Nutrient Concentration Trends in Surface Waters in Two Southeastern States

Alabama Water Resources Conference

September 10, 2015

OUTLINE

- Background
- Data Sources
- Methods and Assumptions
- Nutrient Concentration Trend Analyses
- Conclusion

BACKGROUND

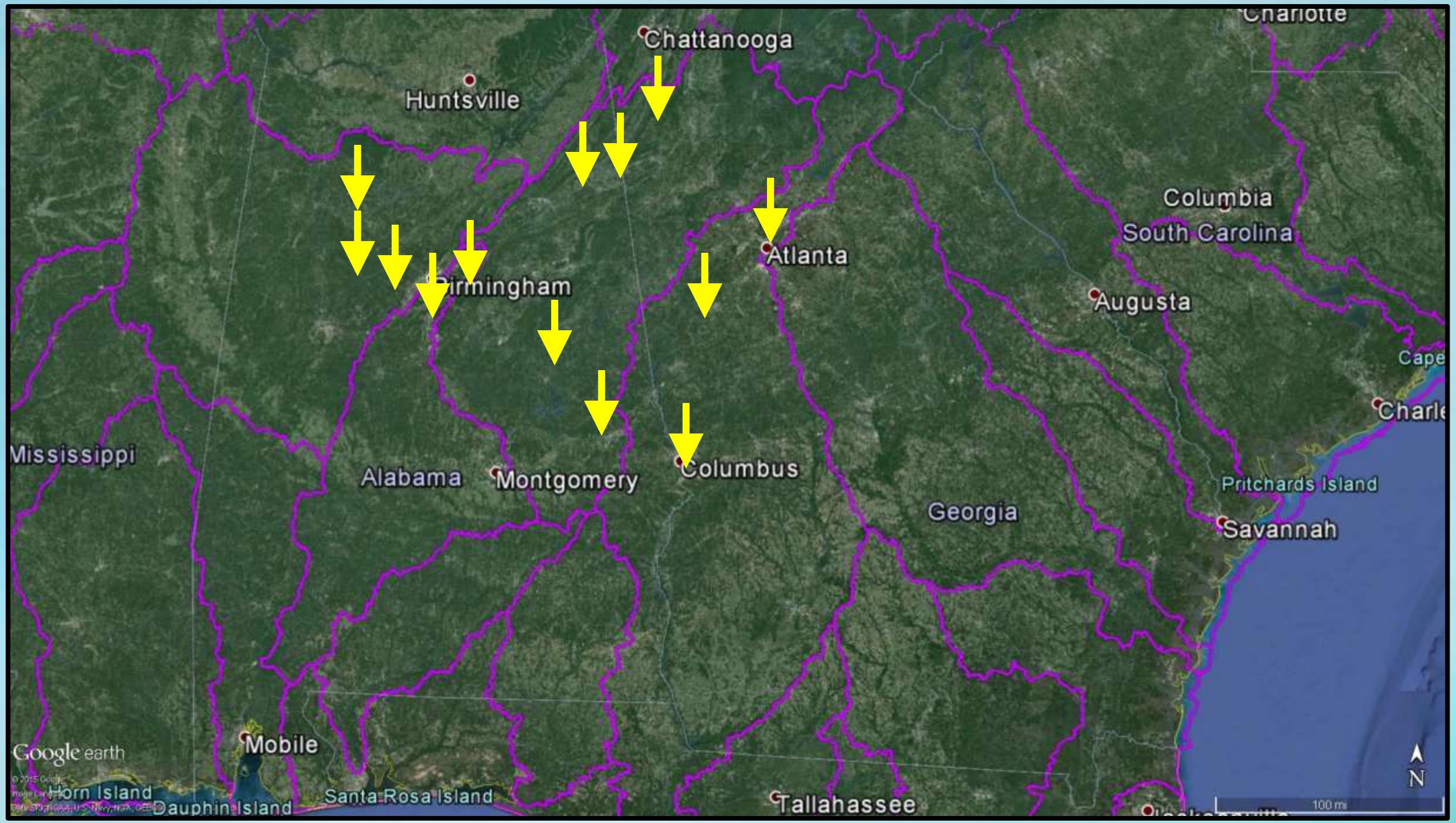
- 1992 – 1998: Impaired Waters Reporting
- 1998: National Nutrient Strategy
- TMDL Litigation – Consent Decrees
- Nutrient Criteria Development Plans
- Accelerated TMDL Development
- TMDL Implementation
- Nutrient Concentrations - 

DATA SOURCES

- Google Earth Pro with EPA MYWATERS kml
- National Water Quality Monitoring Council
  - Water Quality Portal
  - http://waterqualitydata.us/
    - USGS
    - ADEM
    - GAEPD

METHODS AND ASSUMPTIONS

- Nutrients = Phosphorus
- Period of Record - > 10 Years
- Not Detected = 0.5 x MDL
- Single data source per location when possible
- Simple linear trends
- No correction for seasonal effects or missing data
  – Growing Season = April - October


Chattanooga
Huntsville
Atlanta
Columbia
South Carolina
Augusta
Birmingham
Mississippi
Alabama
Montgomery
Columbus
Georgia
Pritchards Island
Savannah
Mobile
Horn Island
Dauphin Island
Santa Rosa Island
Tallahassee
Google earth
N
100 mi

