2018 Annual Data Review

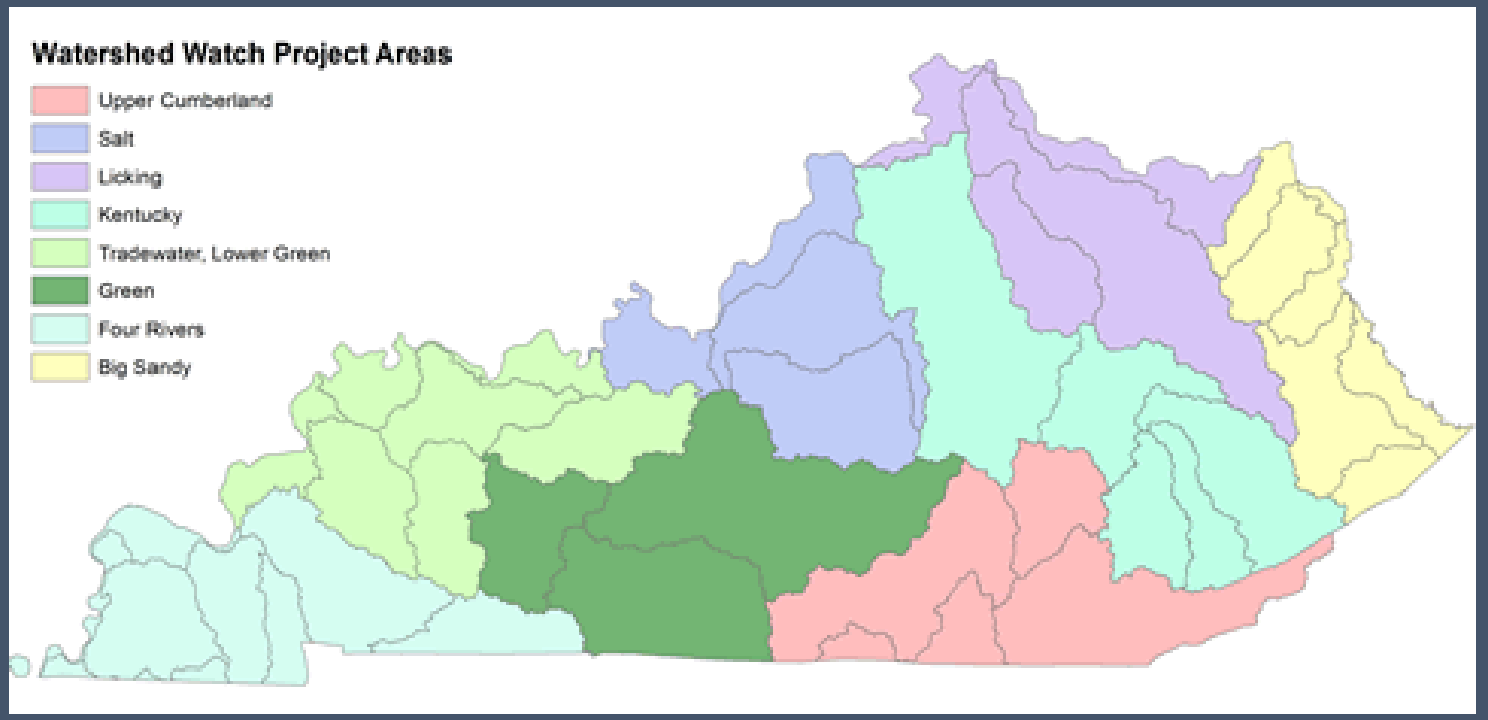
Four Rivers Watershed Watch

What is WWKY?

- **Mission:** support a citizens monitoring effort to improve and protect water quality by raising community awareness and supporting implementation of the goals of the Clean Water Act and other water quality initiatives
- **Purpose:** coordinate and advise the basin groups across the state, supporting citizen scientists by providing the necessary tools to collect and interpret their data
- Made up of representatives from each basin and from our three founding partners (Kentucky Division of Water, Kentucky Waterways Alliance, and Sierra Club)

WATERSHED WATCH IN KENTUCKY

What is WWKY?



- Creates a common agenda for the eight basin groups, setting the standards for engagement with volunteers across the state, and coordinating with partnering organizations that promote clean water in Kentucky

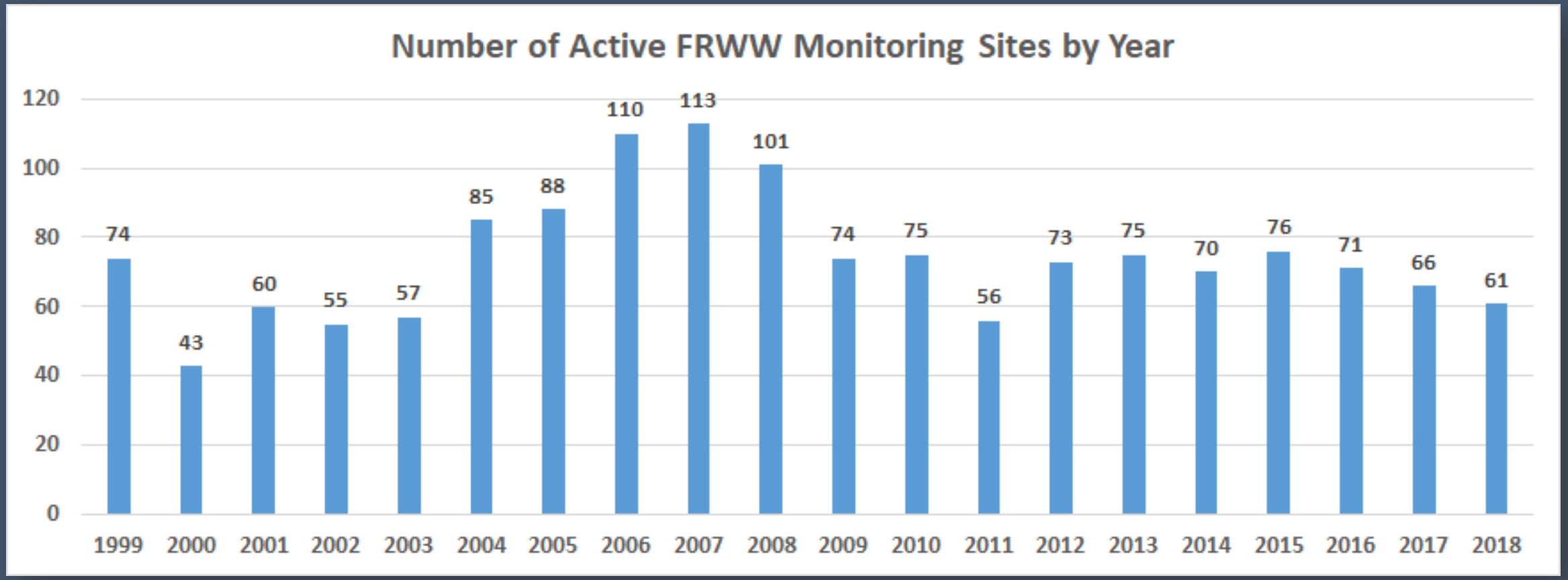
WATERSHED WATCH IN KENTUCKY

WWKY Committees

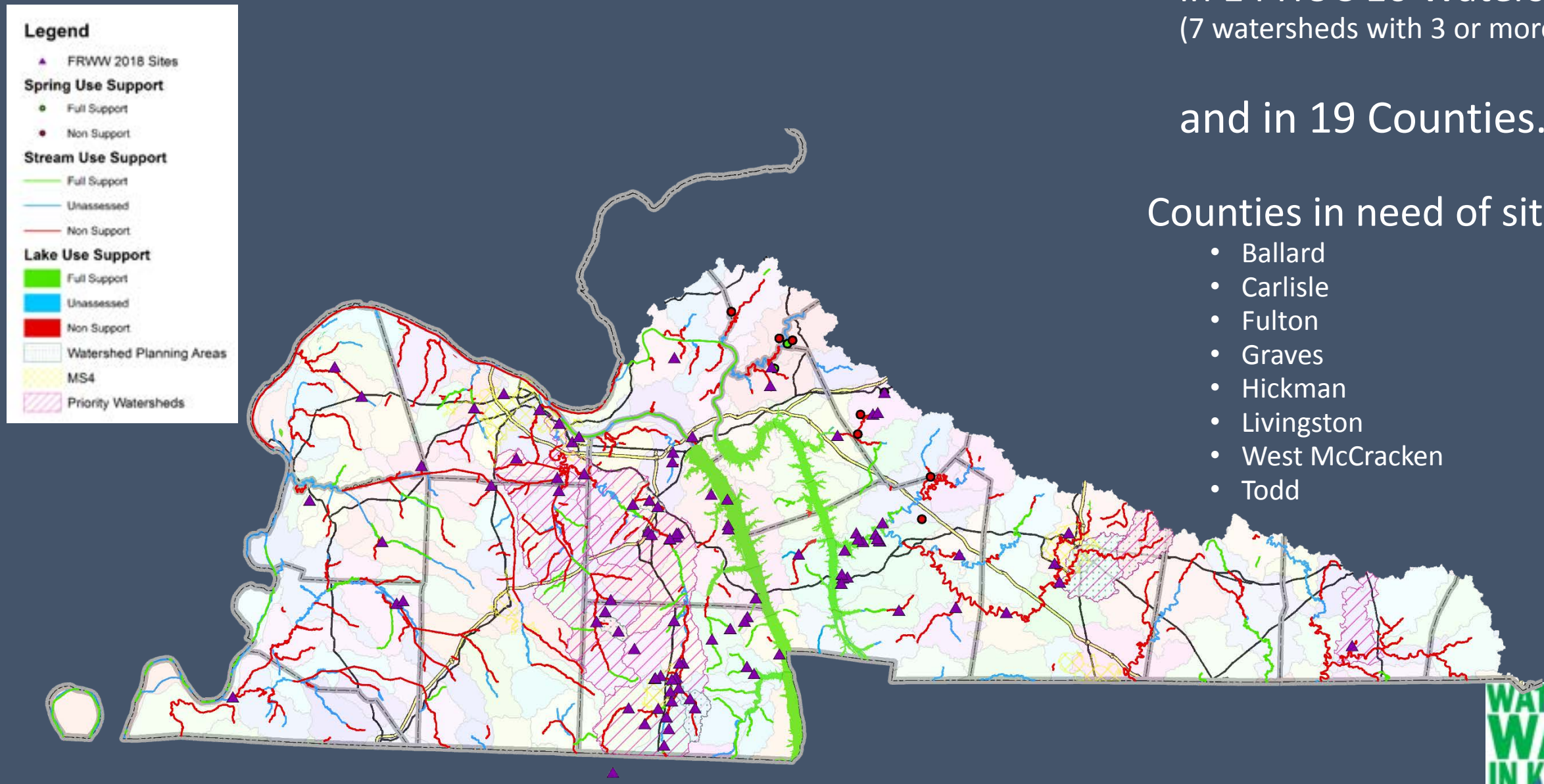
- Finance Committee
- Organizational Operations Committee
- Basin Support Committee
- Outreach Committee
- Citizen Action Committee
- Science Advisory Committee

We are always looking for representatives from each basin to serve on these committees!

