E.coli, Great Miami mainstem 2011

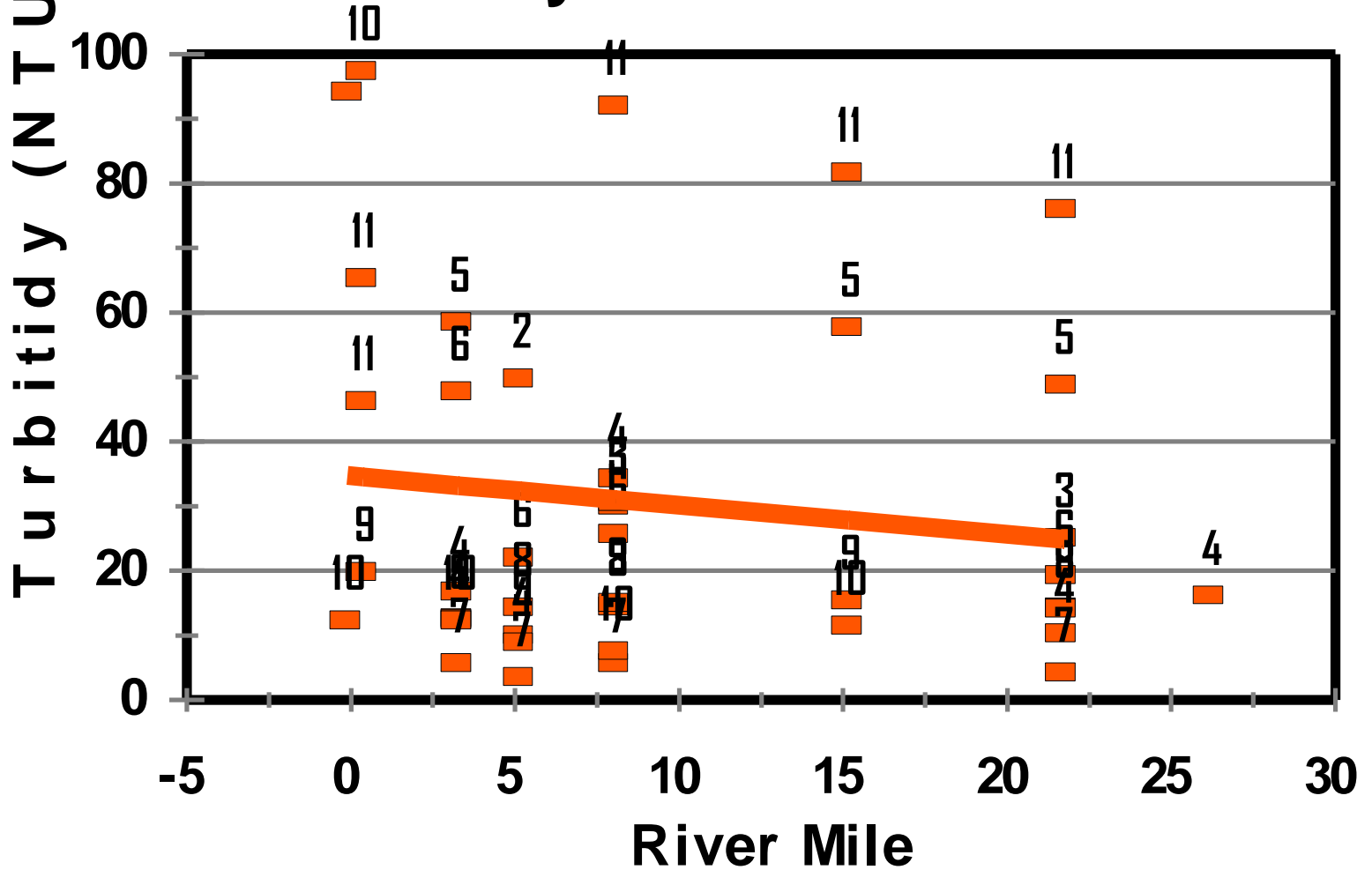


If % E.coli is a measure of human fecal contamination, there is more downriver from urban septic and surface runoff.



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# Turbidity in GMR 2011

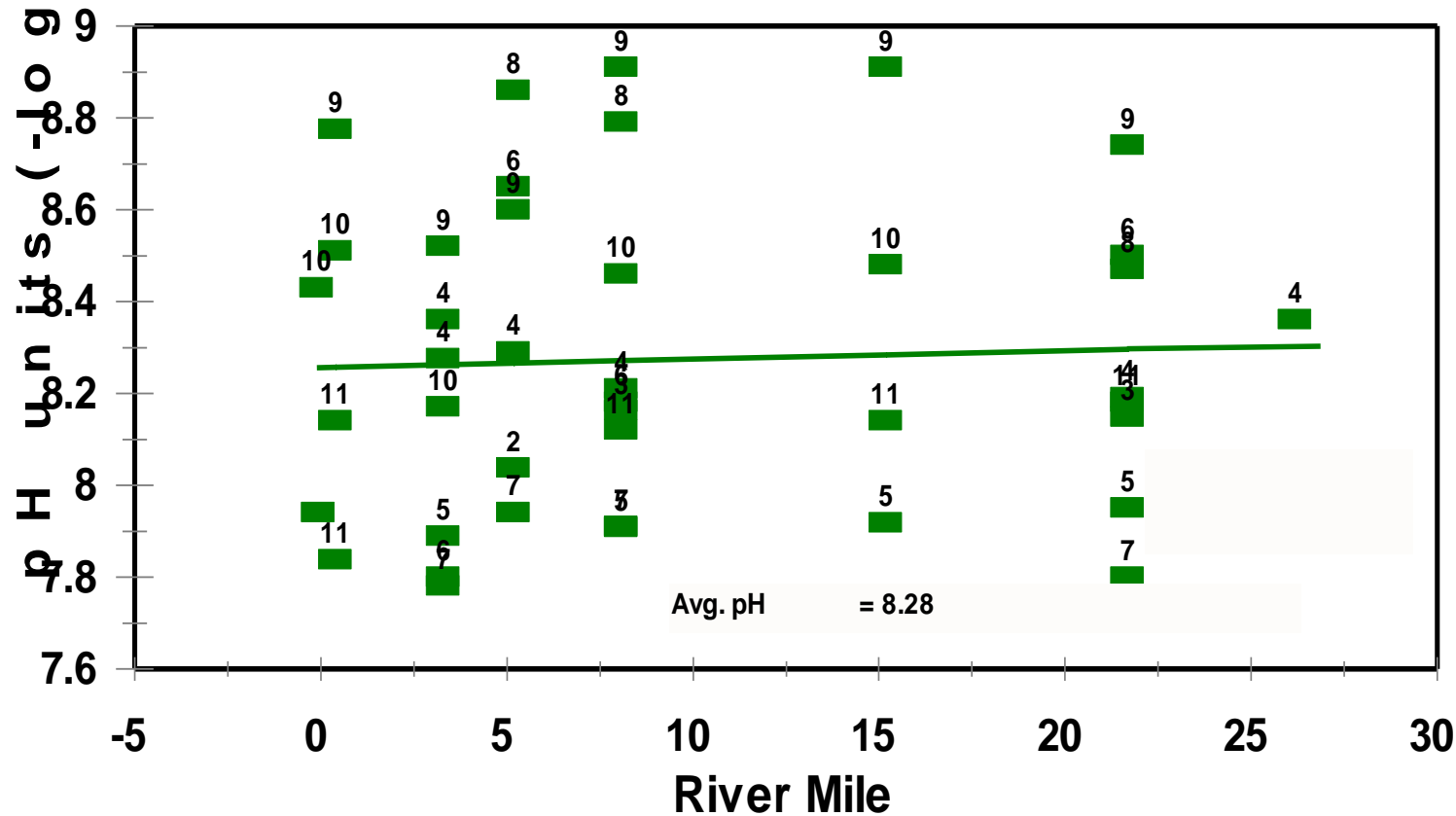


Turbidity was highest in winter from high discharge (Nov) and May (likely algal biomass)