Study Locations

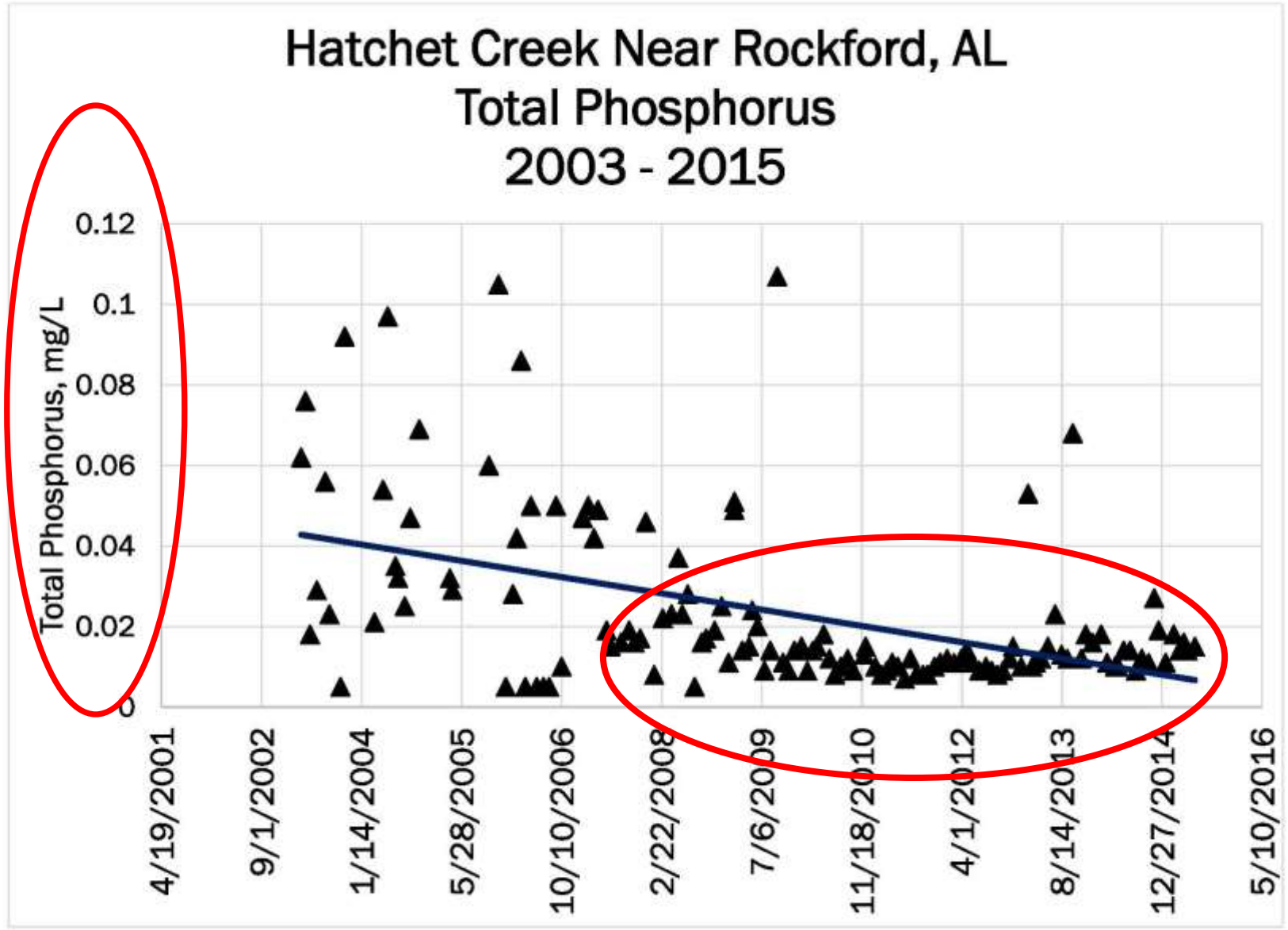
Reference Sites

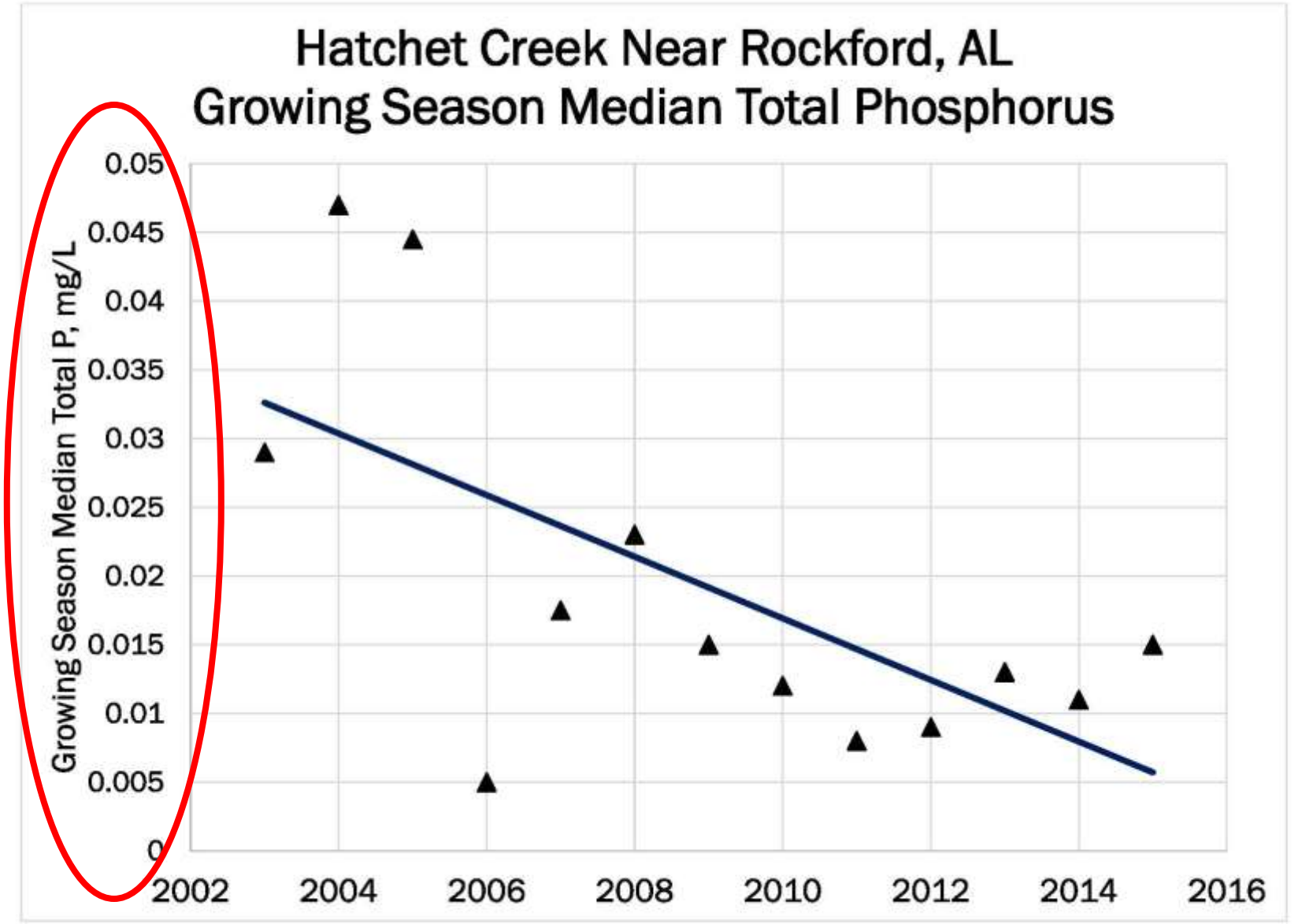
- Little River (Coosa River Basin)
- Hatchet Creek (Coosa River Basin)
- Sipsey Fork (Black Warrior River Basin)