Sampling Sites by Year



2018 Active Sites



61 sites sampled…

in 14 HUC 10 Watersheds
(7 watersheds with 3 or more sites)…

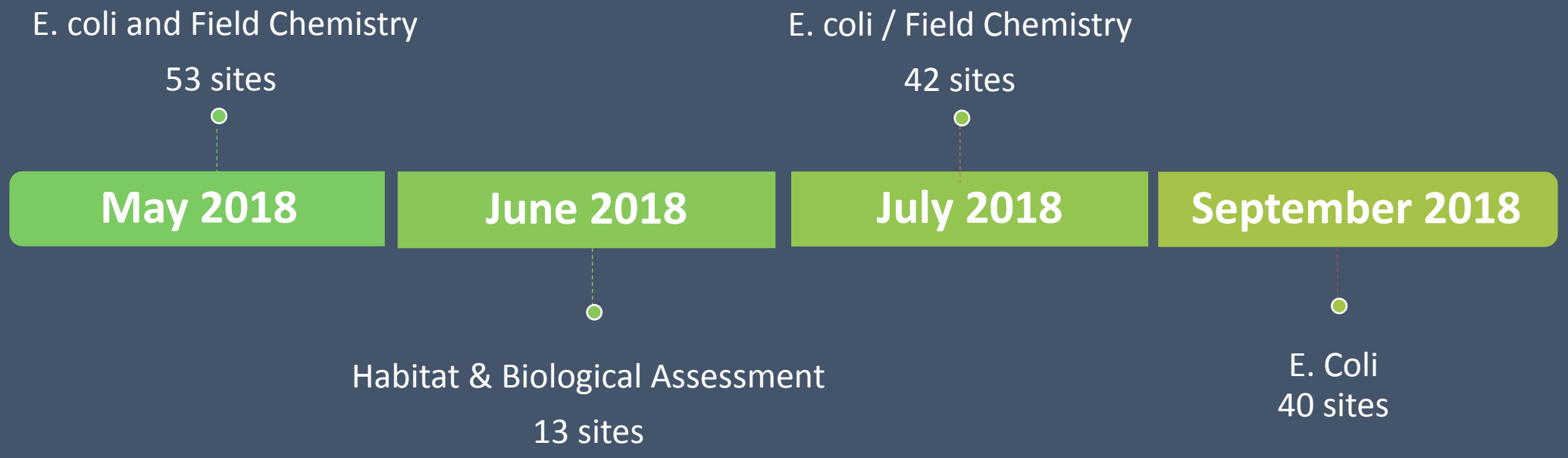
and in 19 Counties.

Counties in need of sites:

- Ballard
- Carlisle
- Fulton
- Graves
- Hickman
- Livingston
- West McCracken
- Todd

WATERSHED WATCH IN KENTUCKY

2018 Sampling Overview



WATERSHED WATCH IN KENTUCKY

Streams are constantly changing

GRAB SAMPLE & FIELD CHEMISTRY

- Instantaneous water quality
- Quick process
- Specific pollutant analysis

VS.

BIOLOGICAL & HABITAT ASSESSMENT

- Water quality over time
- Takes more time
- Collective pollution indication

WATERSHED WATCH IN KENTUCKY

Field Parameters

This good quality stream has higher dissolved oxygen, lower temperature and balanced pH.

Why?? Shade, riparian (stream side) vegetation, stable stream banks, low nutrients.

Dissolved Oxygen

pH

Temperature

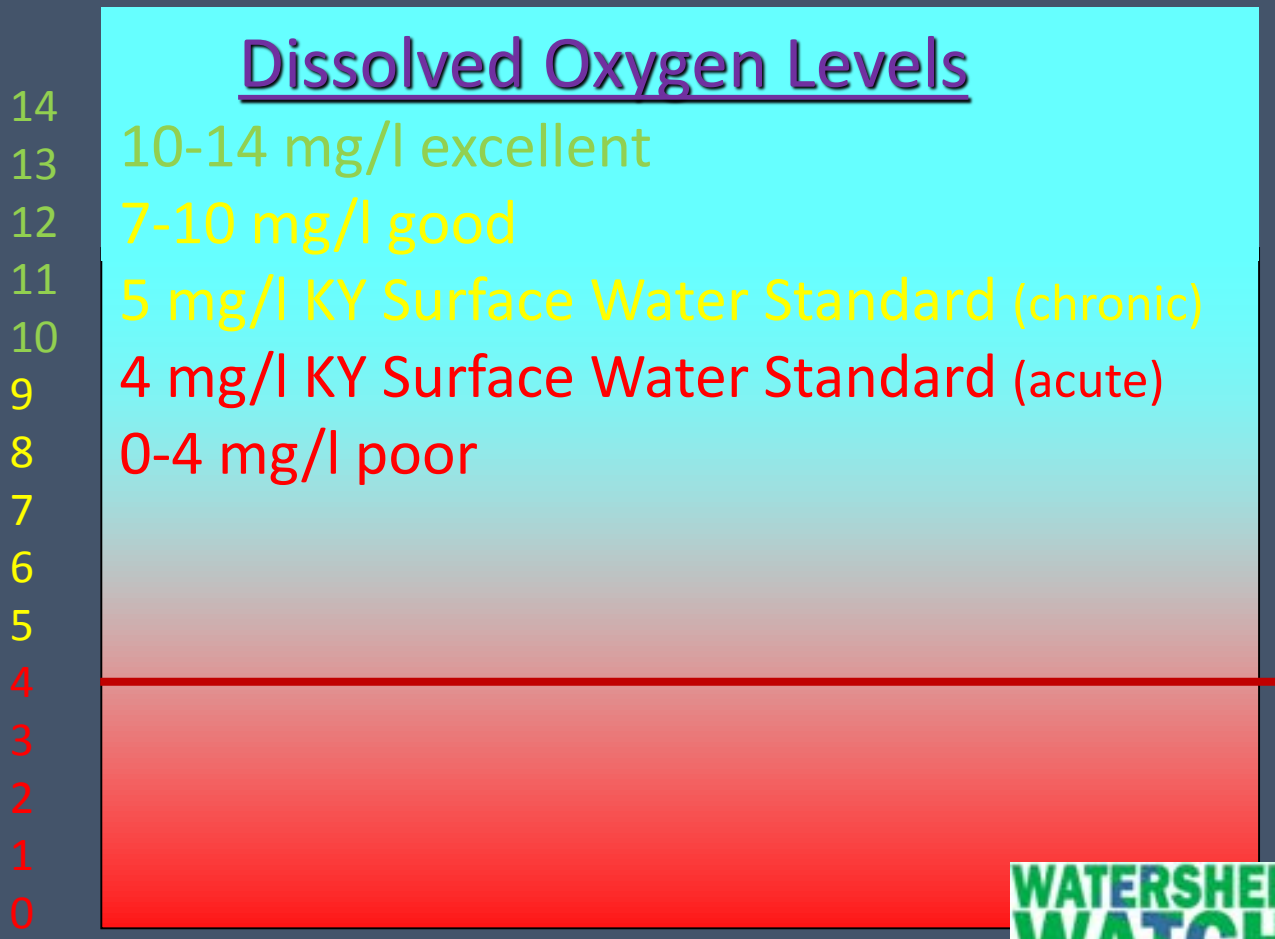
Conductivity

WATERSHED WATCH IN KENTUCKY

Why Monitor Dissolved Oxygen?

- Essential for aquatic life – fish, aquatic insects
- KY Criteria:
  - Instantaneous: greater than or equal to 4.0 milligrams per liter, mg/l (or parts per million, ppm)
  - 24-hour Average: greater than or equal to 5.0 mg/l
- WWKY data compared to **instantaneous criteria (4.0 mg/l)**