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# Ph of Great Miami mainstem 2011

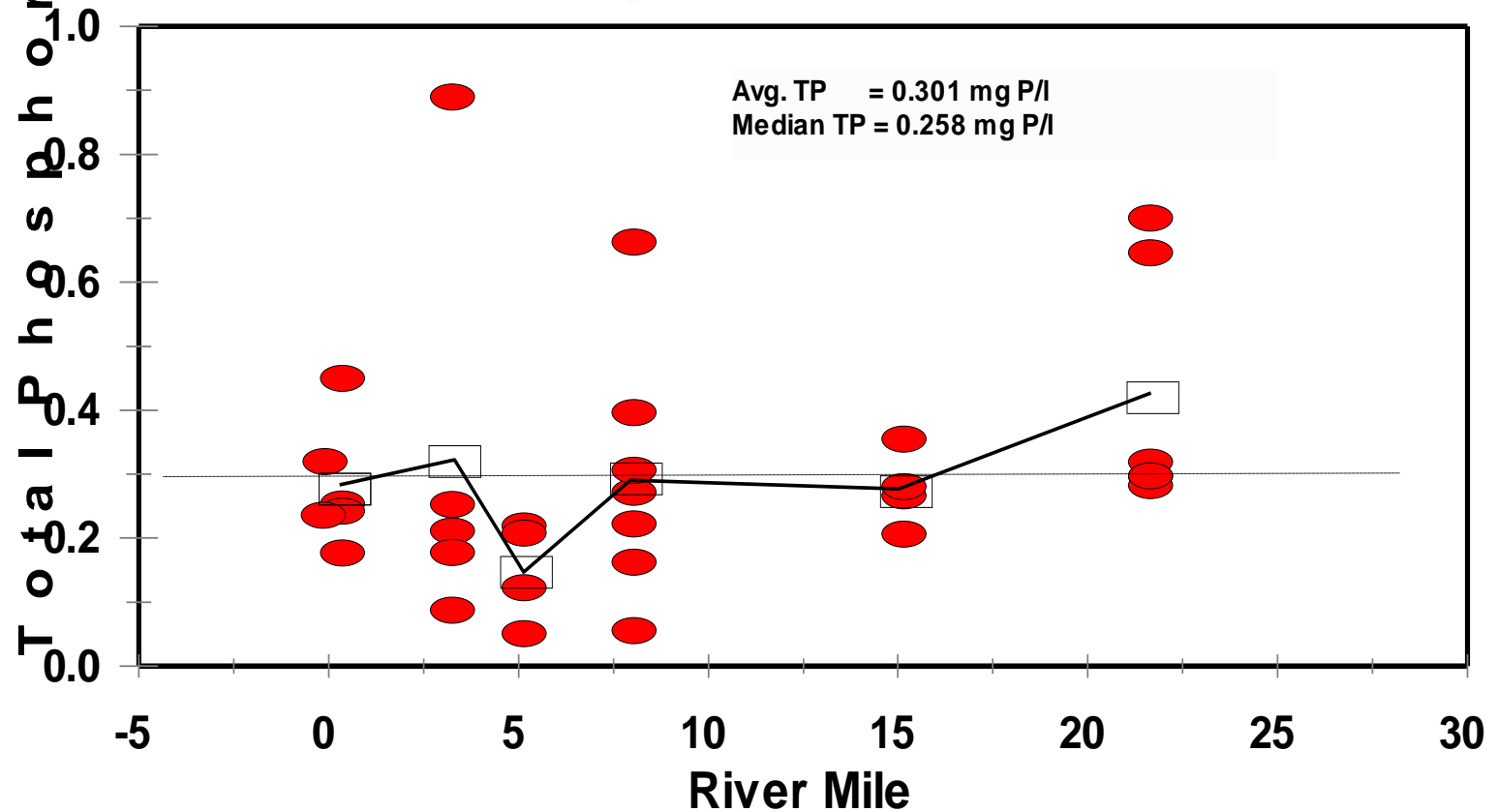


pH has been driven up by photosynthesis > than equilibrium with limestone of 8.2 by extreme photosynthesis from nutrient loading, especially in Aug. & Sept.