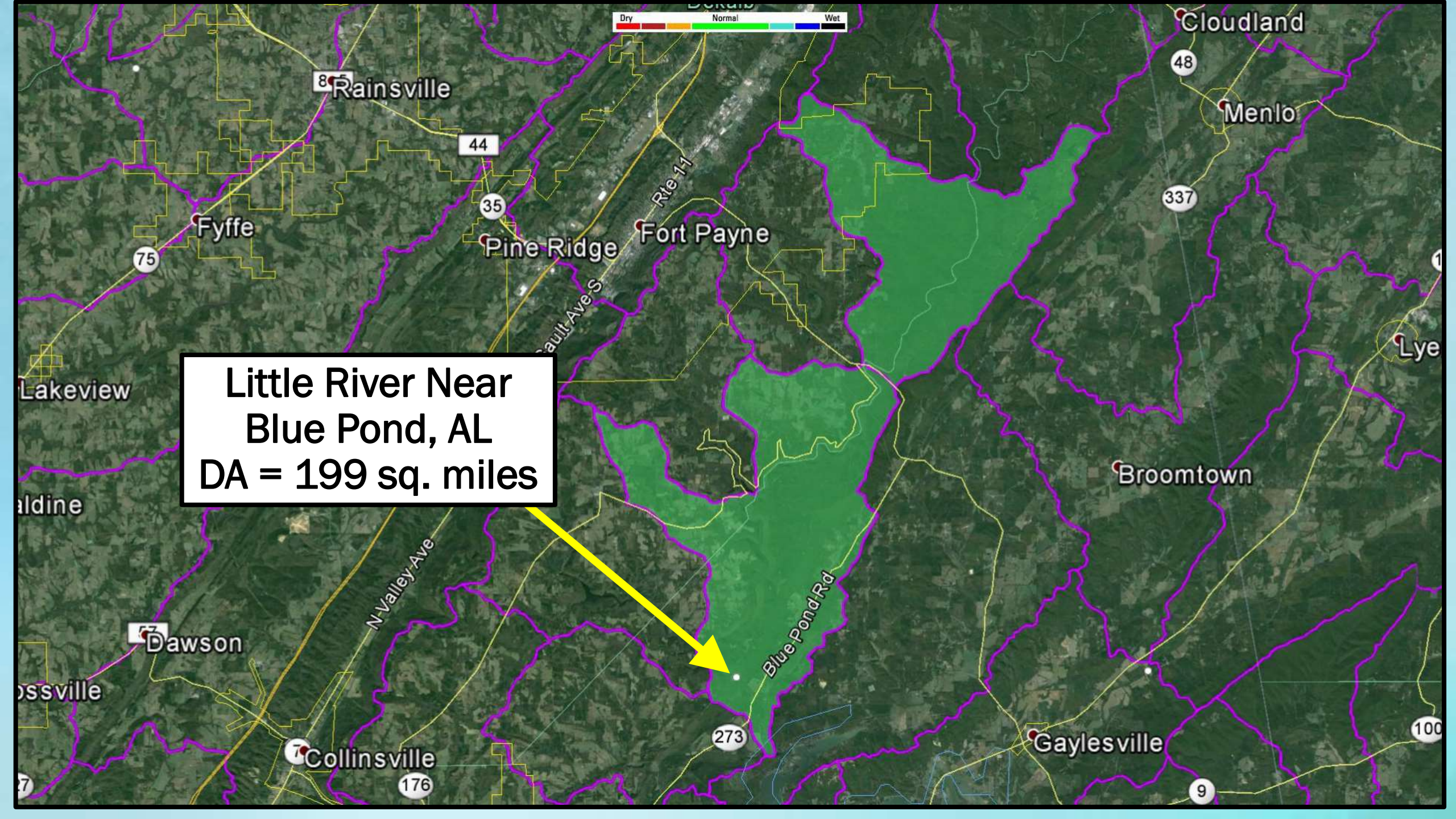
Study Sites

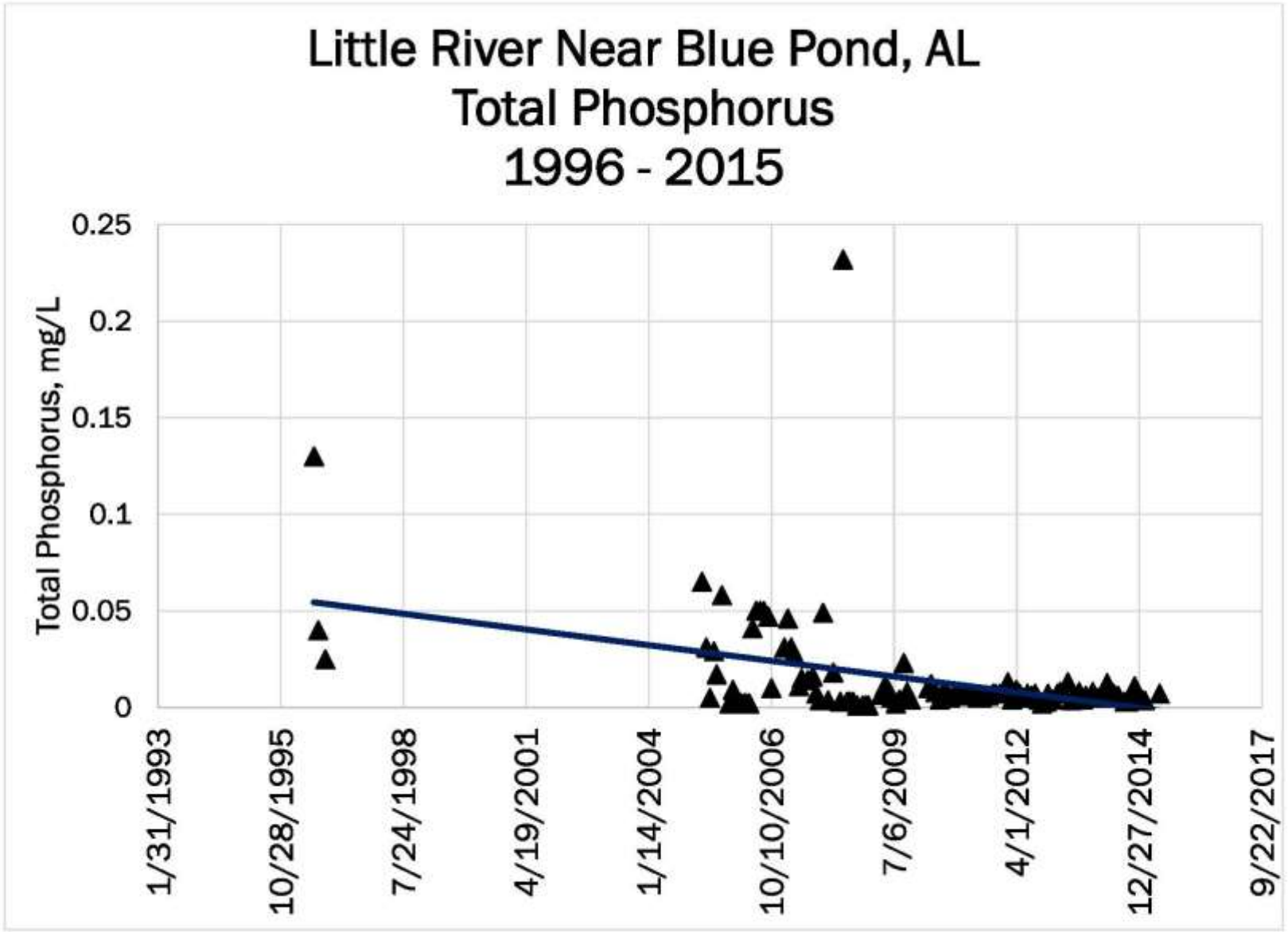
- Chattahoochee River (3 sites)
- Conasauga River
- Coosa River
- Locust Fork
- Valley Creek
- Sougahatchee Creek
- Cahaba River (2 sites)