KY Criteria: 401 KAR 10:031
http://www.lrc.ky.gov/kar/401/010/031.htm



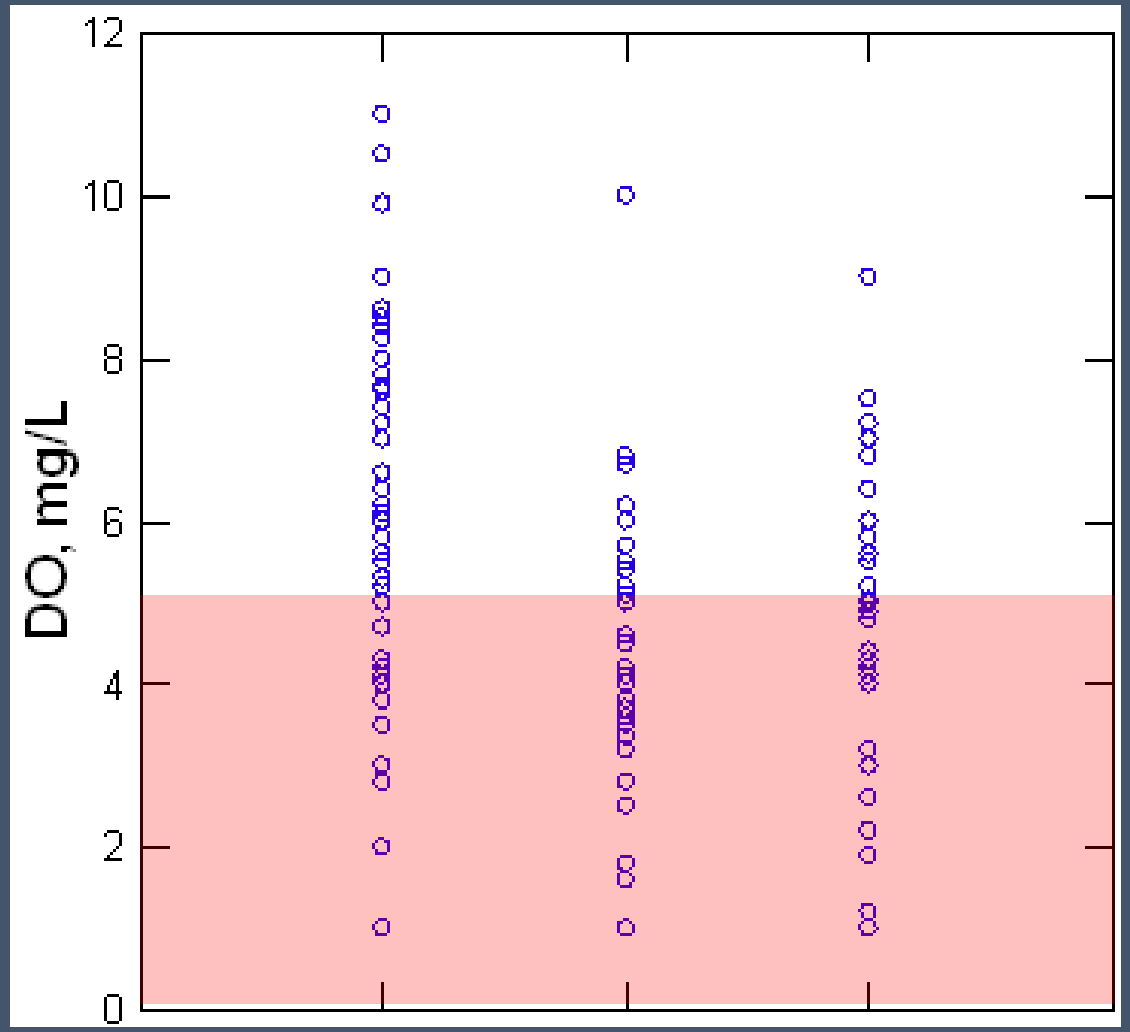
WATERSHED WATCH IN KENTUCKY

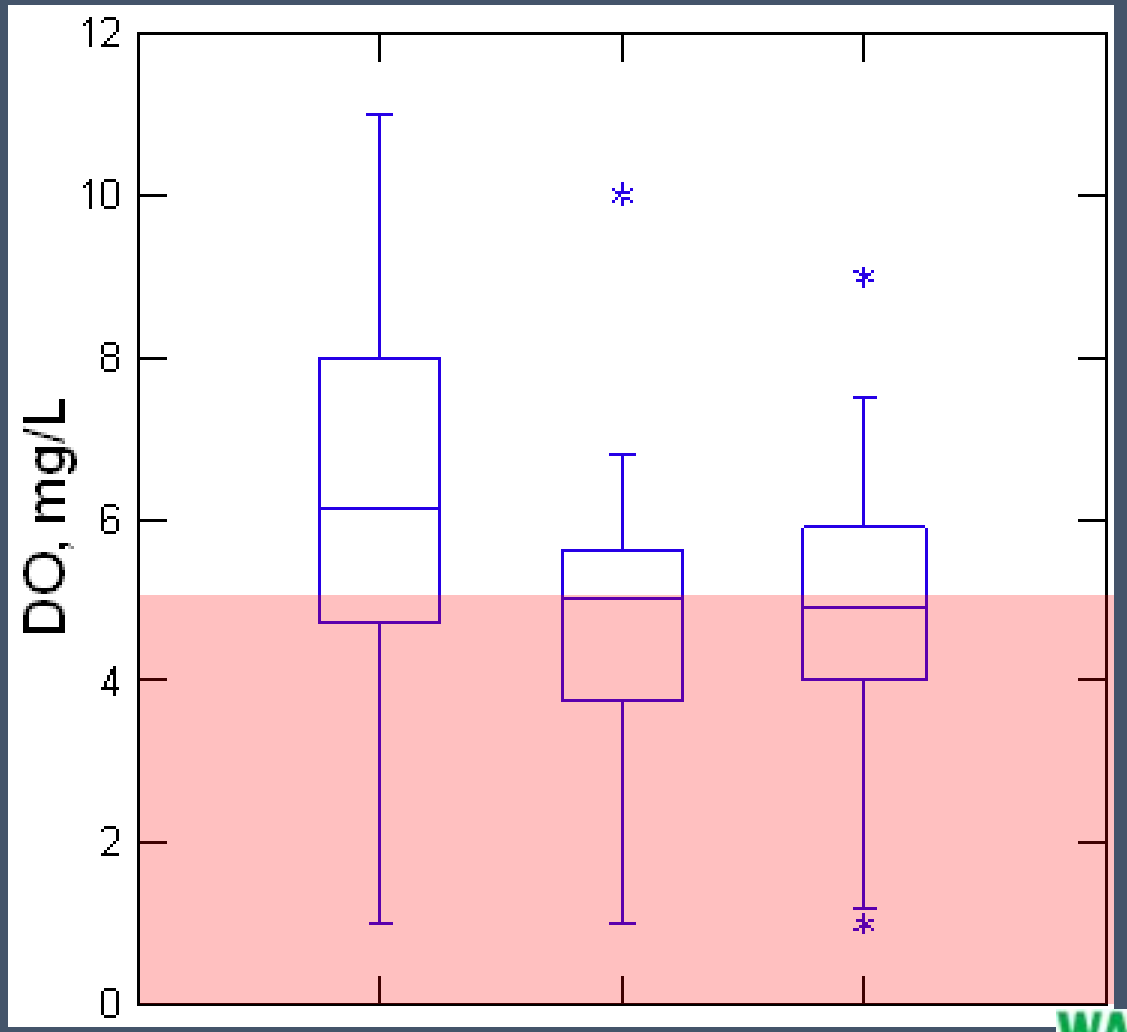
What Can Lower Dissolved Oxygen?

- Presence of oxygen demanding substances (biodegradable organic matter) in the water
- Nutrients from farm fields or urban areas
- Lack of shade

WATERSHED WATCH IN KENTUCKY

2018 FRWW Dissolved Oxygen Results





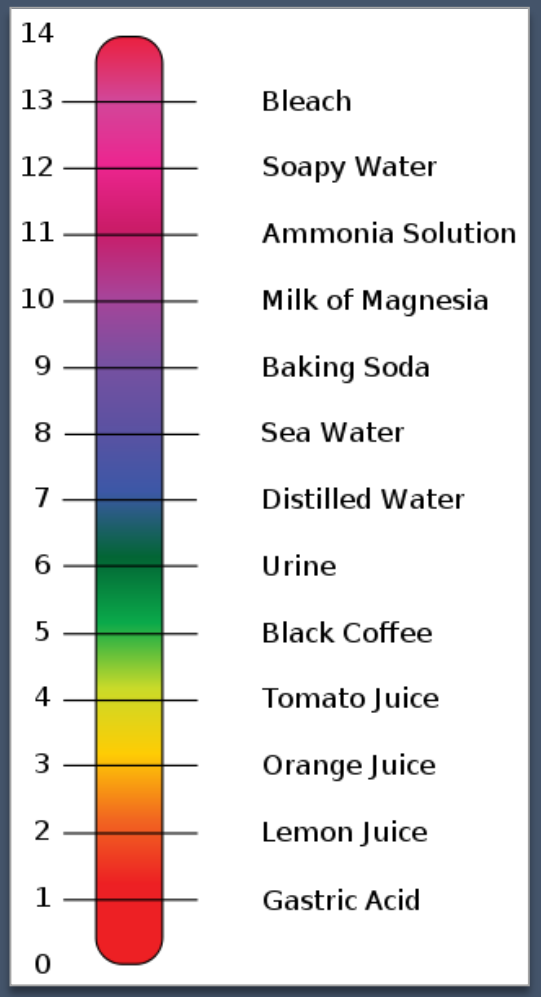
WATERSHED WATCH IN KENTUCKY

DO Spotlight

- ~80% of samples met DO Criteria (i.e. DO>4mg/L)
- Sites of Interest:
    - 241 – Bayou de Chien
    - 281 – East Fork Clarks River
    - 308 – Clayton Creek
    - 311 – Lake Barkley
    - 314 – Bee Creek
    - 322 – Little River
    - 329 – Lake Barkley
    - 330 – Little River
    - 331 – Little River
    - 366 – East Fork Clarks River
    - 386 – Camp Creek
    - 408 – Clarks River
    - 3175 – East Fork Clarks River
    - 3185 – Crab Creek
    - 3637 – Chestnut Creek
    - 3731 – East Fork Clarks River

WATERSHED WATCH IN KENTUCKY

Why Monitor pH?



- Measure of acidity or alkalinity
- Scale of 0-14
  - 0 - strong acid
  - 7 – neutral
  - 14 – strong base
- Water outside neutral range of 6-9 pH units may be harmful to aquatic plants & animals
- Acidic water (low pH) may increase the toxicity of some metals
- KY Water Quality Criteria requires water pH between **6 and 9 pH units**