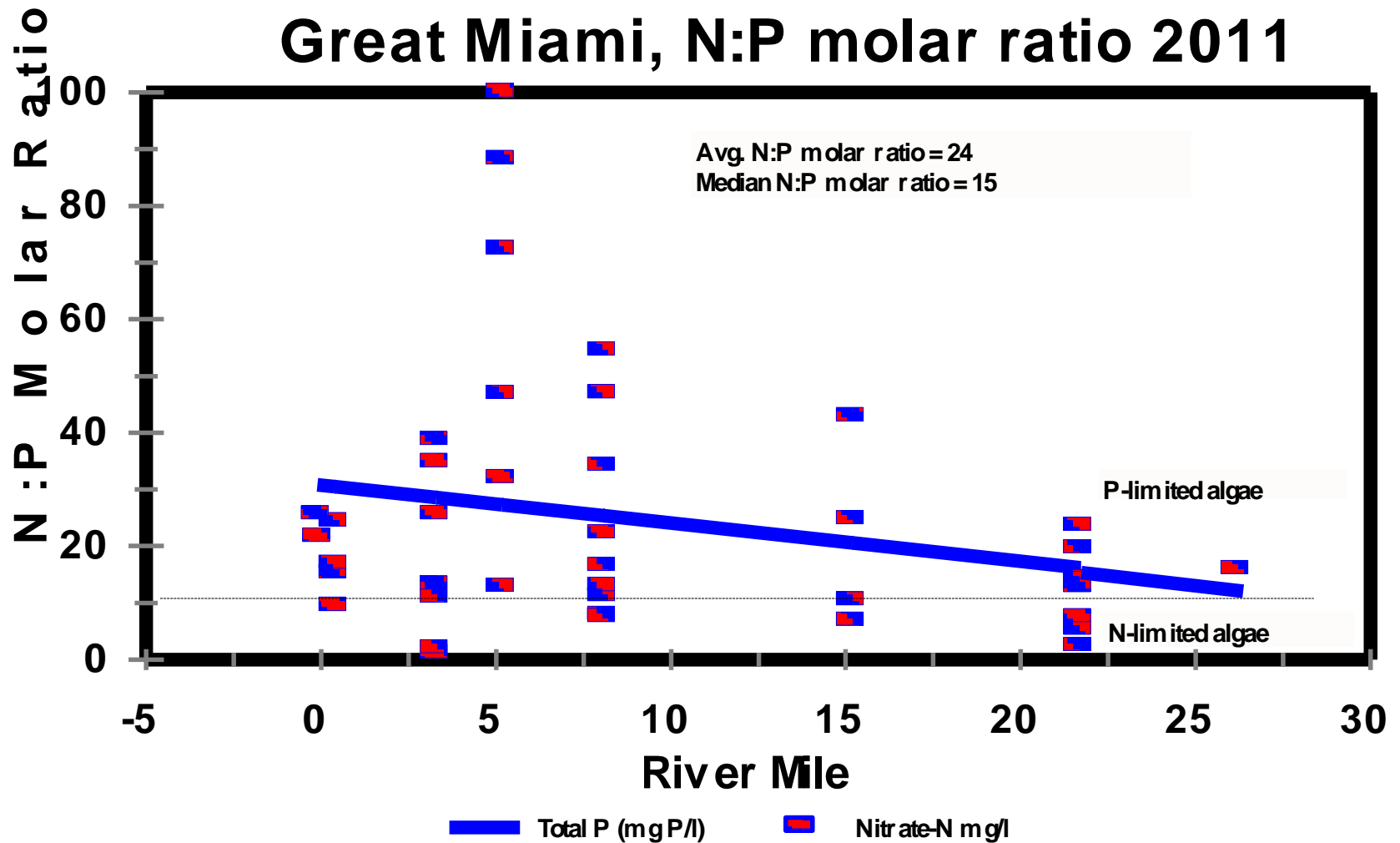
# Total Phosphate mainstem 2011



Total P in the mainstem had an average and median that just barely met the OEPA standard for urban rivers. The upstream concentration may have been elevated by WTP effluents.



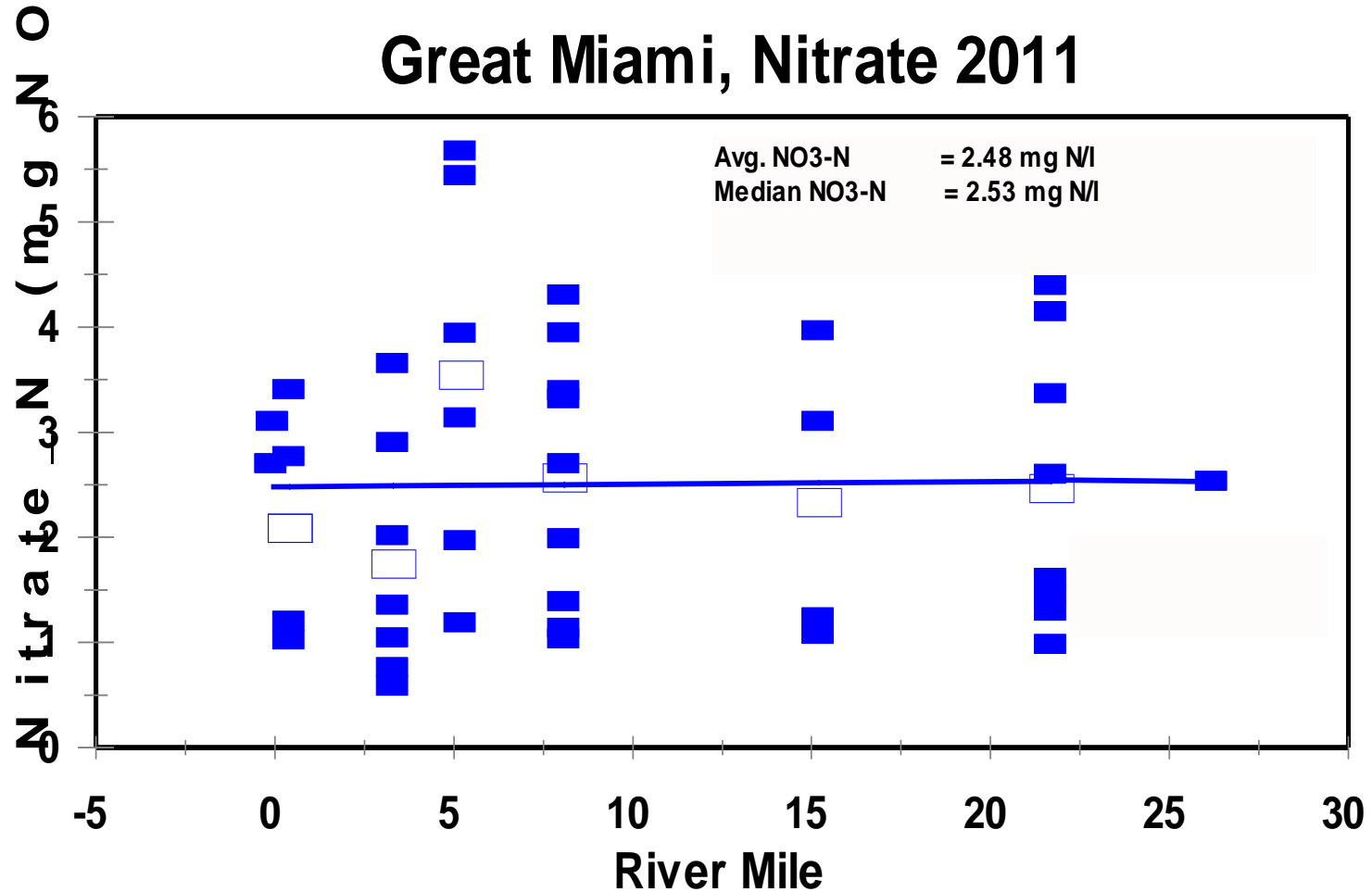
# Great Miami, N:P molar ratio 2011



Molar N:P from 10-14 are balanced for algal growth. Normally high [N] concentrations come from up stream agricultural runoff, but in 2011 the source of excess N was from the urban runoff. WWTP effluent is normally P-rich.