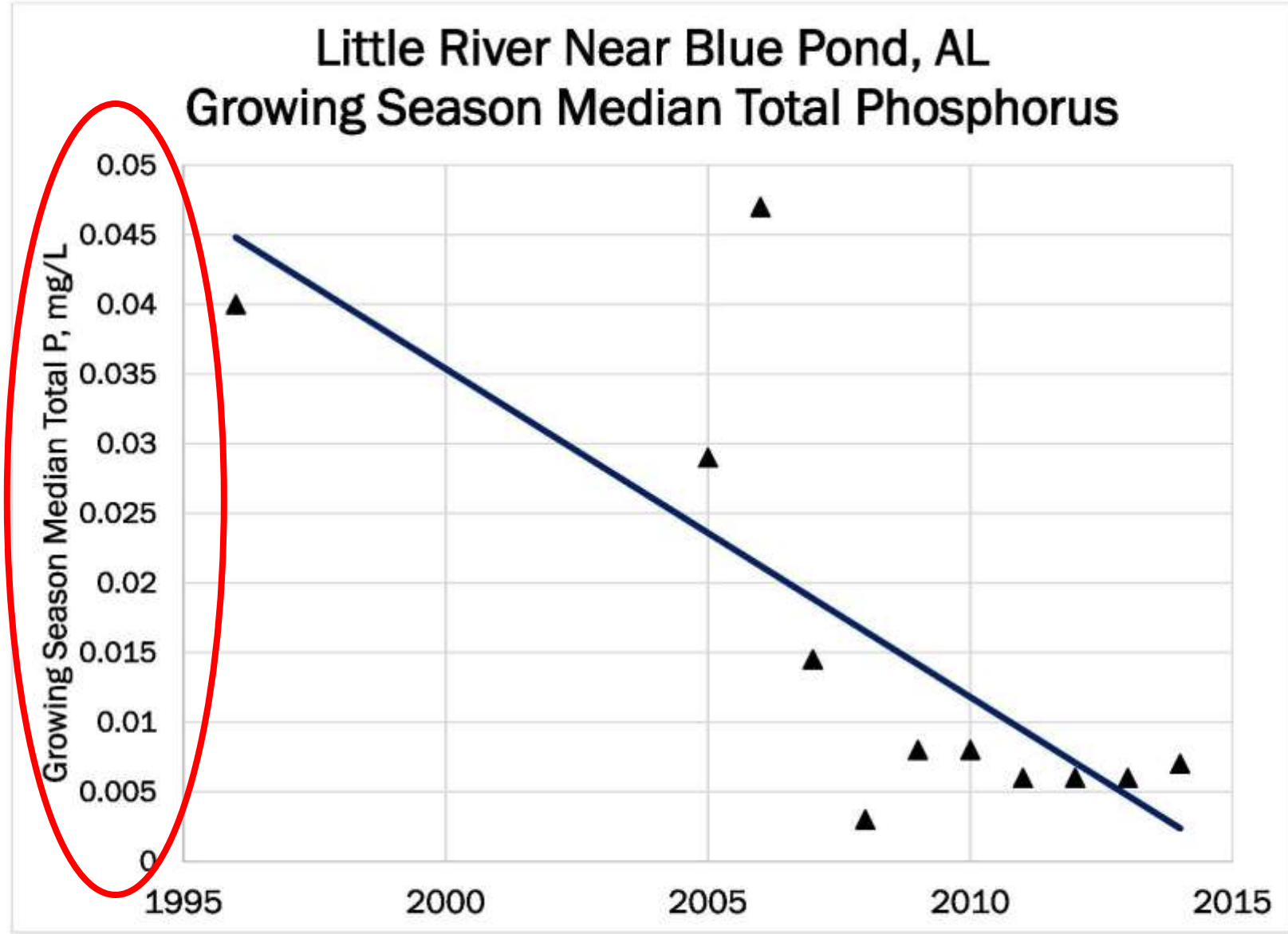

Dry
Normal
Wet
Fayetteville
elby
Stewartville
Ashland St
Goodwater
52
28
Weogufka
59
Hatchet Creek
near Rockford, AL
DA = 263 sq. miles
Kellyton
115
Alexander C
Rockford Hwy
38
Coosa
9
128
259
63
17
53

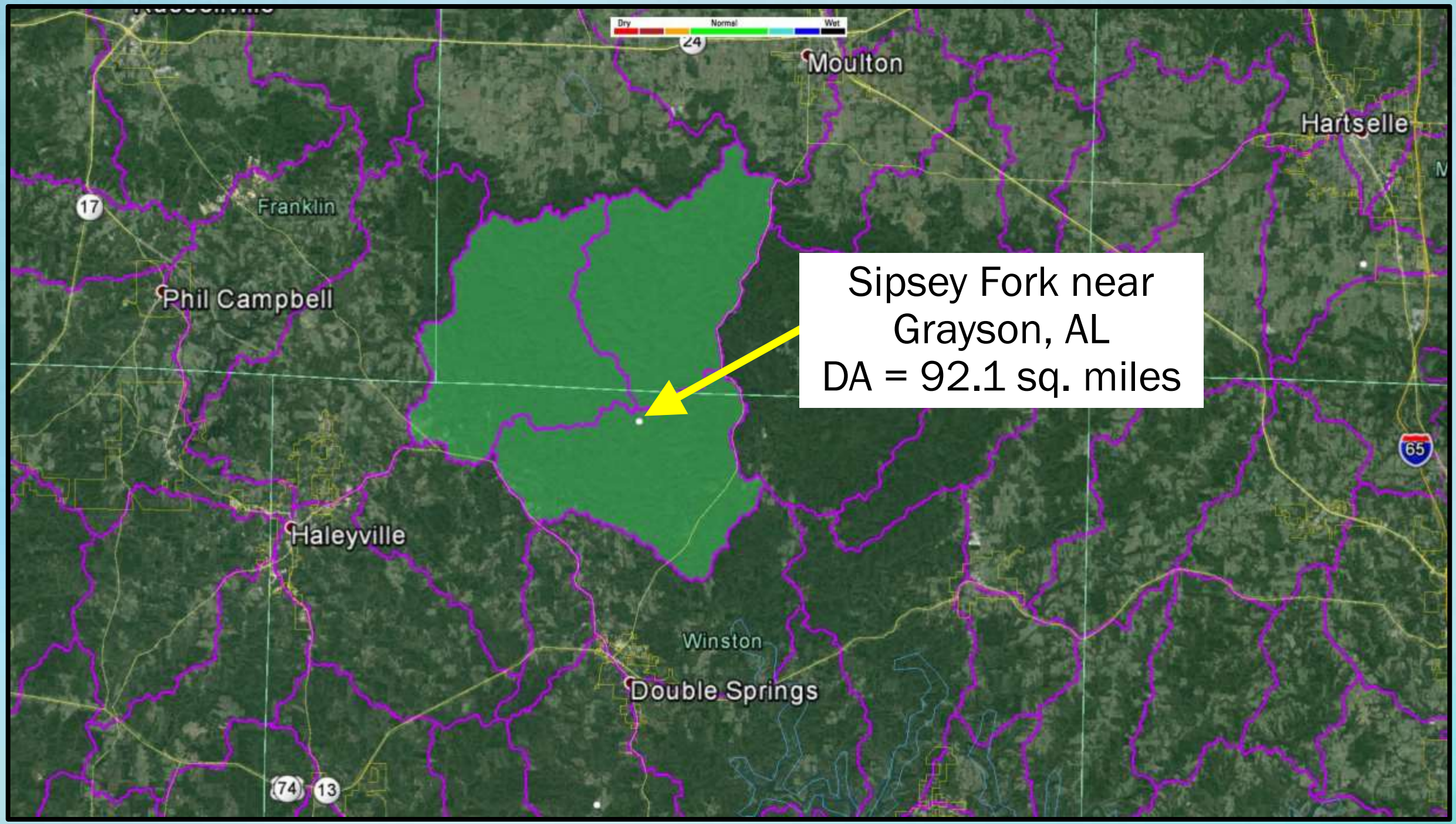

Hatchet Creek Near Rockford, AL
Total Phosphorus
2003 - 2015
Total Phosphorus, mg/L
0.12
0.1
0.08
0.06
0.04
0.02
0
4/19/2001
9/1/2002
1/14/2004
5/28/2005
10/10/2006
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016