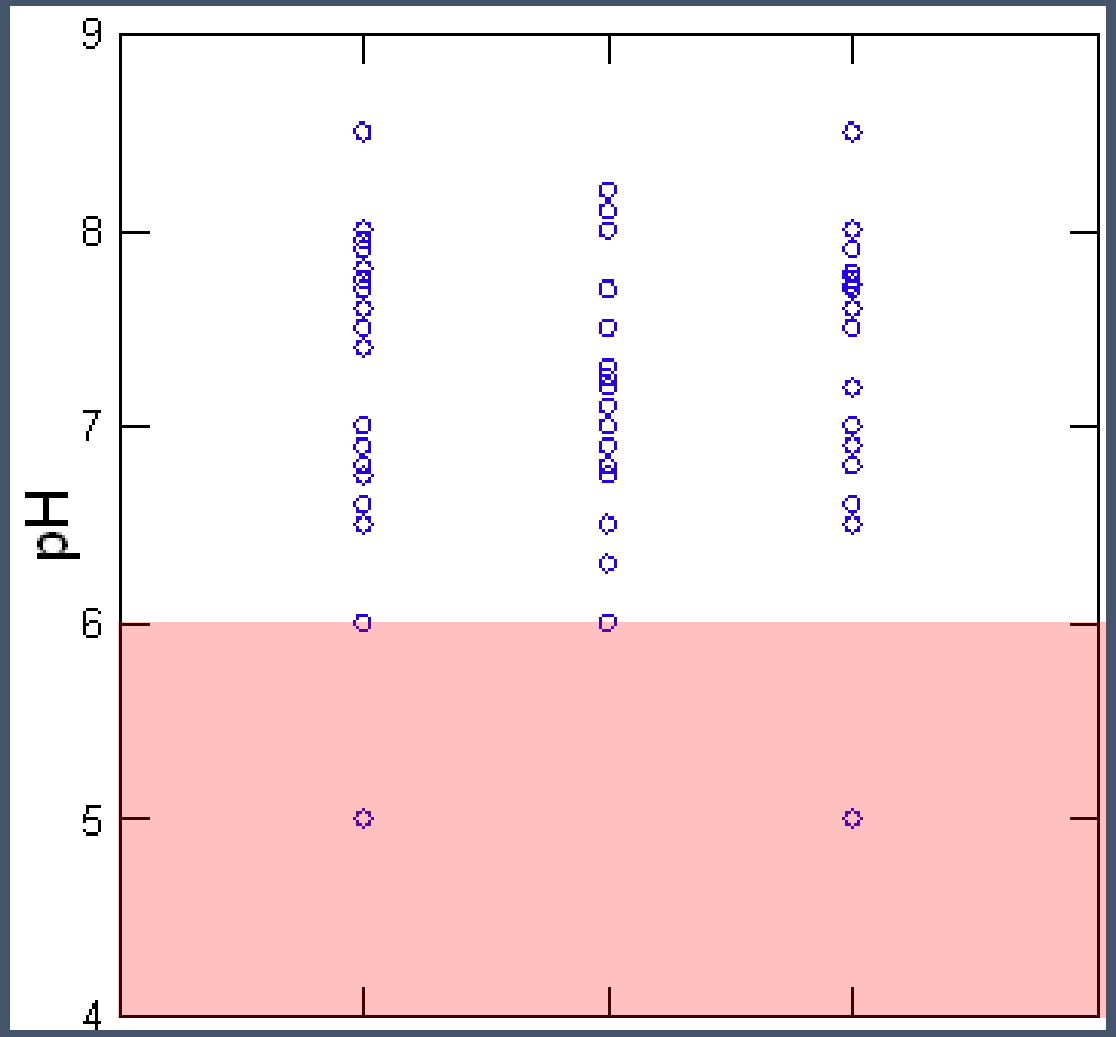
WATERSHED WATCH IN KENTUCKY

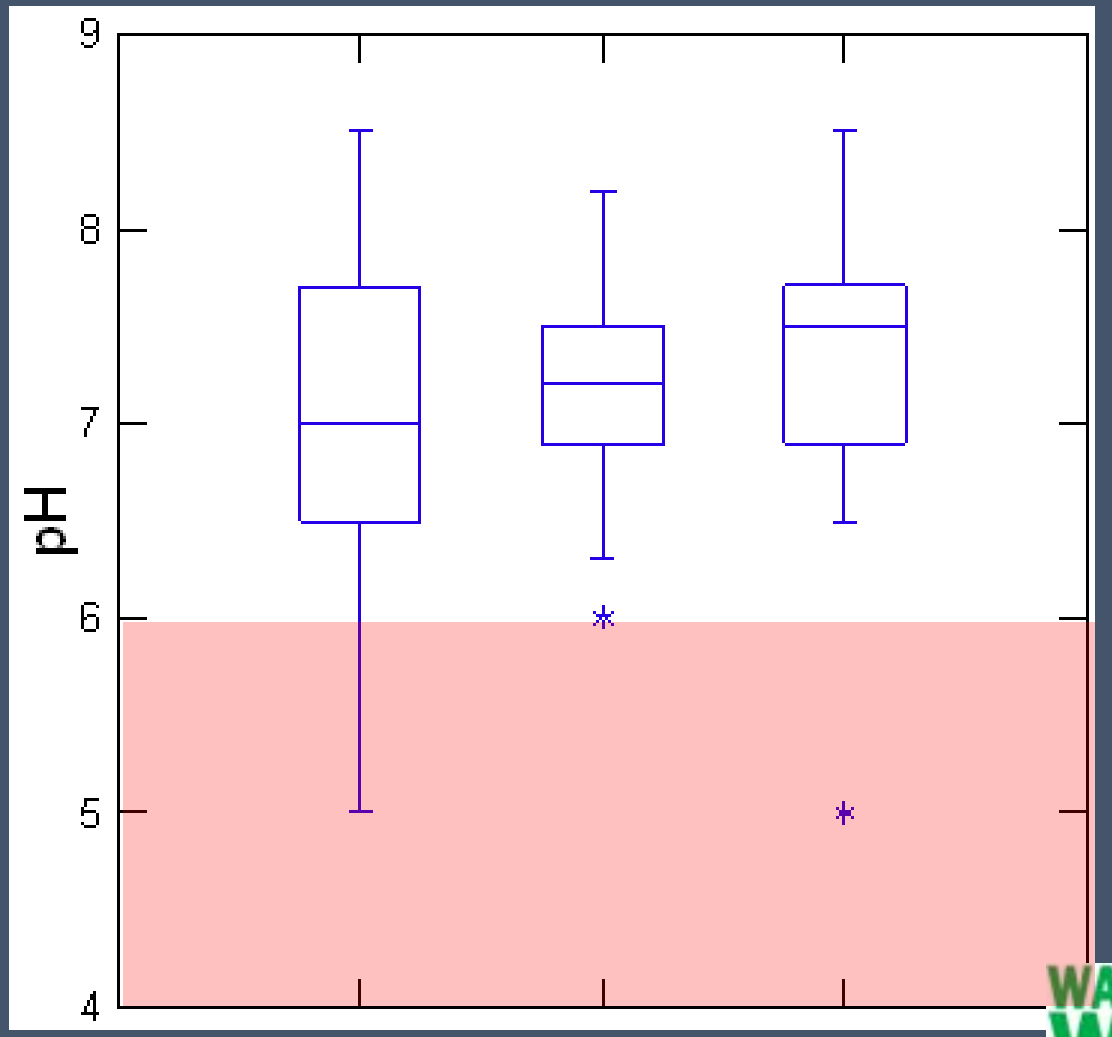
What Affects pH?

- Natural variations because of photosynthesis (increases pH) and respiration/decomposition (decreases pH)
- Acid rain
- Agricultural runoff (lime)

WATERSHED WATCH IN KENTUCKY

2018 FRWW pH Results





WATERSHED WATCH IN KENTUCKY

pH Spotlight

- ~93% of samples met pH critera (between 6 and 9)
- Sites of Interest:
  - 273 – West Fork Mayfield Creek
  - 322 – Little River
  - 372 – Hopson Creek

Why monitor water temperature?

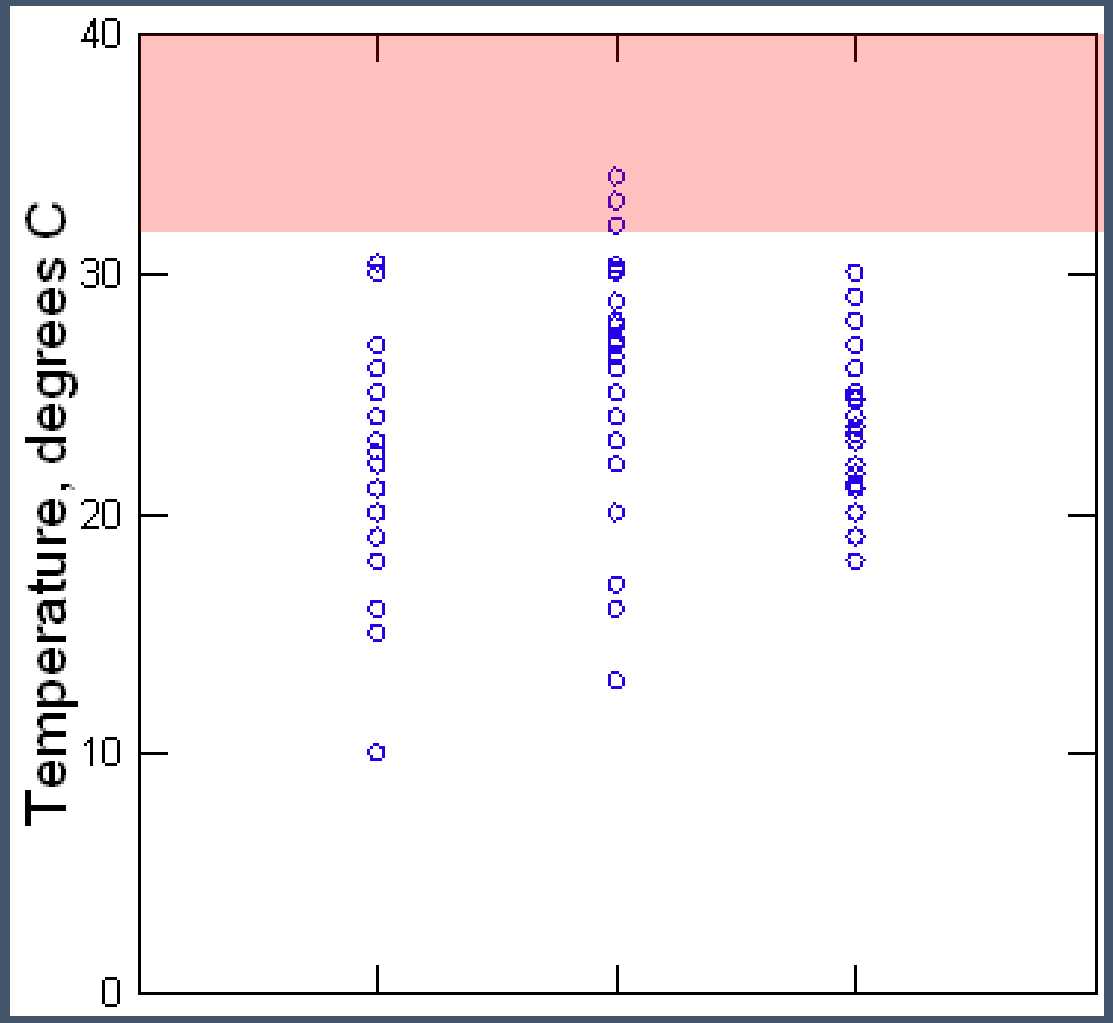
- Celsius scale:
  - 0 °C is the freezing point for water
  - 100 °C is the boiling point
- Cooler water can hold more dissolved oxygen, which is good for fish and other aquatic life
- Hot water sources:
  - Streams that lack riparian forest or vegetation
  - Runoff from hot parking lots or other hard surfaces
  - Thermal discharges from power plants
- KY Water Quality criteria requires water temperature to be less than **31.7 ° C (89 ° F)**

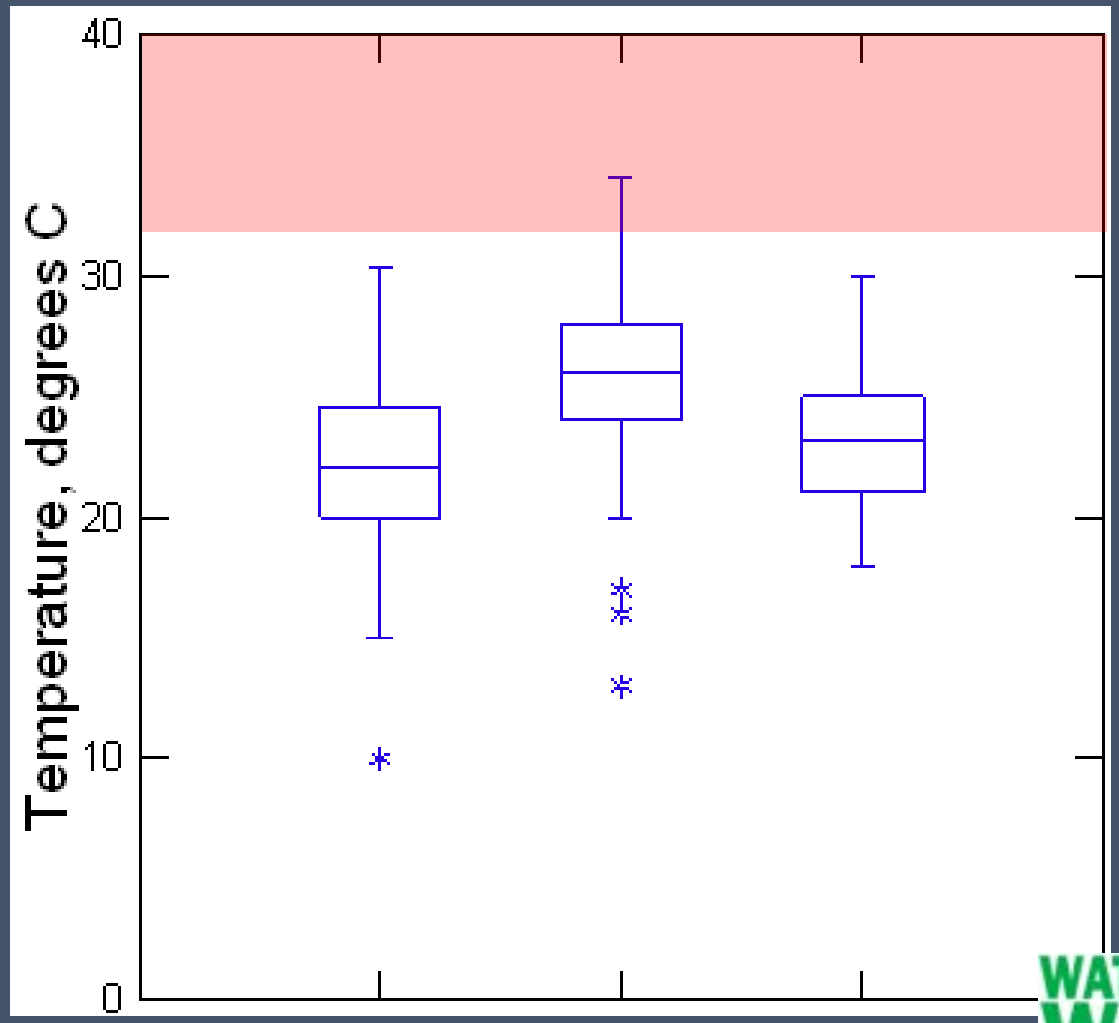
What Affects Temperature?

- Industrial discharges
- Runoff from impervious surfaces
- Lack of shade along streams

WATERSHED WATCH IN KENTUCKY

2018 FRWW Temperature Results





WATERSHED WATCH IN KENTUCKY

Temperature Spotlight

- ~98% of samples met temperature criteria (<31.7°C)
- Sites of Interest:
  - 241 – Bayou de Chien

Why monitor conductivity?