# Great Miami, Nitrate 2011

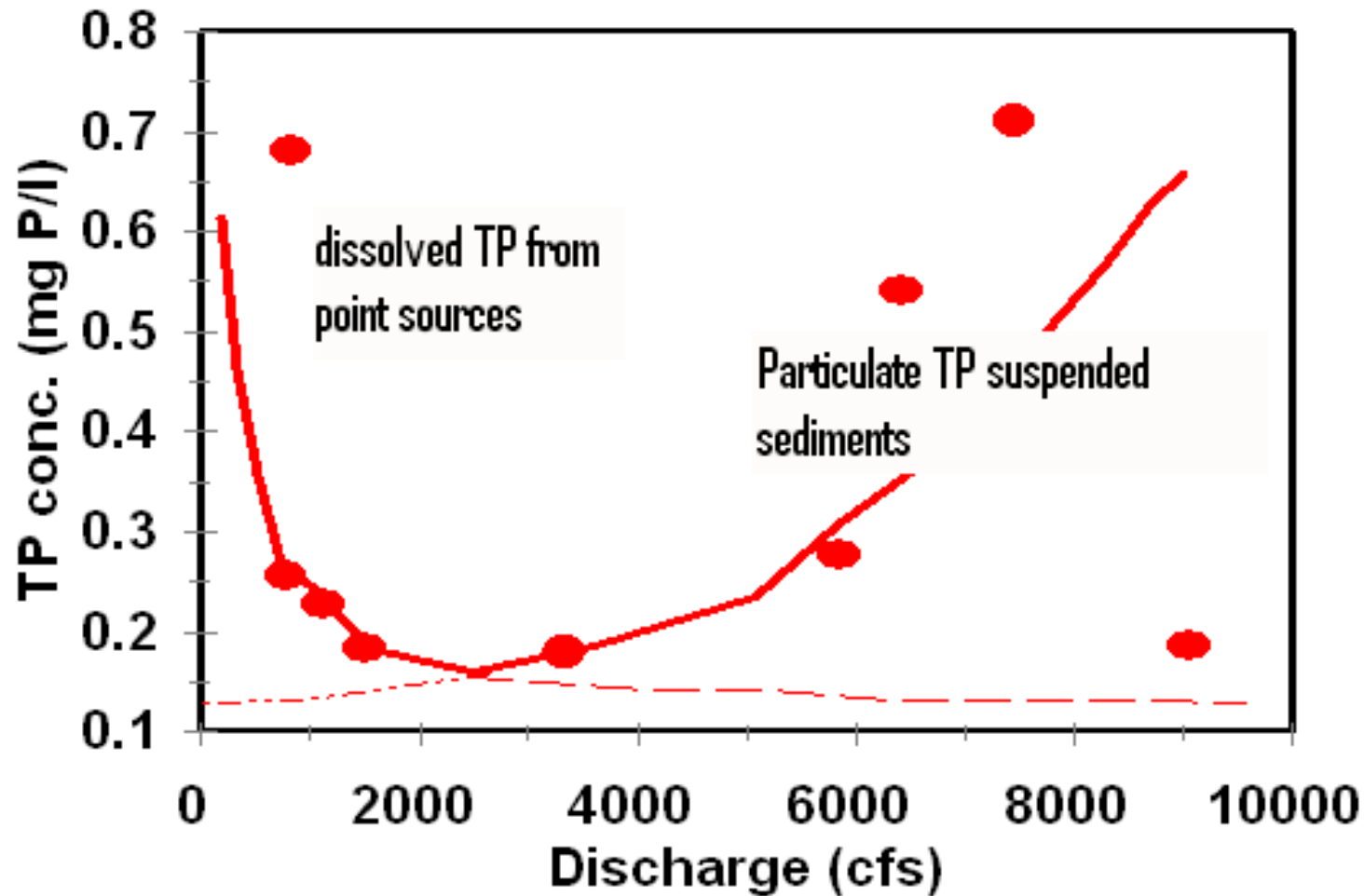


Since Nitrate-N does not vary longitudinally, most of the difference in N:P ratio is caused by declining TP downstream, likely from algal assimilation in the deeper pools.

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# Relation between Total P and cfs GMR

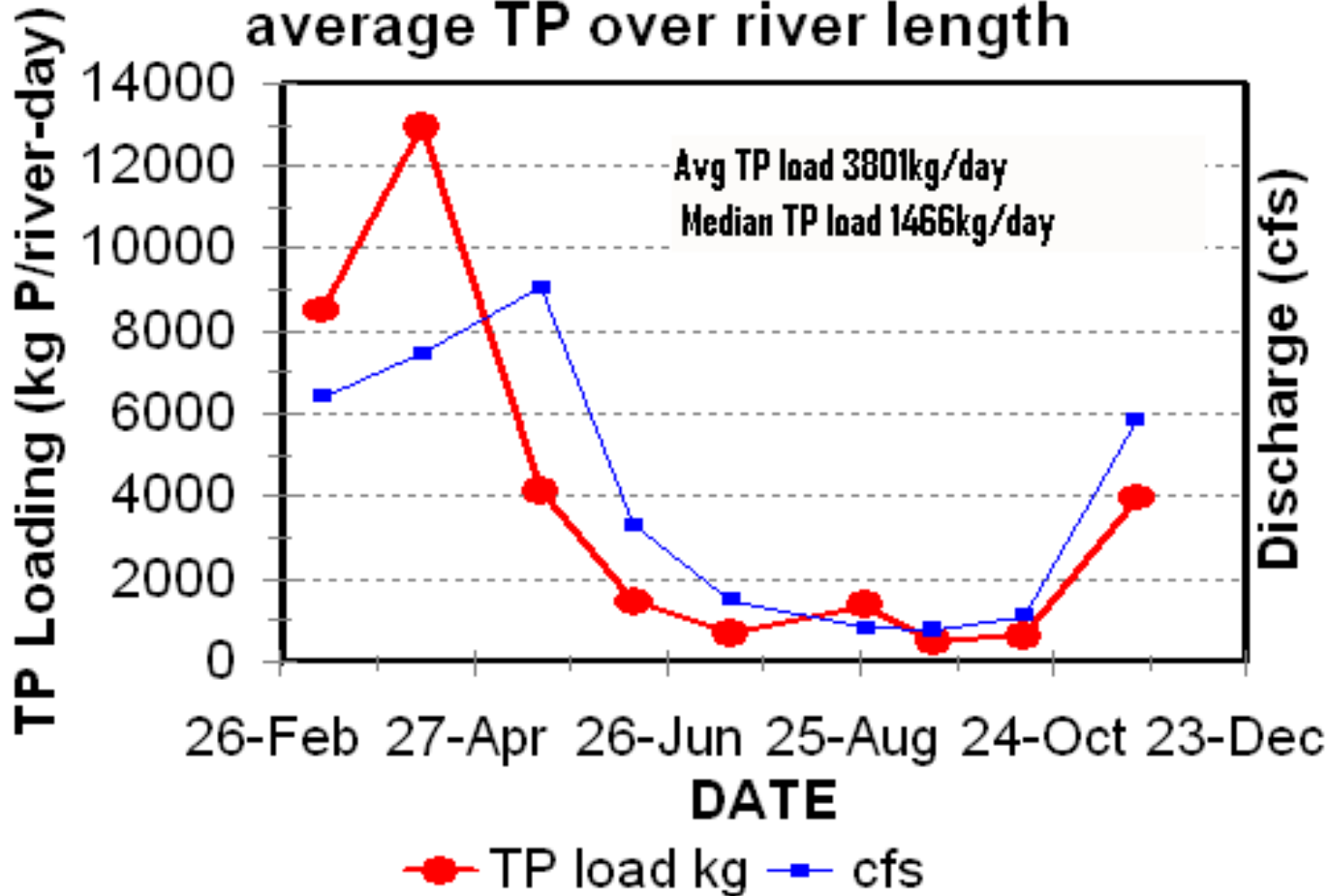


[TP] depends upon discharge, like 2010. At low flow WWTP effluent dominates; at high flow resuspension in muds dominate.



# TP load of GMR 2011

average TP over river length



With higher discharge in 2011, TP load was nearly double that in 2010.