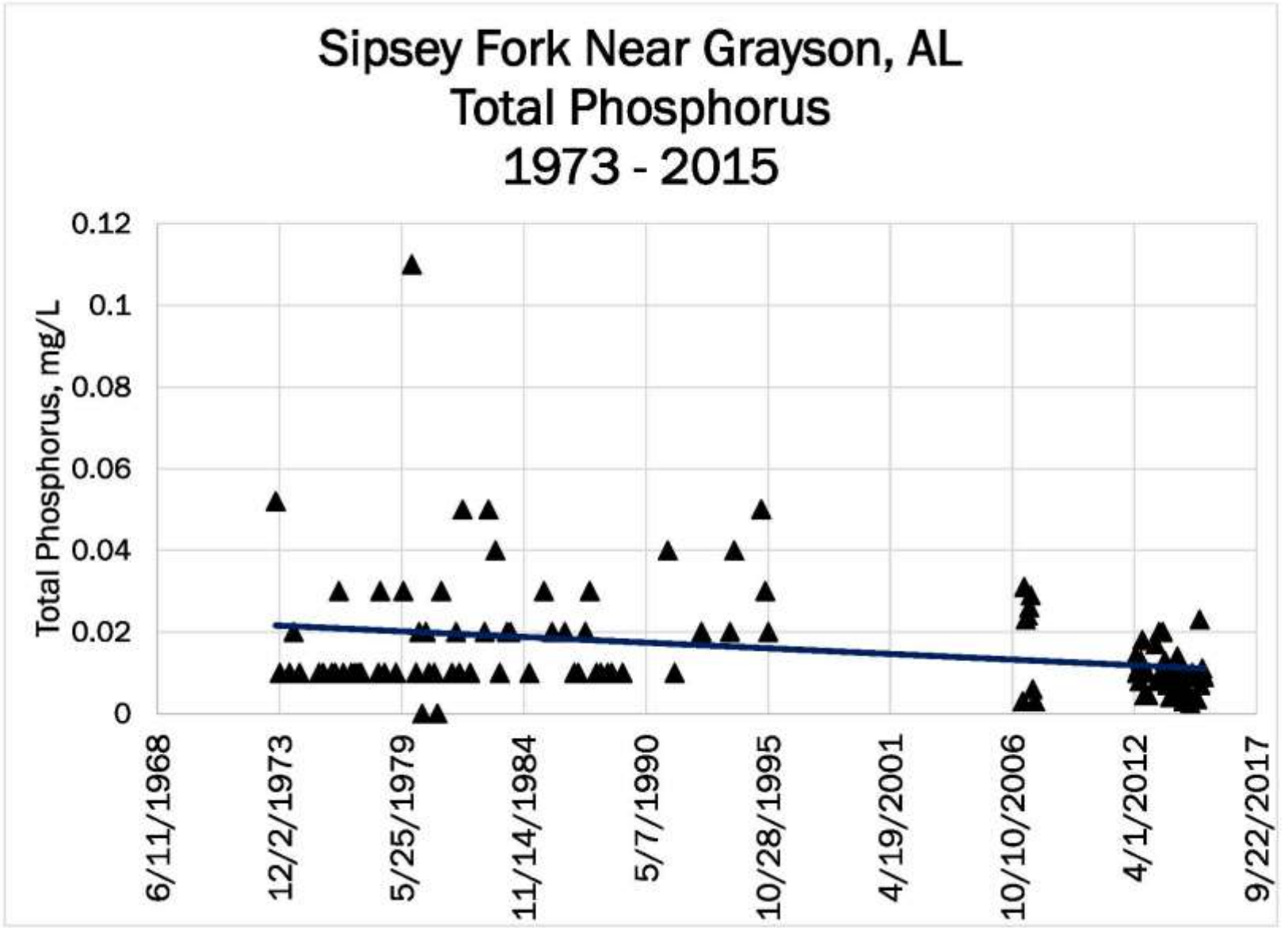

Hatchet Creek Near Rockford, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2002
2004
2006
2008
2010
2012
2014
2016