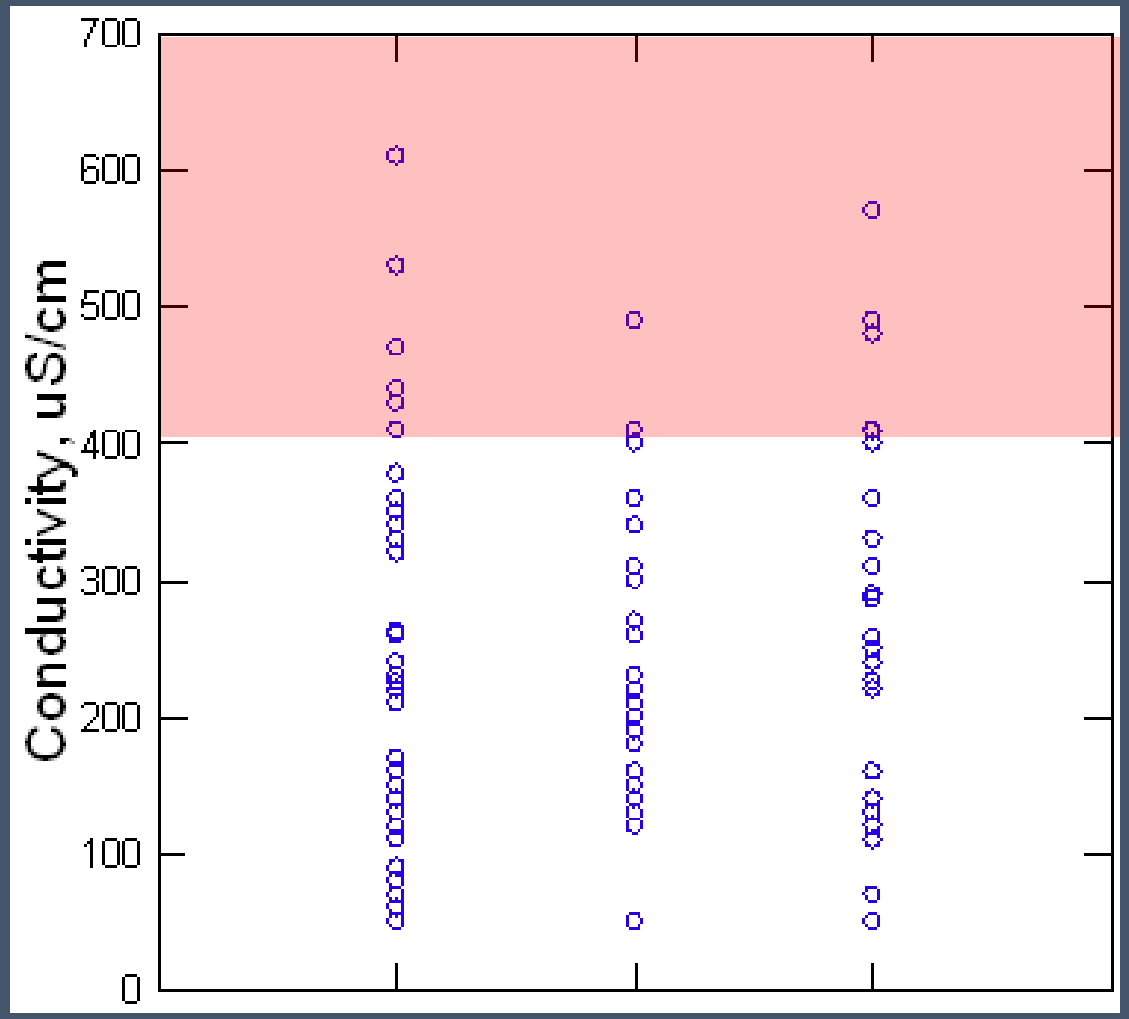
- Measure of ability of water to conduct electricity
- Higher dissolved salts results in higher conductivity
- Sources:
  - Wastewater treatment facility effluent
  - Industrial wastewater effluent
  - Road salts
  - Acid mine drainage
- Narrative KY criterion prohibits change that harms aquatic life
- FRWW generally uses a benchmark of 400 us/com

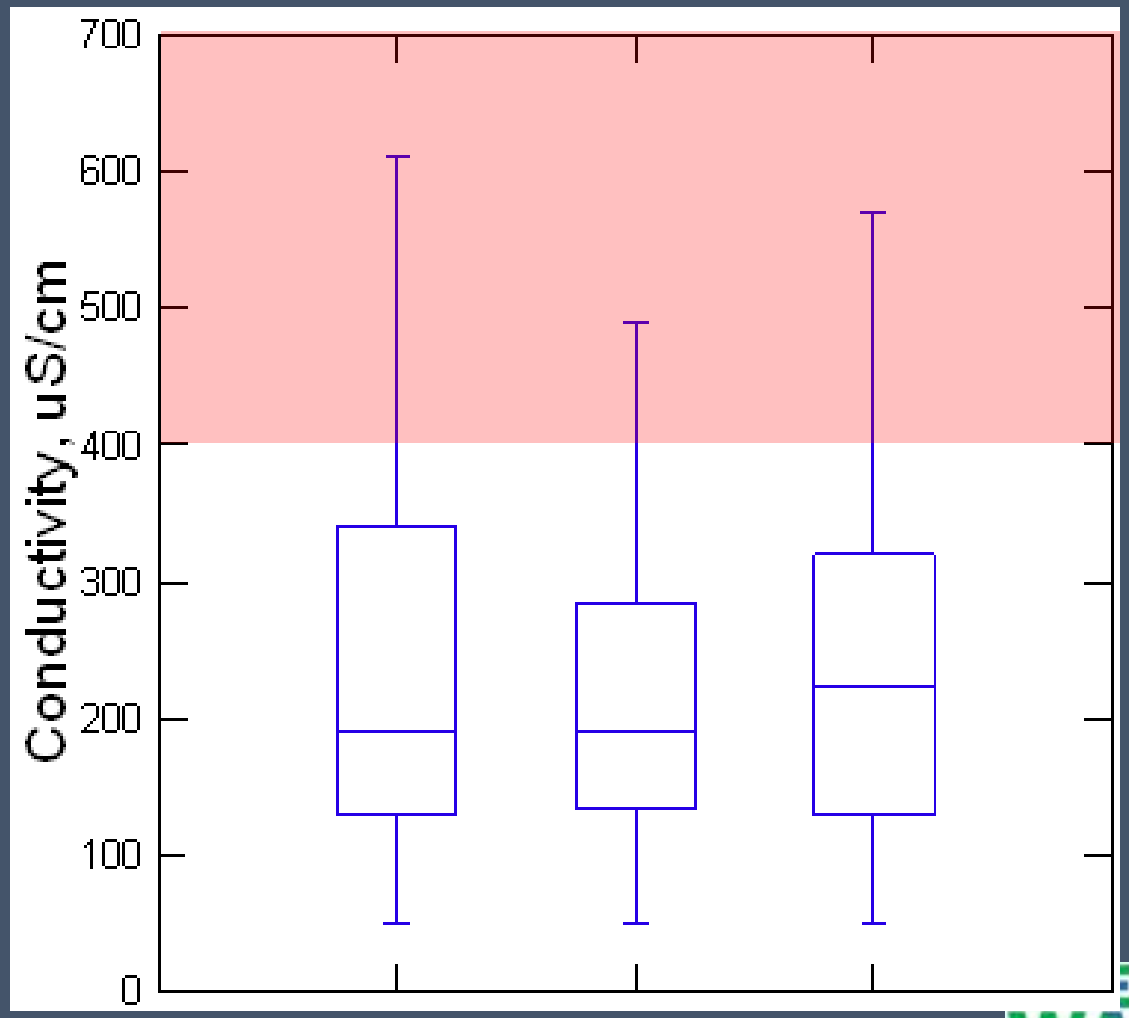
What Can Affect Conductivity?

- Parking lot runoff
- Industrial discharges
- Failing septic systems
- Temperature

WATERSHED WATCH IN KENTUCKY

2018 FRWW Conductivity Results





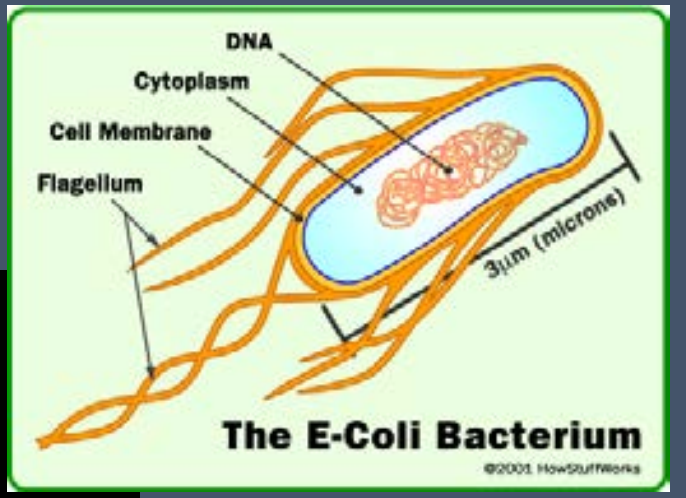
ERSHED WATCH IN KENTUCKY

Conductivity Spotlight

- ~98% of samples met temperature benchmark (<400uS/cm)
- Sites of Interest:
  - 235 – Humphrey Creek
  - 2908 – Princeton Spring
  - 2965 – Eddy Creek
  - 3637 – Chestnut Creek

Why Monitor Bacteria?

- Live in the intestines of warm-blooded animals and are passed in fecal material
- Indicate the presence of animal or human fecal material
- May indicate the presence of disease causing organisms