Avg TP load 2010 = 3052 kg/d

Median TP load 2010 = 862 kg TP/d

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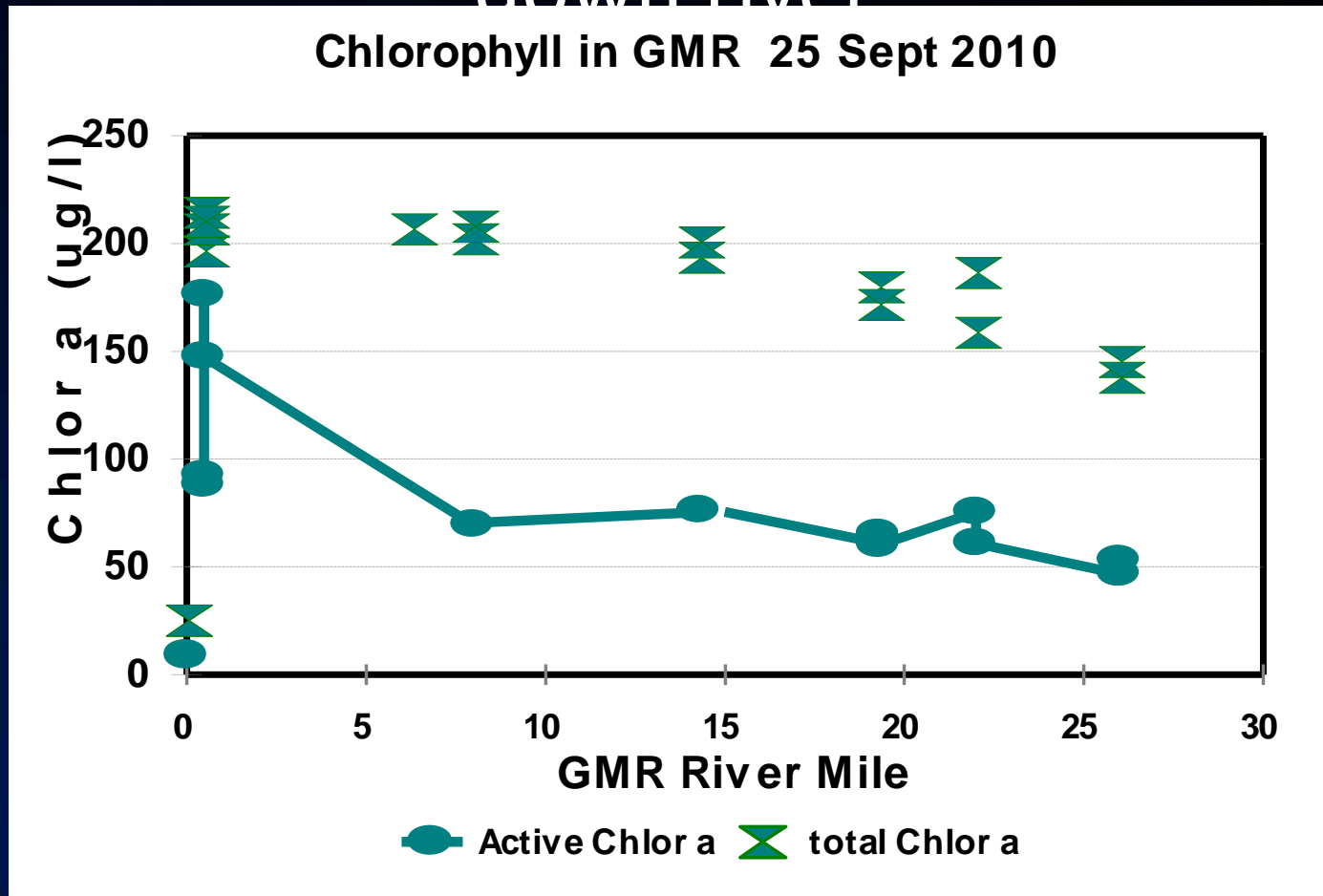


# Summary

1. pH is elevated to extremes by severe suspended algal densities avg. pH = 8.4 (max 8.84 units).
2. Total Phosphorus Is low, median 0.258 mg P/l avg. 0.301 mg P/l, less than 0.3 mg/l targeted for urban rivers by OEPA.
3. Nitrate was low 2.5 mg N/l, lower than 4.0 mg N/l in 2010 with no pattern upstream to downstream.
4. N:P molar ratio was 24:1 (avg.) or 15 (median), > Richardson ratio of 14, with excess N. Algae likely P-limited especially towards the mouth of GMR
5. Conductivity = 702 uS > 673 uS in 2010, max 890 uS about normal for limestone bedrock.
6. *E. coli* bacteria 2011 = geometric mean 422 > 114 in 2010, avg. 8212 > 567 in 2010, likely caused by higher discharge.



# Suspended algal chlorophyll increases down river



As current slows in dredged river channel, algal assimilation of high nutrients makes the GMR hypereutrophic.

Great Miami River Watershed



# Summary of Longitudinal Study

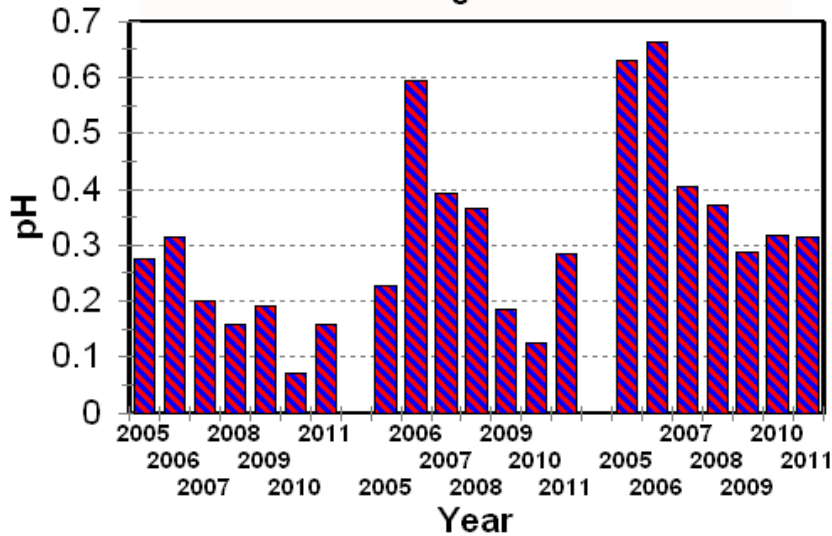
- Chlorophyll at low flow in the lower river exceeds that in most hypereutrophic lakes.
- Concentration of nutrients did not decline towards Ohio R. in 2011, likely because of higher discharge and faster water turnover.
- Lower river is a recovery zone for up river nutrient loading.