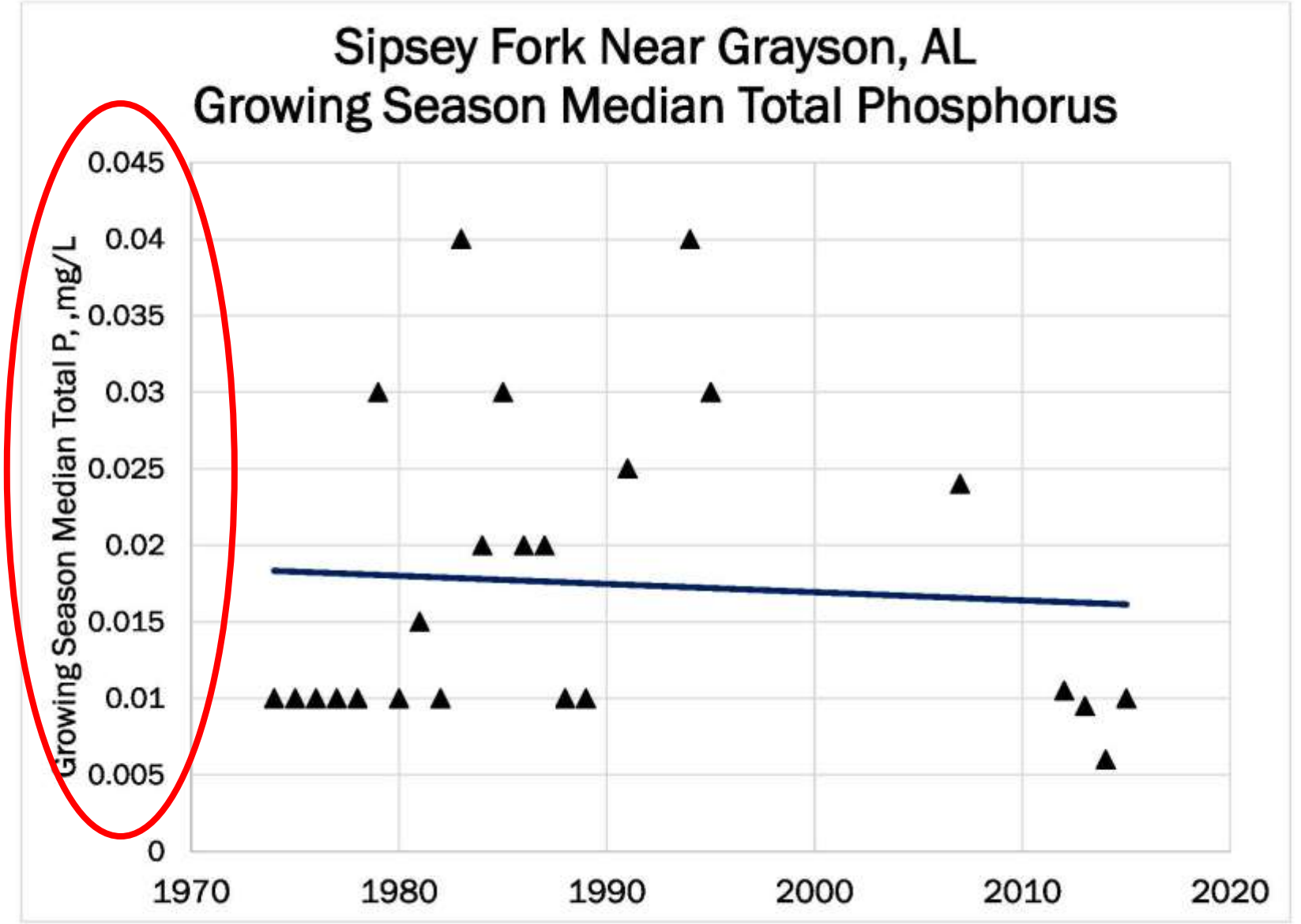

Dry
Normal
Wet
Little River Near
Blue Pond, AL
DA = 199 sq. miles
Rainsville
Fyffe
Pine Ridge
Fort Payne
Rte 11
Cloudland
Menlo
Lye
Lakeview
Broomtown
Dawson
N Valley Ave
Blue Pond Rd
Collinsville
Gaylesville
44
35
75
48
337
273
176
9
100

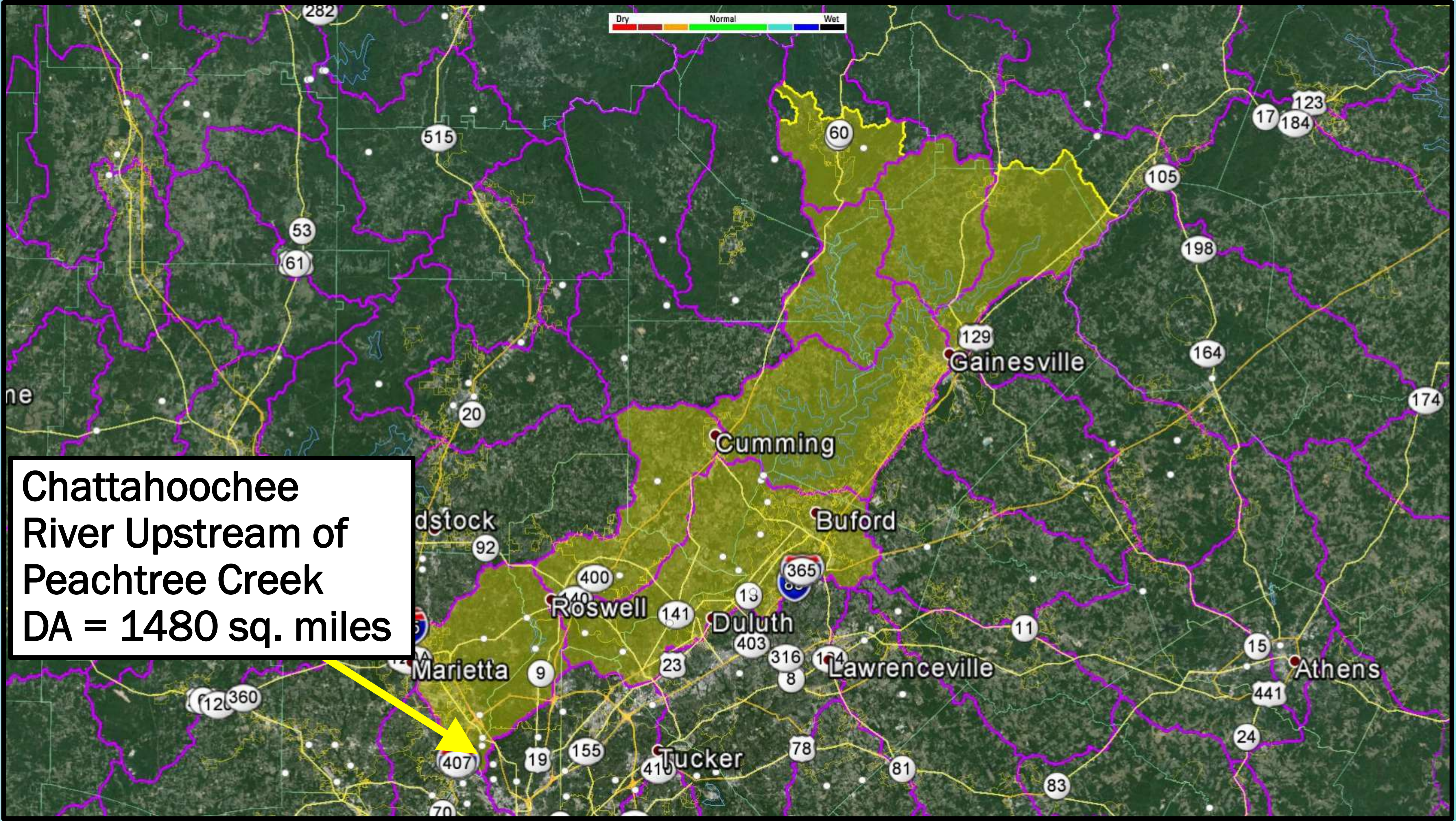

Little River Near Blue Pond, AL
Total Phosphorus
1996 - 2015
Total Phosphorus, mg/L
0.25
0.2
0.15
0.1
0.05
0
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017