WATERSHED WATCH IN KENTUCKY

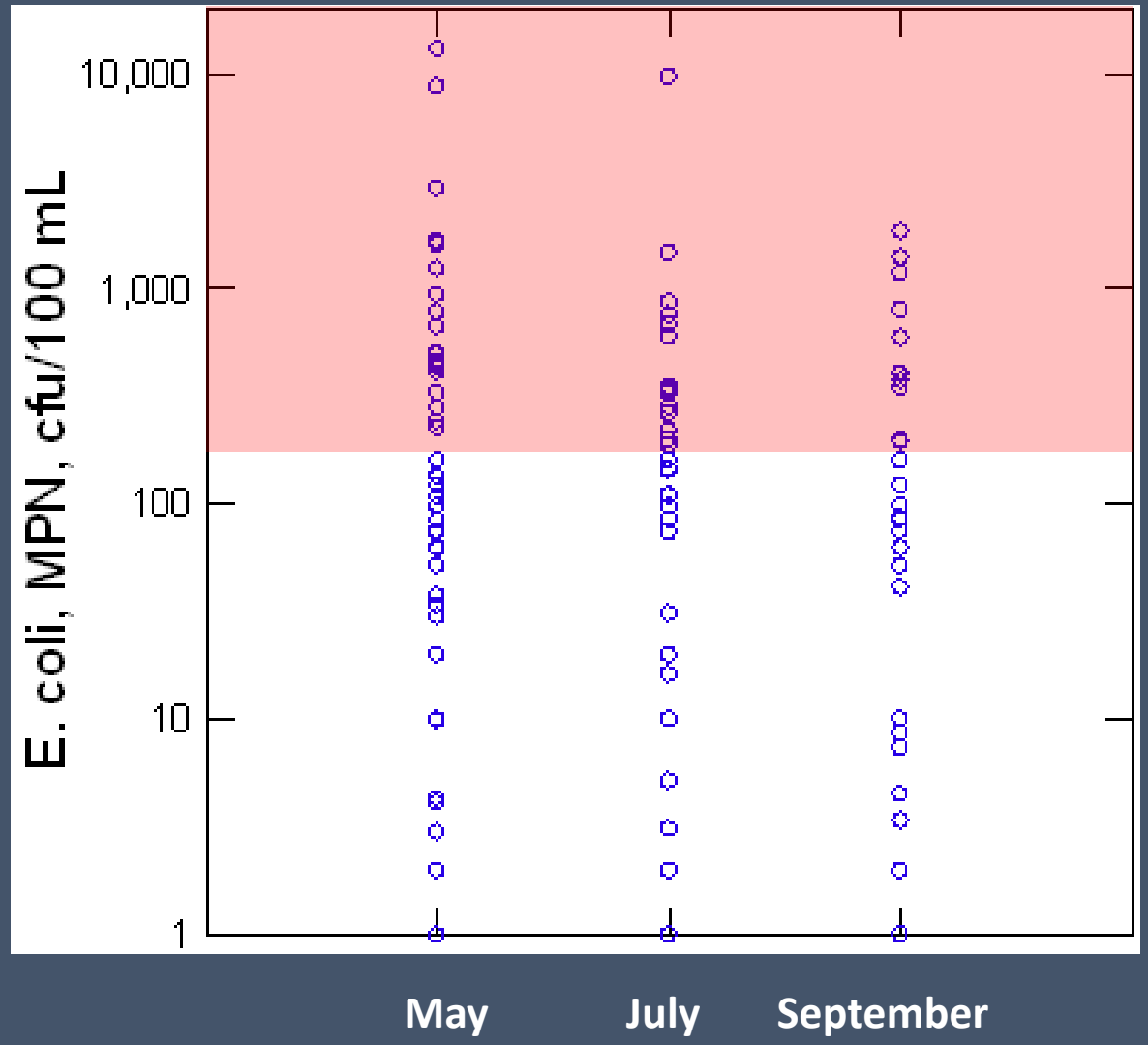
Sources of E. coli

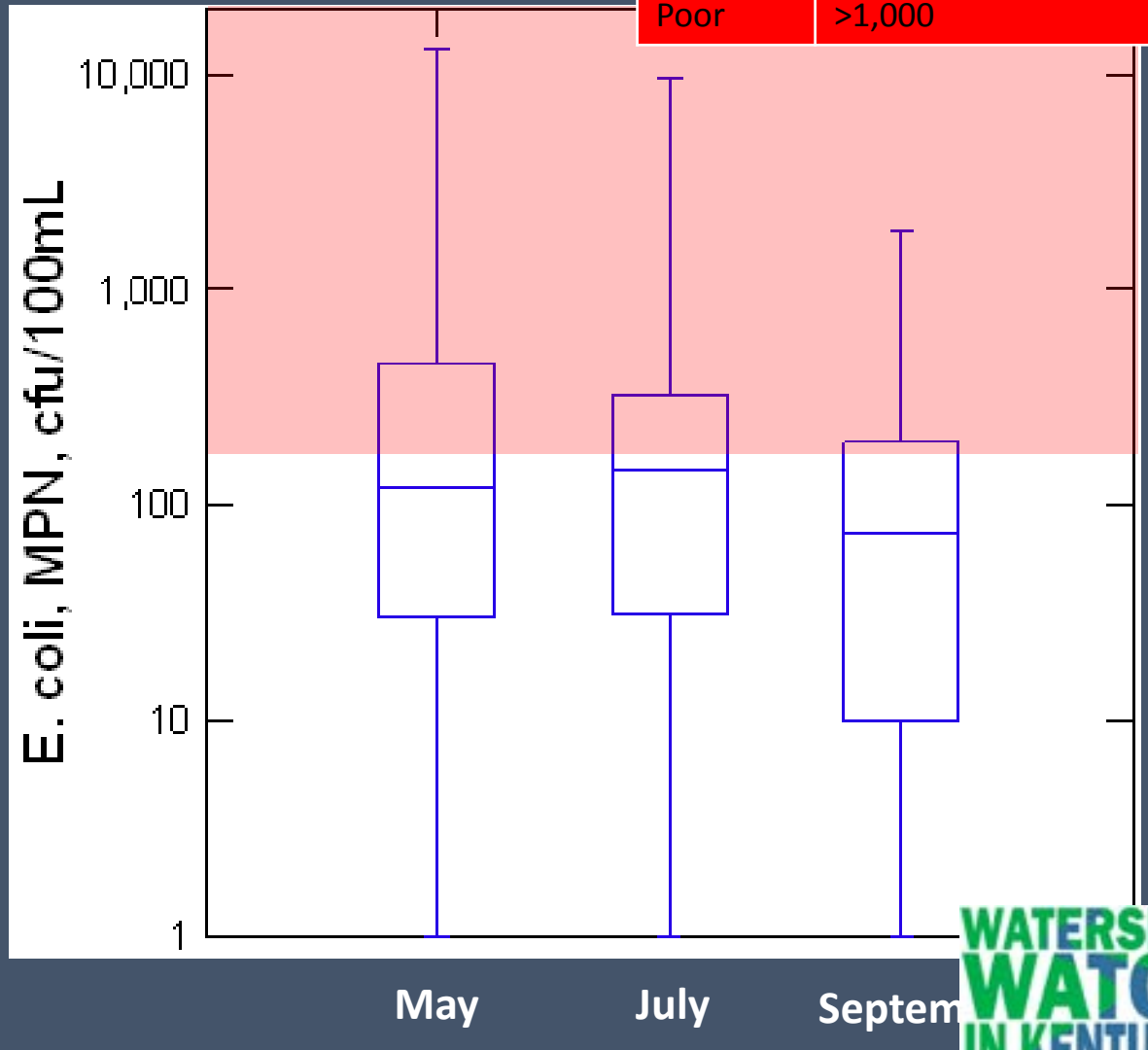
- Potential Animal sources:
  - wildlife
  - pets
  - livestock
- Potential Human sources:
  - sanitary sewer overflows (SSOs)
  - combined sewer overflows (CSOs)
  - leaking sewer lines
  - failing wastewater treatment plant
  - sewer lines connected to stormwater lines
  - failing or inappropriately located septic systems
  - straight pipes
  - stormwater outfalls

WATERSHED WATCH IN KENTUCKY

2018 FRWW E. coli Results

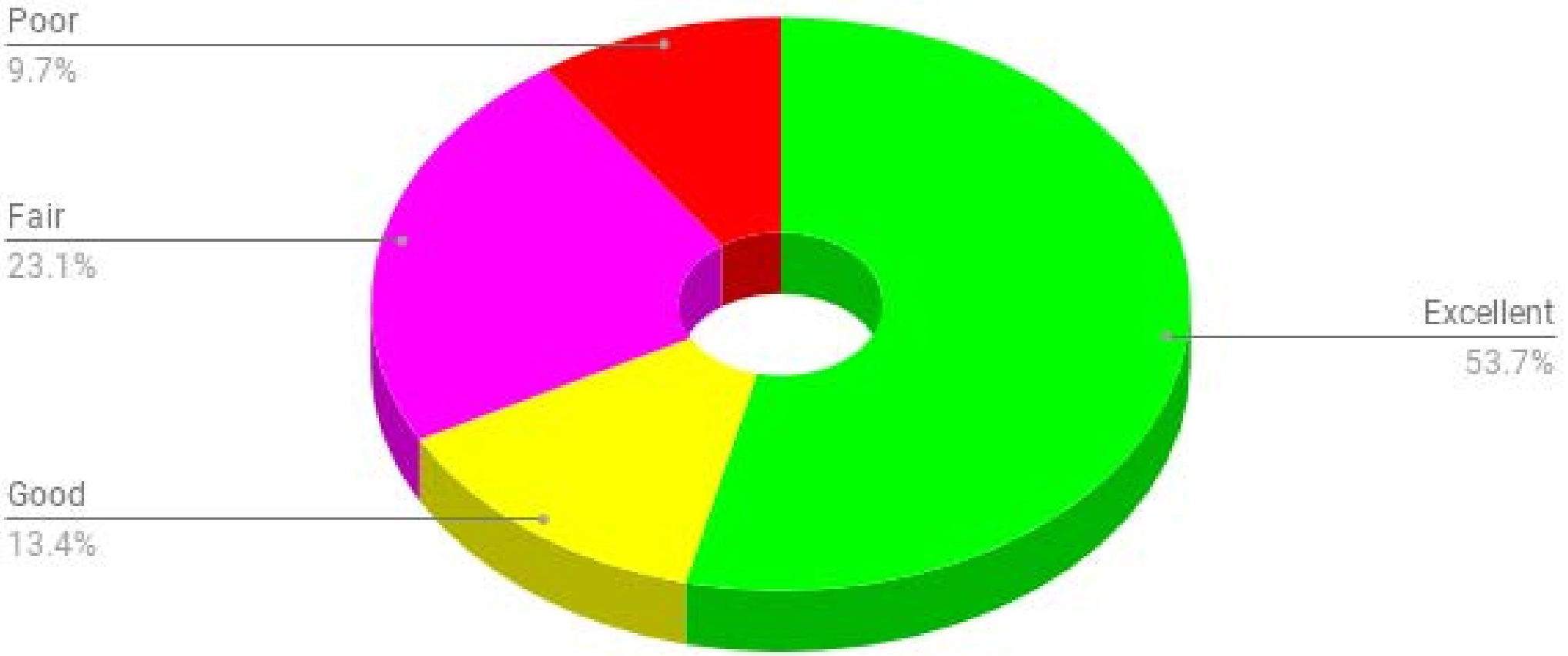
Category	E. coli Concentration (CFU/100mL)
Excellent	<130
Good	130 – 240
Fair	241 – 1,000
Poor	>1,000