# TP has declined in WWR & GMR; NO3-N declining.

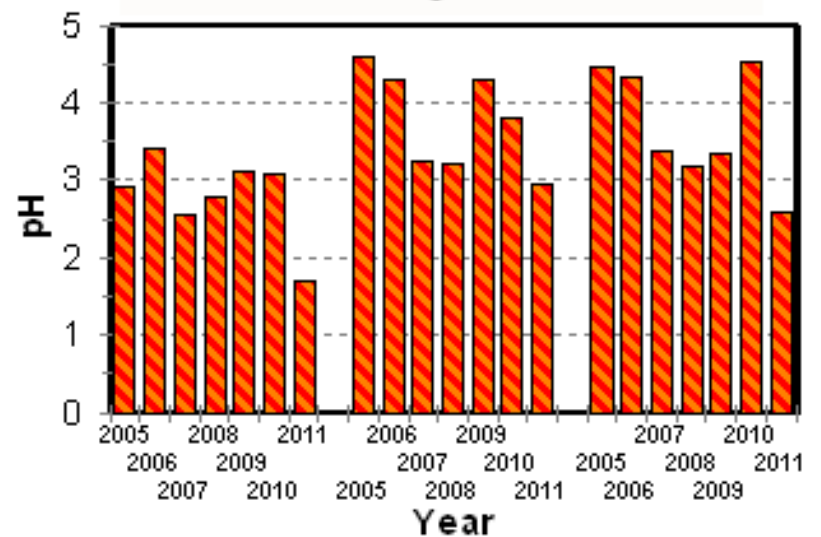
## Average TP by Year

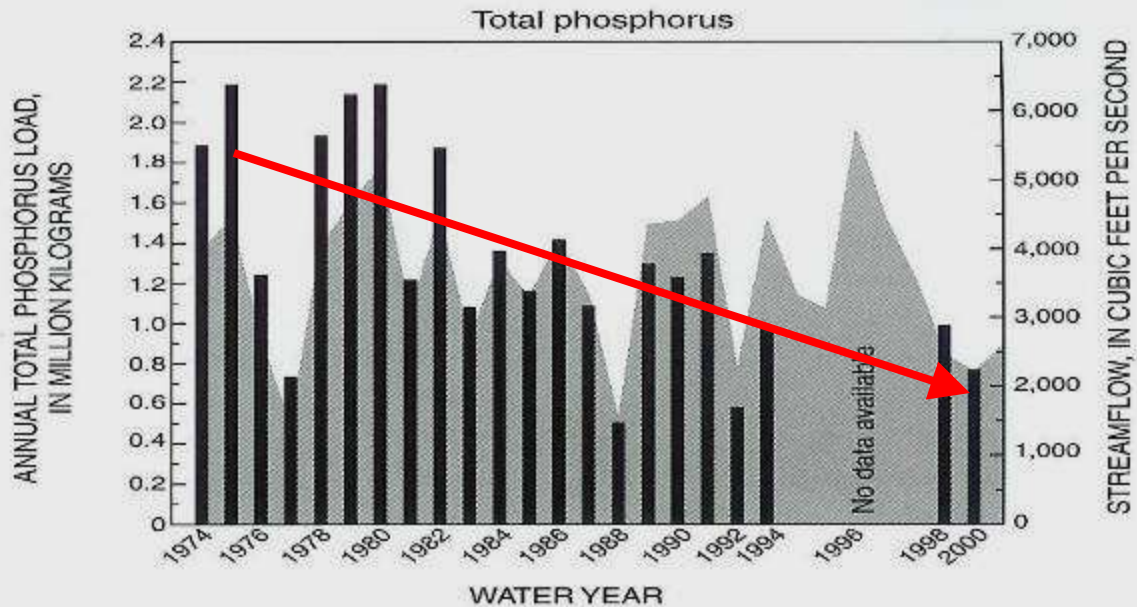
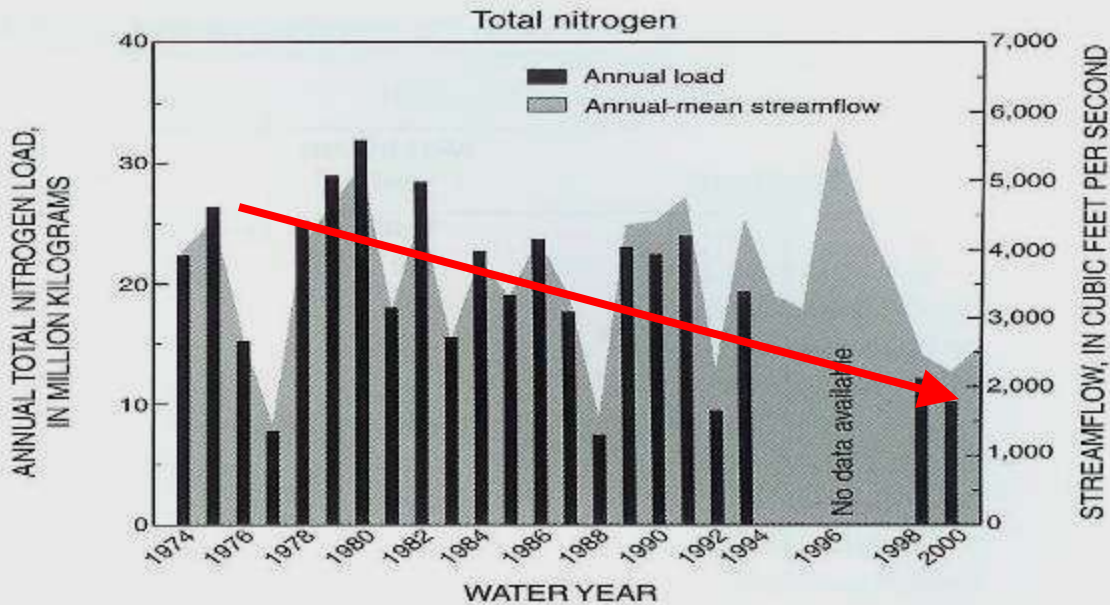
Whitewater R Heritage GMR US50 GMR



## Average NO3-N by Year

Whitewater R Heritage GMR US50 GMR



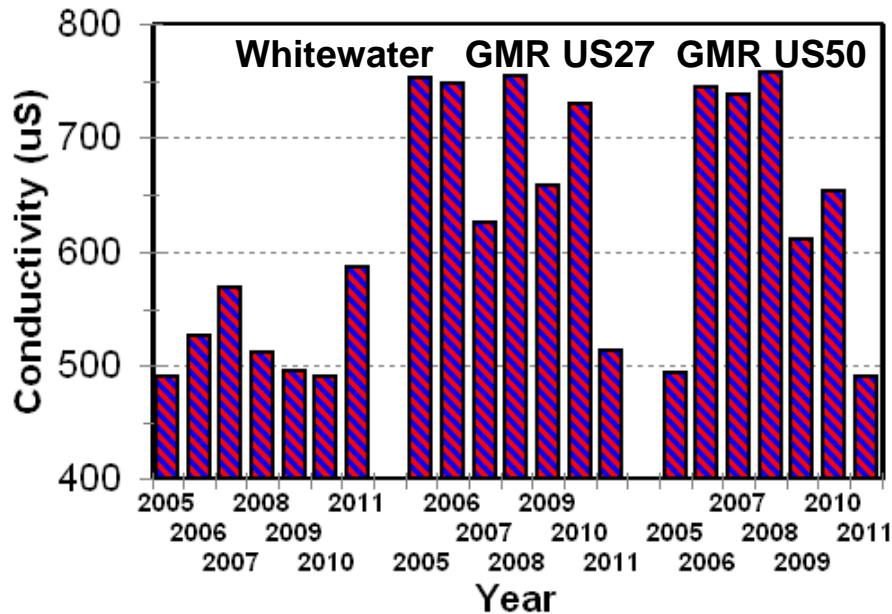


Since most of the load is agricultural, the annual load varies with rainfall discharge and changes in farming practice and water treatment plant efficiency. The decreasing nutrient flux in recent years comes from improvement in WWTP by Clean Water Act funding.