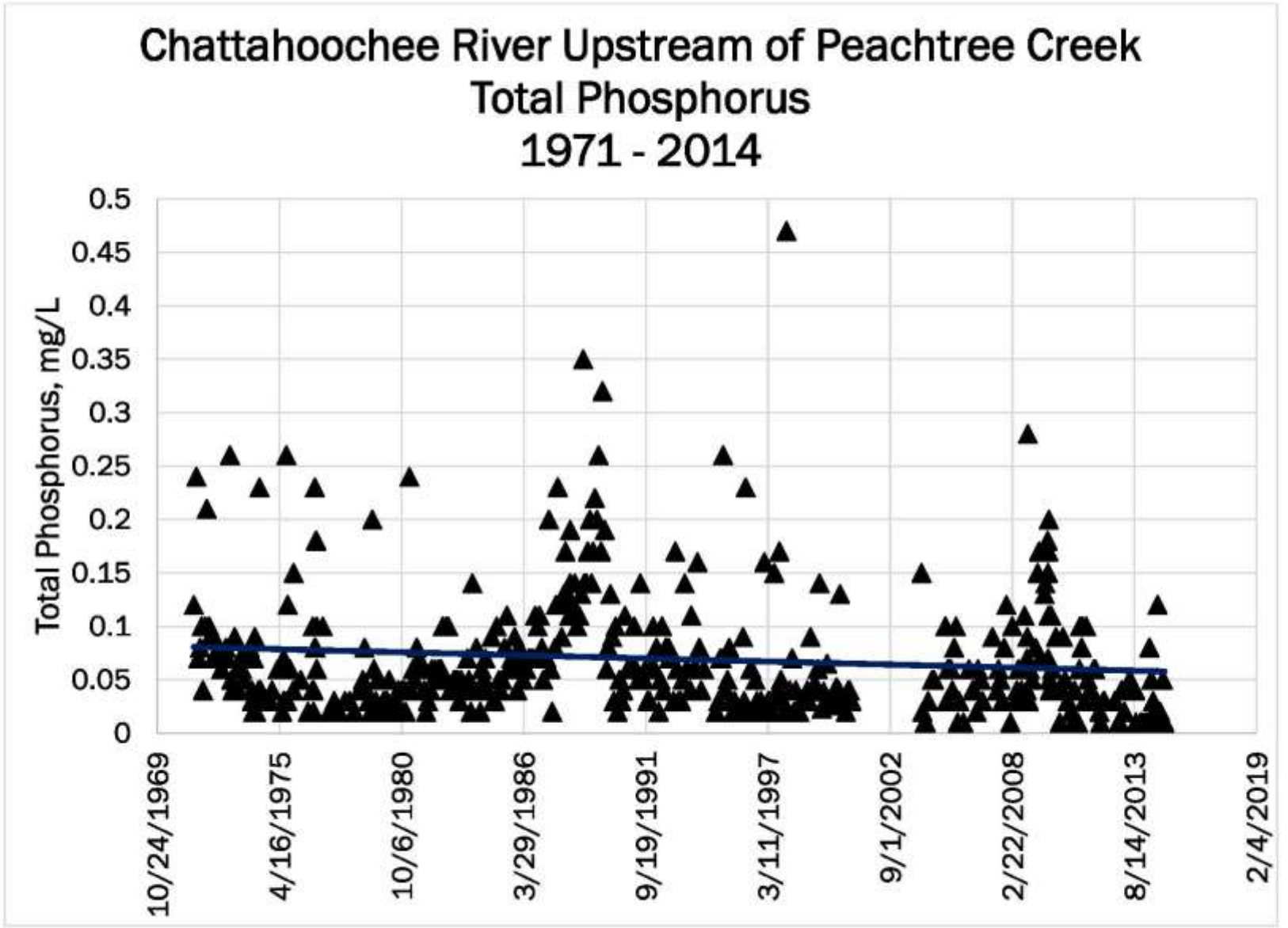

Little River Near Blue Pond, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1995
2000
2005
2010
2015

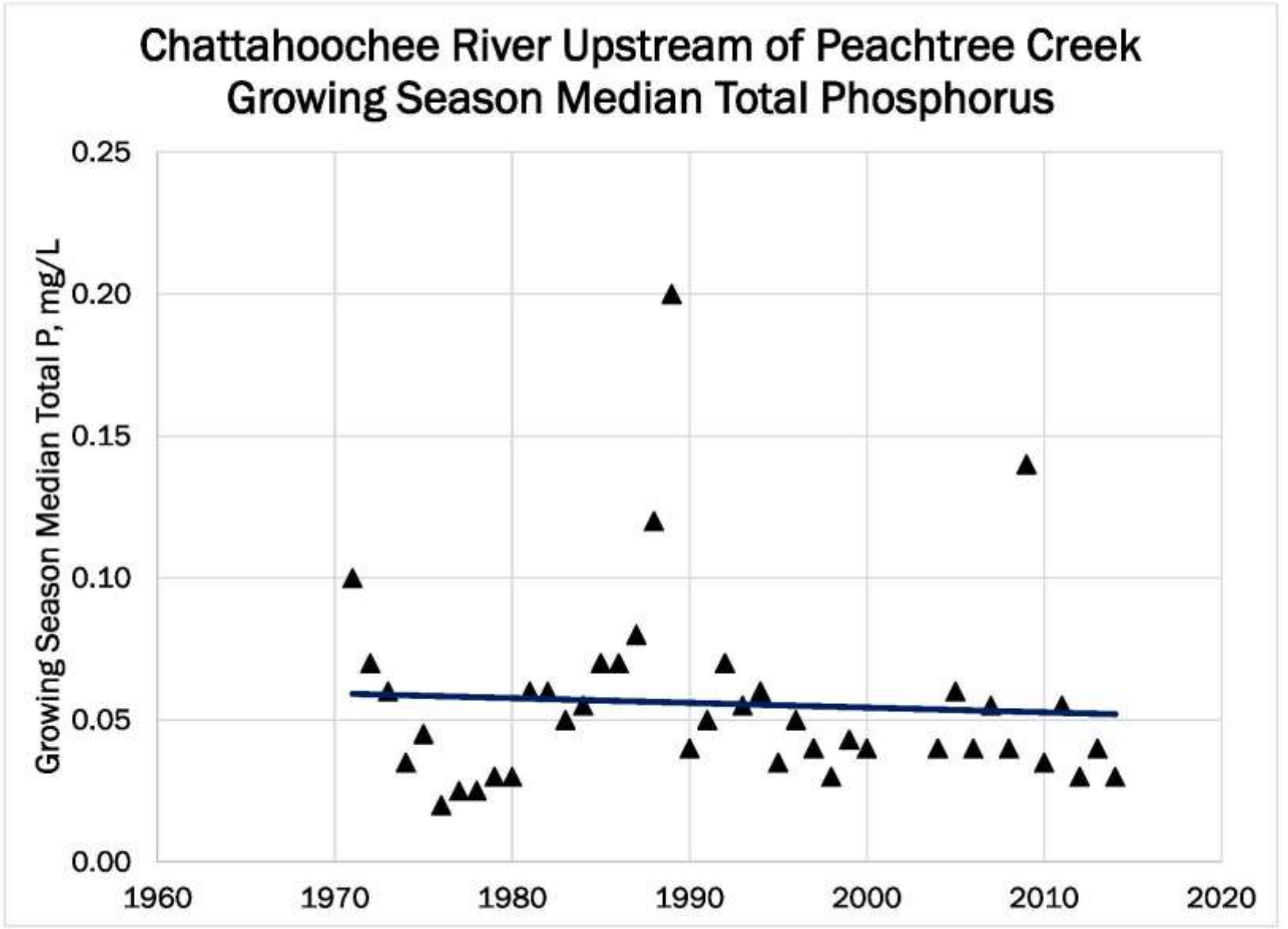

Dry
Normal
Wet
24
Moulton
Hartselle
17
Franklin
Phil Campbell
Sipsey Fork near
Grayson, AL
DA = 92.1 sq. miles
65
Haleyville
Winston
Double Springs
74
13