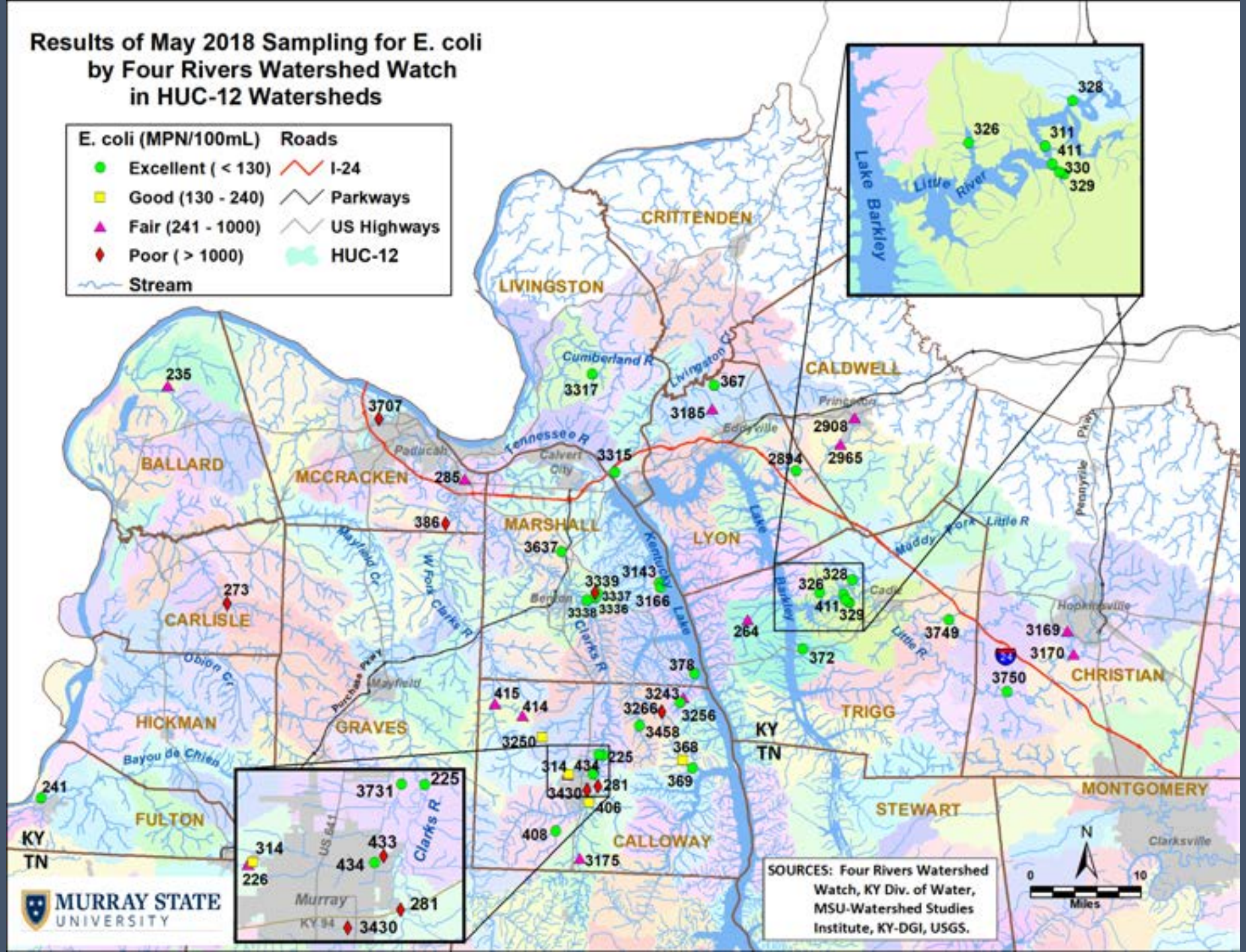




WATERSHED WATCH IN KENTUCKY

2018 FRWW E. coli Samples by Category




Results of May 2018 Sampling for E. coli
by Four Rivers Watershed Watch
in HUC-12 Watersheds
E. coli (MPN/100mL)
Excellent (< 130)
Good (130 - 240)
Fair (241 - 1000)
Poor (> 1000)
Stream
Roads
I-24
Parkways
US Highways
HUC-12
CRITTENDEN
LIVINGSTON
CALDWELL
BALLARD
MCCRACKEN
MARSHALL
LYON
CARLISLE
HICKMAN
GRAVES
TRIGG
CHRISTIAN
FULTON
CALLOWAY
STEWART
MONTGOMERY
KY
TN
Lake Barkley
Little River
Cumberland R
Tennessee R
Livingston Cr
Paducah
Calvert City
Eddyville
Princeton
Hopkinsville
Clarksville
Maryland Cr
W Fork Clarks R
Kentucky Lake
Clarks R
Obion Cr
Mayfield
Purchase Pkwy
Bayou de Chien
Maddy Fork Little R
Pennyrile Pkwy
Cadiz
Murray
KY 94
US 641
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3317
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3185
2908
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285
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MURRAY STATE UNIVERSITY
SOURCES: Four Rivers Watershed Watch, KY Div. of Water, MSU-Watershed Studies Institute, KY-DGI, USGS.
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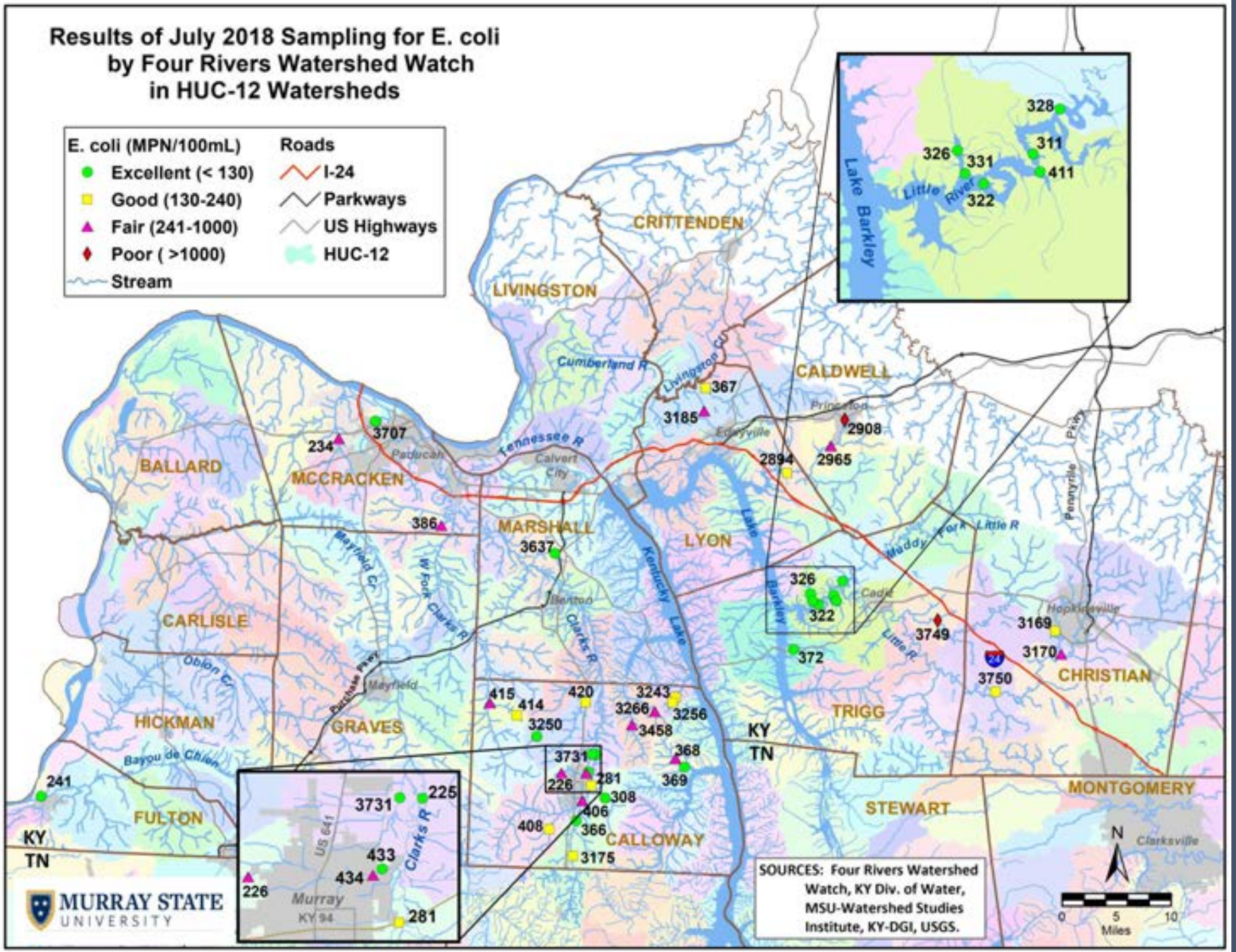
Miles
WATERSHED WATCH IN KENTUCKY


Results of July 2018 Sampling for E. coli
by Four Rivers Watershed Watch
in HUC-12 Watersheds
E. coli (MPN/100mL)
Excellent (< 130)
Good (130-240)
Fair (241-1000)
Poor (>1000)
Stream
Roads
I-24
Parkways
US Highways
HUC-12
CRITTENDEN
LIVINGSTON
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BALLARD
MCCRACKEN
MARSHALL
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STEWART
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Tennessee R
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Hopkinsville
Clarksville
Murray
Mayfield
Benton
Penyrile Pkwy
Purchase Pkwy
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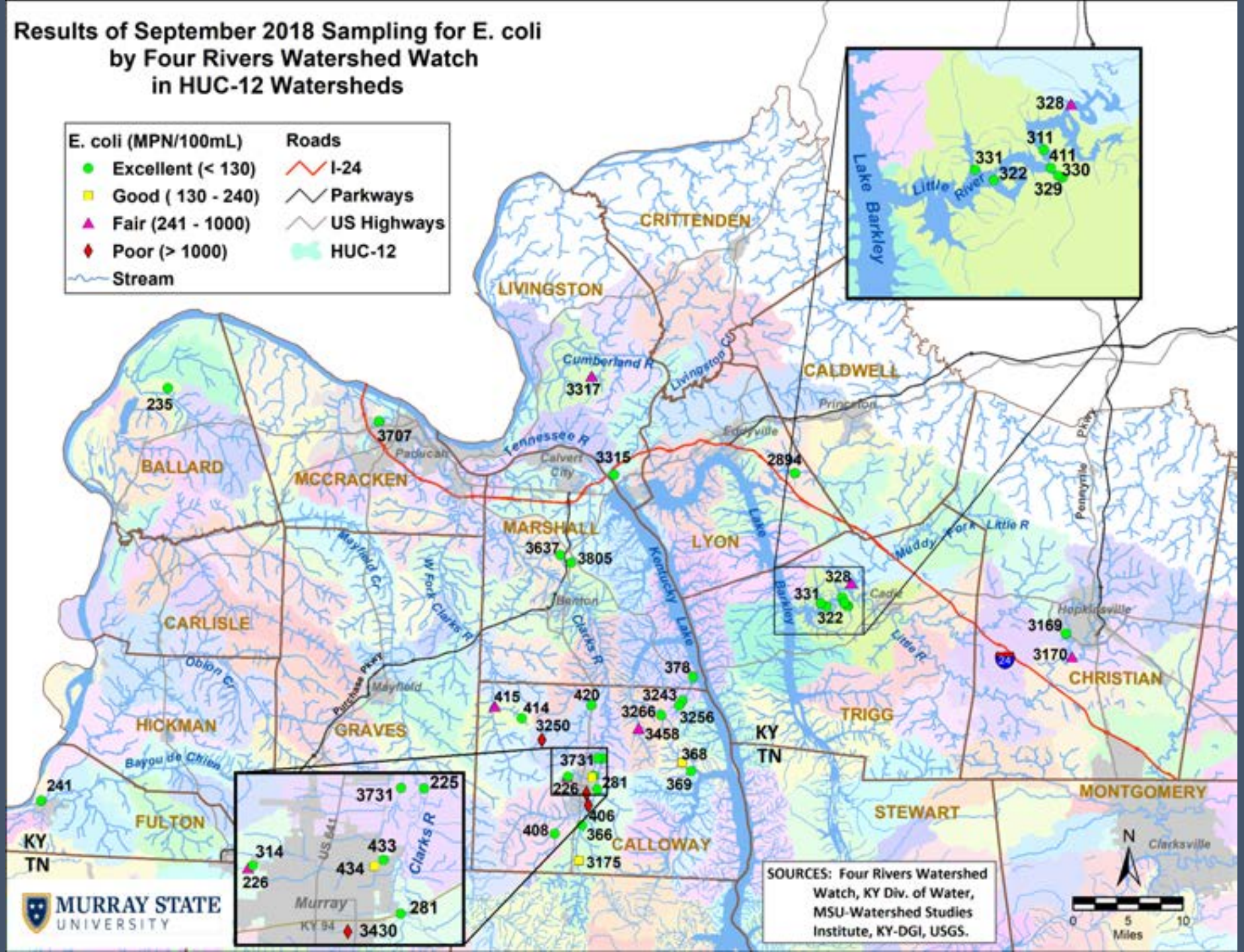
MURRAY STATE UNIVERSITY
WATERSHED WATCH IN KENTUCKY