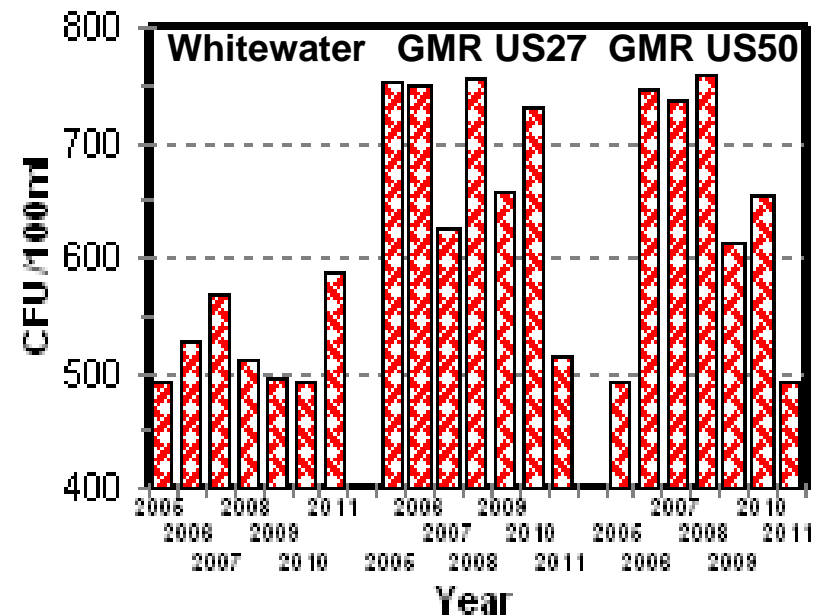
**Figure 20.** Annual loads of total nitrogen and total phosphorus for the Great Miami River at Hamilton, Ohio, water years 1974 through 2000.

# Sewage indicators show no pattern, but WWR lower effluent.

## Average Conductivity by Year

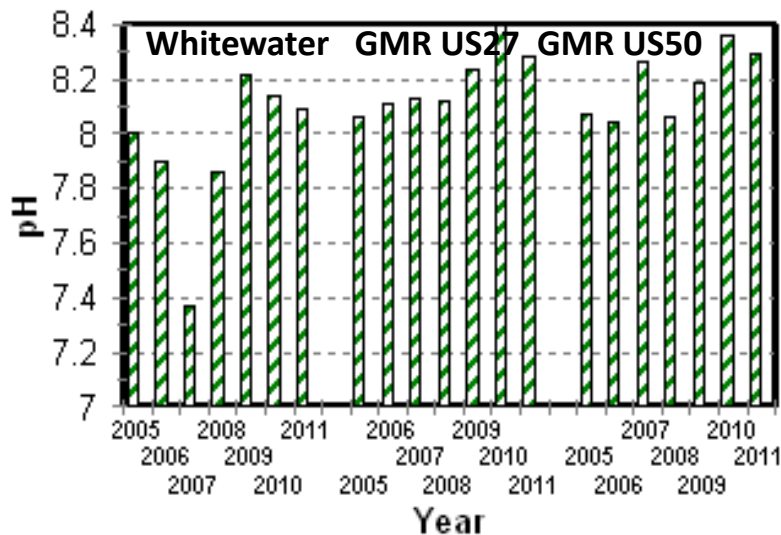


## Average Fecal(E.coli) by Year

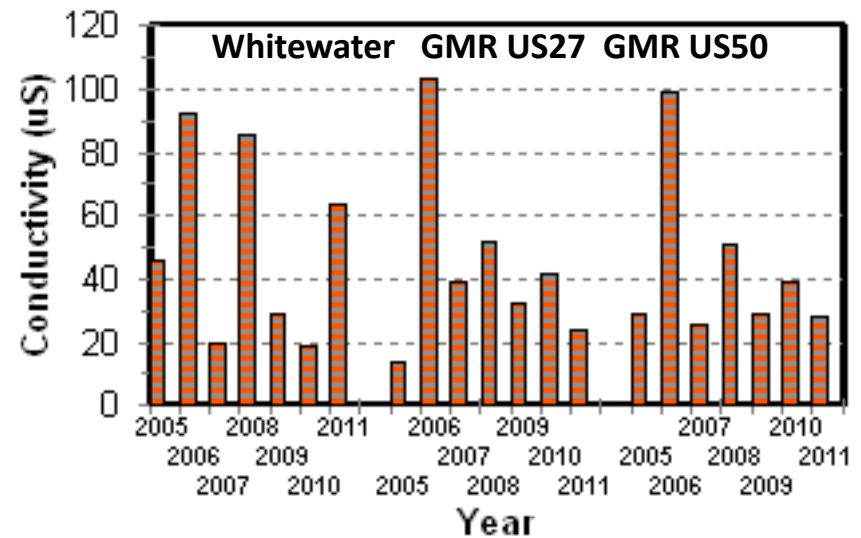


pH in GMR has been increasing as primary production increases.

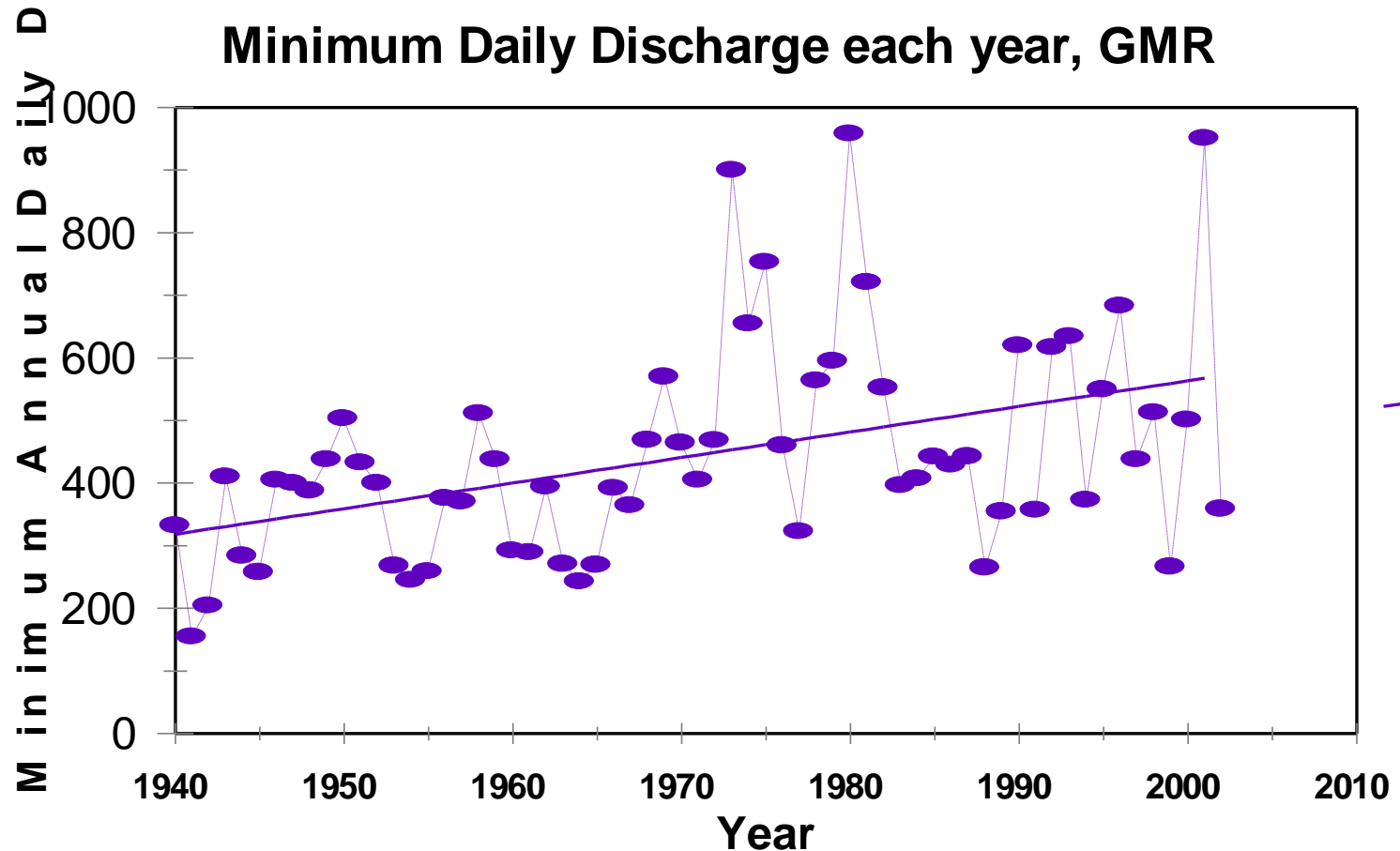
## Average pH by Year



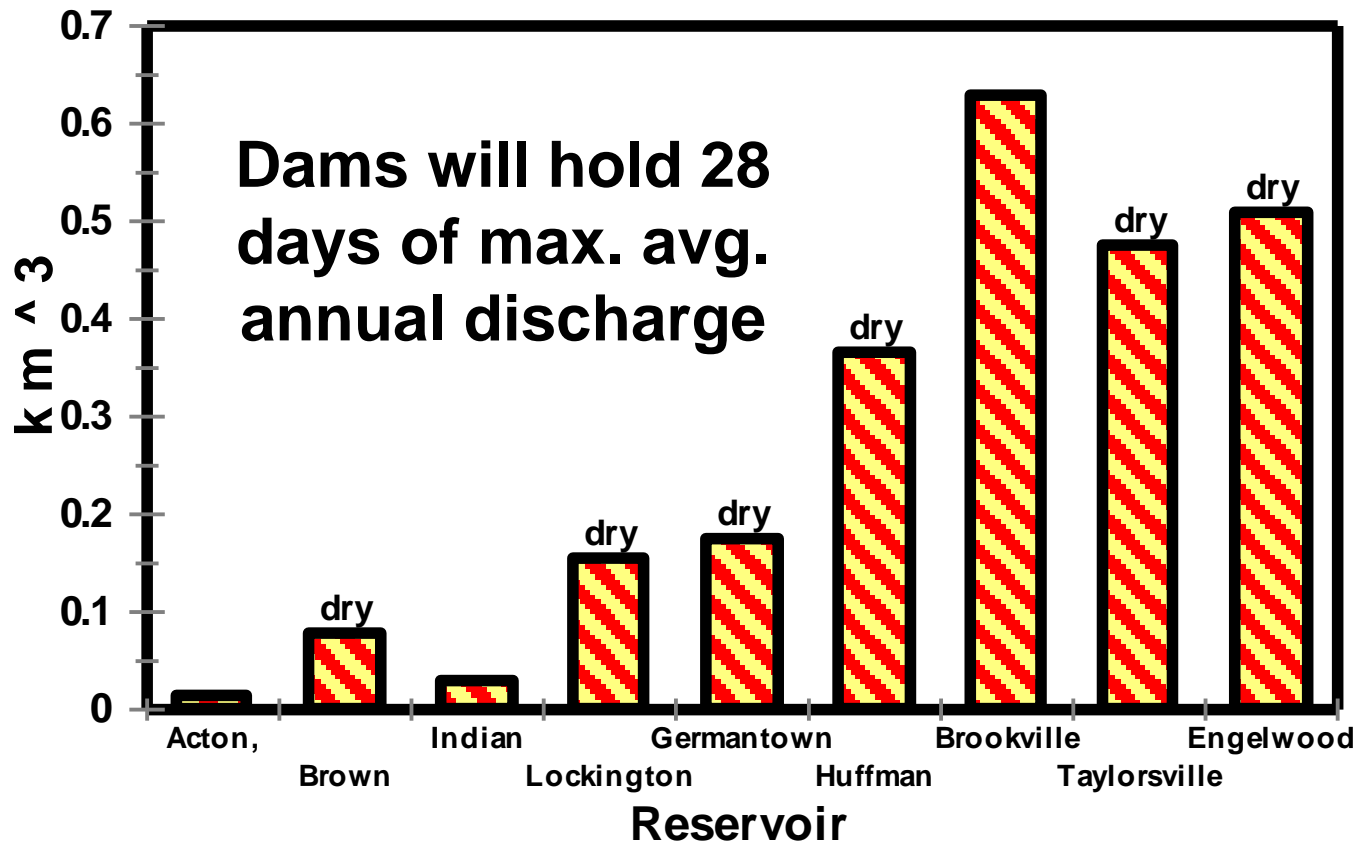
## Average Turbidity by Year



# Minimum Discharge at Hamilton has been increasing as WWTP volume increases.



# GMR Flood Storage Reservoirs



Floodwater storage in the GMR watershed is very high since the 1913 flood with many dams and weirs as well as 17 low head dams that slow the low water flow rate.



# Summary of inter-year comparison.

- Estimated average TP load on sample dates is average 3801 kg Tp/river-day or median 1486 kg Tp/river-day.
- USGS Miami found 73,000 & 37,000 kg/ TP-river-day, respectively 1998-2000. Average TP appears to be dropping in recent years below Cincinnati.
- pH is rising as photosynthesis has likely been increasing with dry summers in dredged river bed/ Nitrate has not changed but may be declining.
- Fecal coliforms & E.coli may be decreasing, but our methods have changed and are more conservative, and conductivity does appear to be dropping .
- Minimum discharge has increased over the past 70 years, likely as WWTP volume increased even with better treatment.



# Hazards to River.

- **Long term problem in the lower GMR is the eutrophication. Productivity is being pulled into the water column, instead of periphyton on bottom rocks.**
- **Water flows have been slowed by instream gravel mining creating pools instead of runs and riffles. The multiple mainstem dams up river ensure planktonic dominance from Dayton south.**