Results of September 2018 Sampling for E. coli
by Four Rivers Watershed Watch
in HUC-12 Watersheds
E. coli (MPN/100mL)
Excellent (< 130)
Good (130 - 240)
Fair (241 - 1000)
Poor (> 1000)
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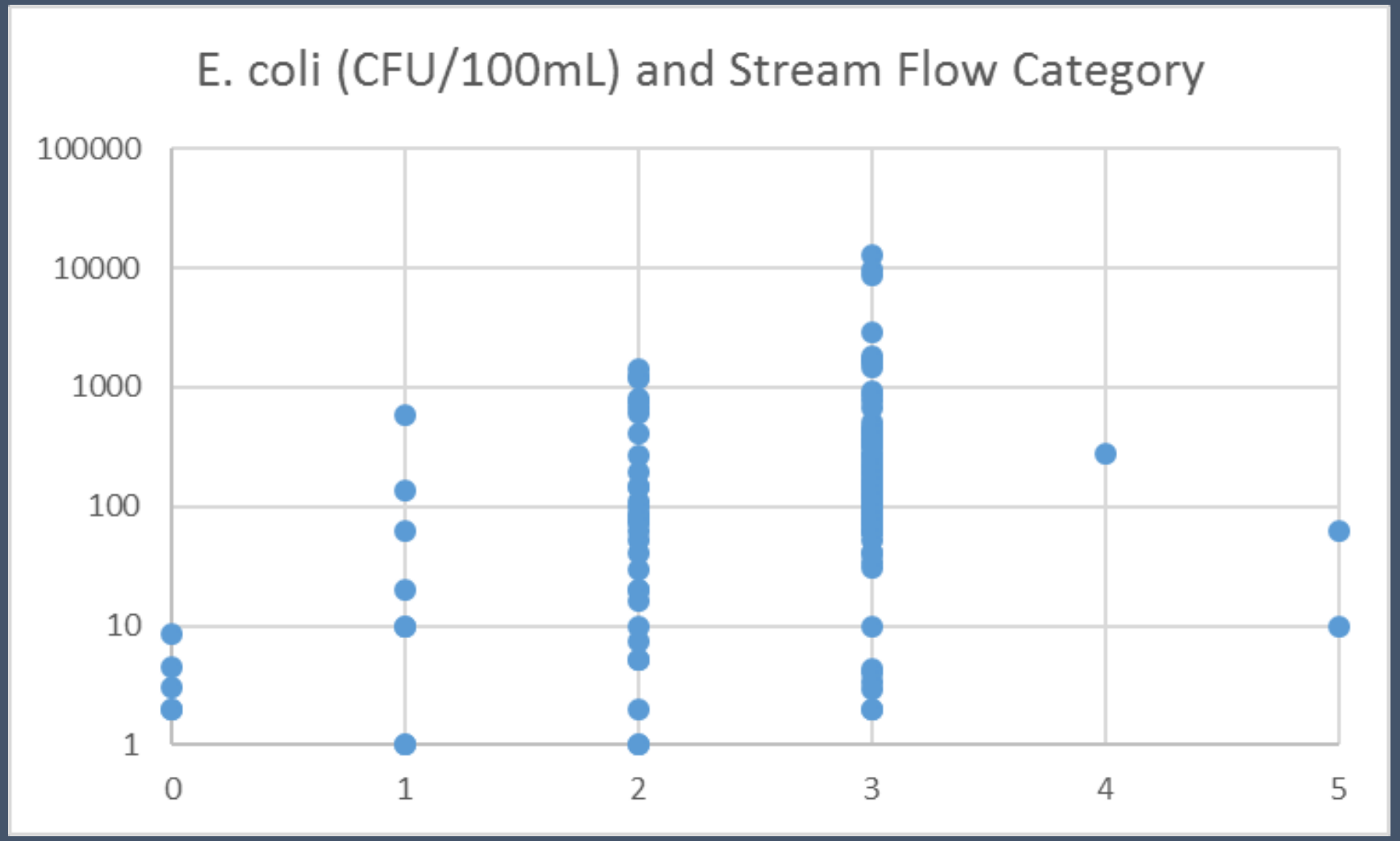
WATERSHED WATCH IN KENTUCKY

E. Coli Is Affected By Flow



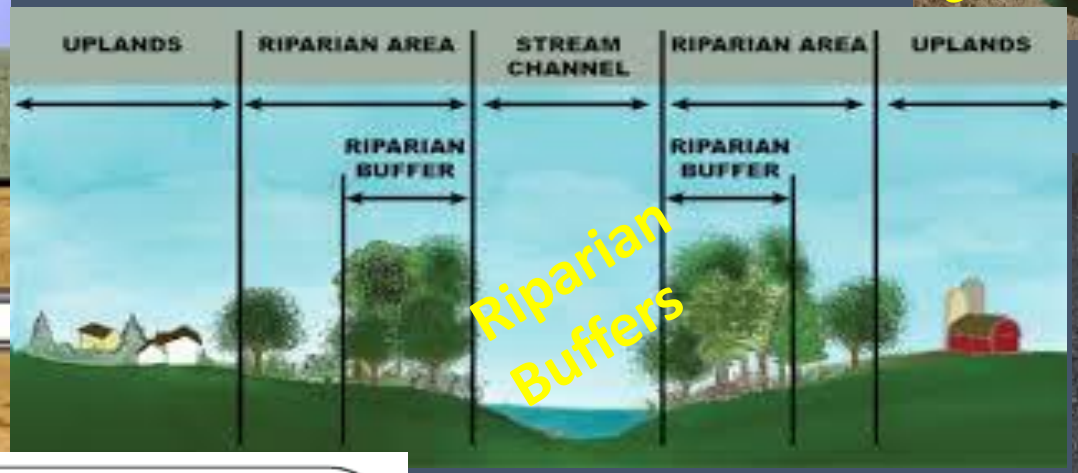
WATERSHED WATCH IN KENTUCKY

E. coli Spotlight

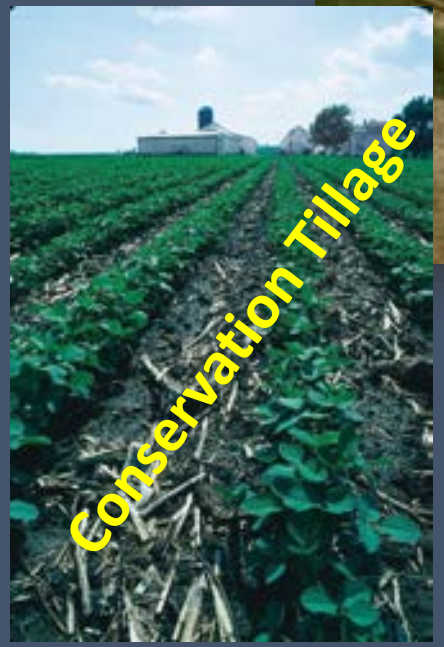
- Sites of Interest:
  - 226 – Bee Creek
  - 235 – Humphrey Creek
  - 273 – West Fork Mayfield Creek
  - 281 – East Fork Clarks River
  - 386 – Camp Creek
  - 406 – Clarks River
  - 415 – Damon Creek
  - 433 – Bee Creek
  - 2908 – Princeton Spring
  - 3170 – North Fork Little River
  - 3185 – Crab Creek
  - 3266 – Little Jonathan Creek
  - 3430 – UT to East Fork Clarks River

WATERSHED WATCH IN KENTUCKY

BMPs for an urban area



BMPs for a rural area



WATERSHED WATCH IN KENTUCKY

Basin Webpage Information

www.4rww.jpf.org

- Home
- About Us
- Schedule of Events
- Sponsors
- Data
- Data Forms
- Resources
- Contact Us

WATERSHED WATCH IN KENTUCKY

Site: 3175 East Fork Clarks River

Single Site (# 3175) Results:

Single Event | Compare Events

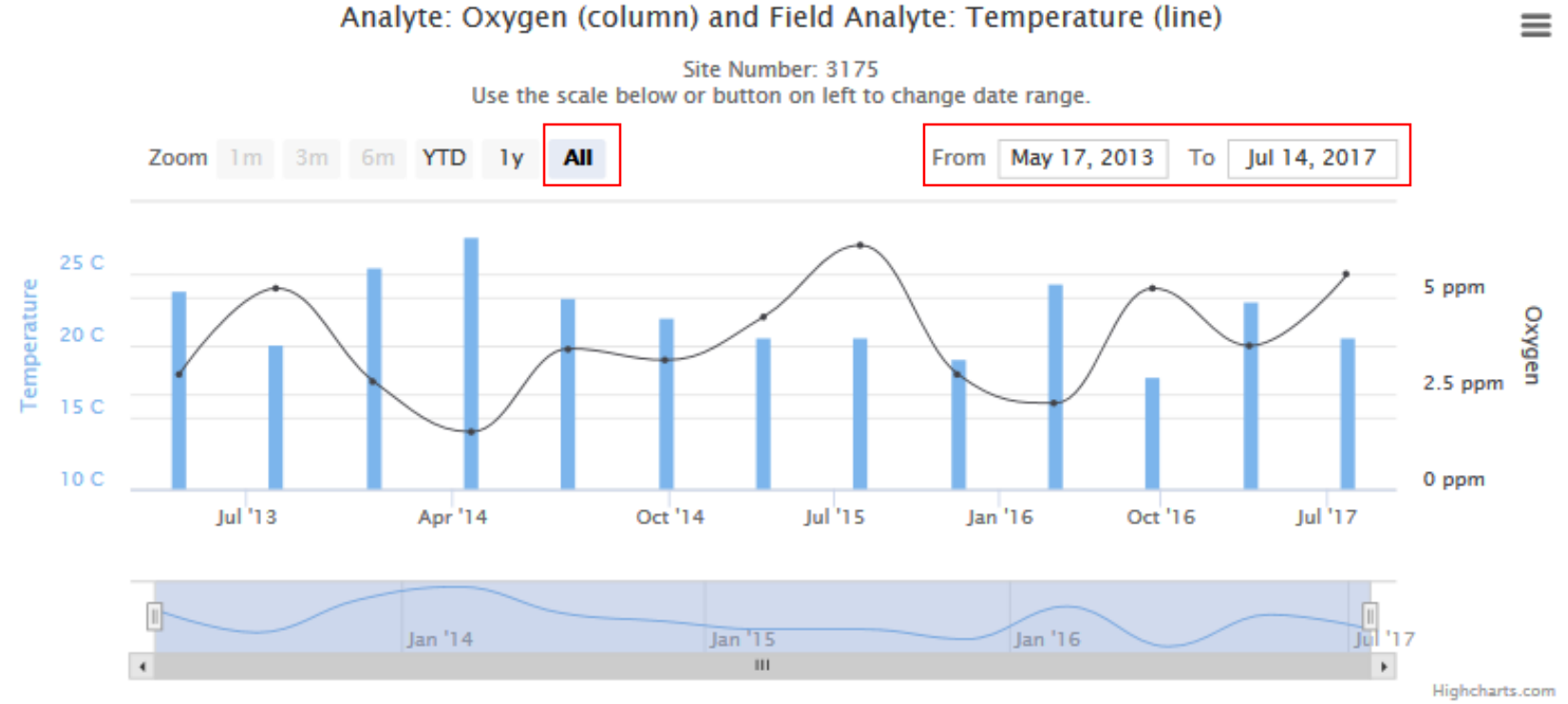
Site: 3175 **Old Site ID:** **Stream Name:** n/a

Location of site is zoomed to in Site Search map above (click "Use a Map" button).

Select a Field Parameter or Analyte (column plot): Dissolved Oxygen (use this to plot a parameter over time)

Optional: Select a Field Parameter to Compare (line): Stream Temperature

Build Graph



http://kgs.uky.edu/wwky/

Summary

- Good news!
  - About 40-50 sites consistently sampled in 2018
  - FRWW expands the monitoring resources of state and local agencies
  - Volunteers doing a great job on COC forms! *
  - Labs (HBS) doing a great job on analysis!
  - Most sites had good or very good water quality for all parameters except E. coli
  - In general, E. coli lower in 2018 than past years

* Dark and clear handwriting really helps!

WATERSHED WATCH IN KENTUCKY

Summary

- The not so good news…
  - E. coli elevated at many sites
  - Dissolved oxygen was low at some sites
- Next Steps
  - Check your chemicals!
  - Compile list of “sites with issues” for further evaluation
    - Refer to KDOW for additional assessment
    - Desktop evaluation of watershed draining to sites with issues using Google Earth / GIS
  - Produce Annual Report for WWKY
  - Schedule of Activities for 2019

WATERSHED WATCH IN KENTUCKY

Thank you for volunteering!

www.4rww.jpf.org