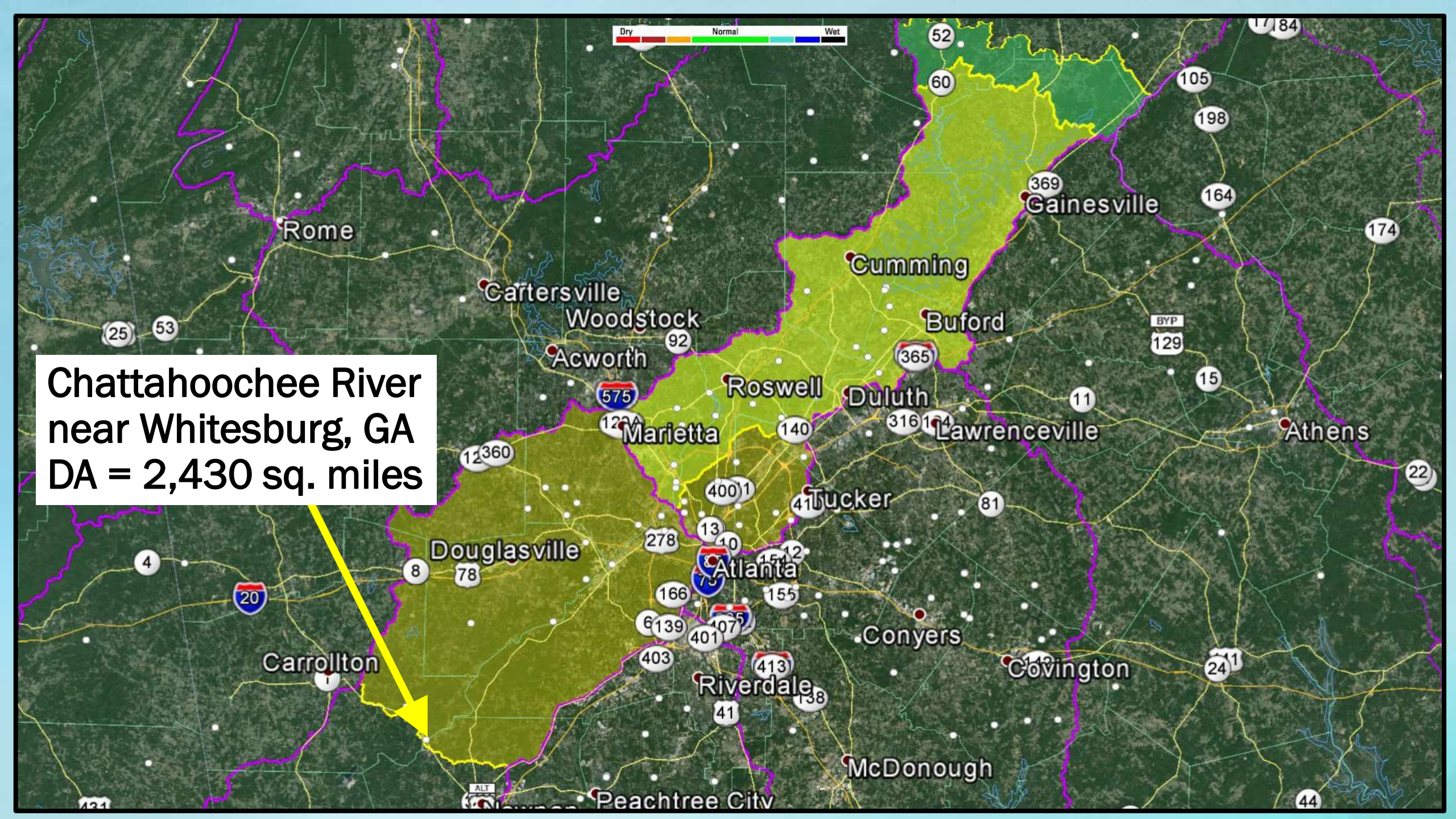

Sipsey Fork Near Grayson, AL
Total Phosphorus
1973 - 2015
Total Phosphorus, mg/L
0.12
0.1
0.08
0.06
0.04
0.02
0
6/11/1968
12/2/1973
5/25/1979
11/14/1984
5/7/1990
10/28/1995
4/19/2001
10/10/2006
4/1/2012
9/22/2017

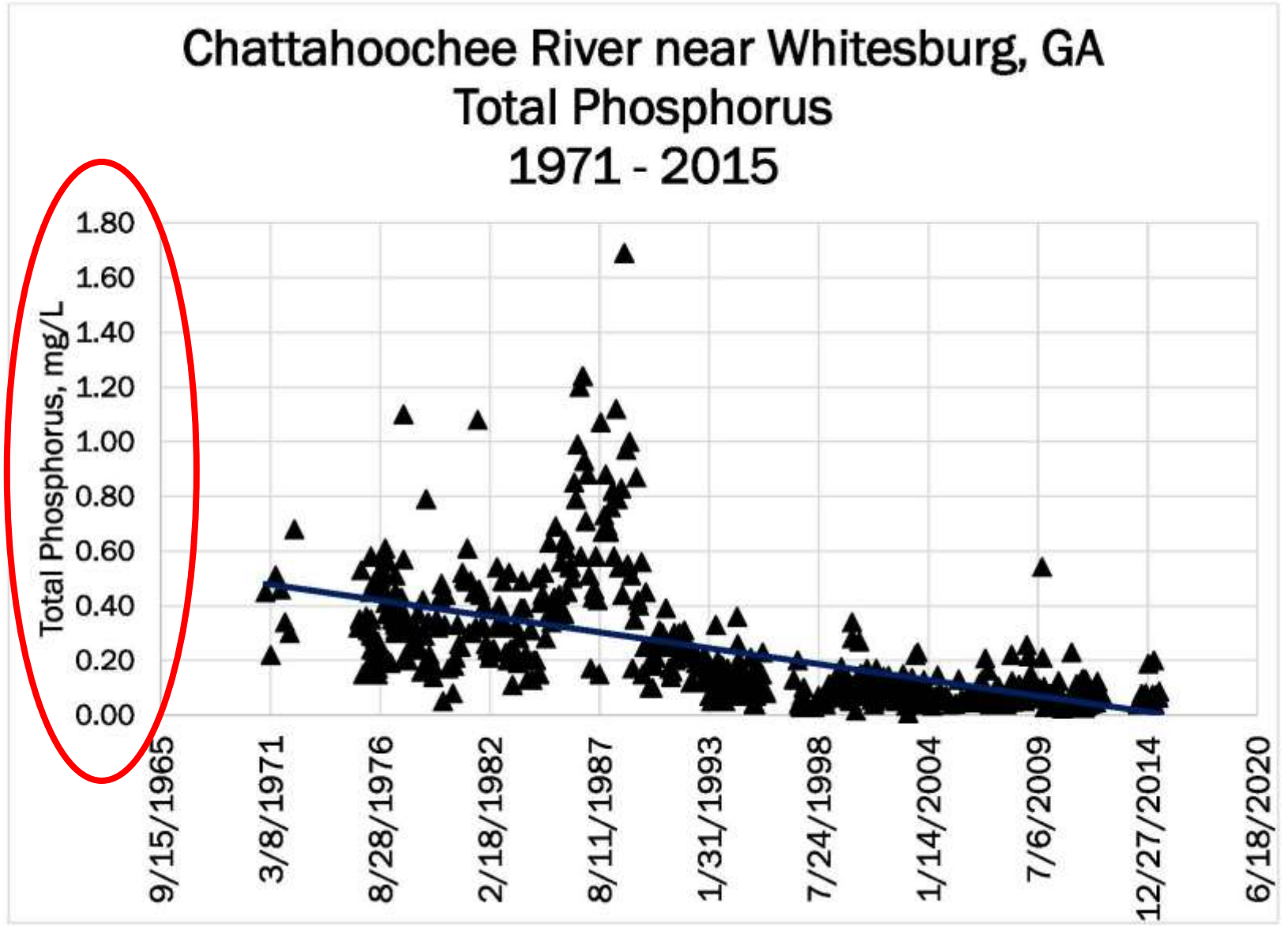

Sipsey Fork Near Grayson, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, ,mg/L
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1970
1980
1990
2000
2010
2020

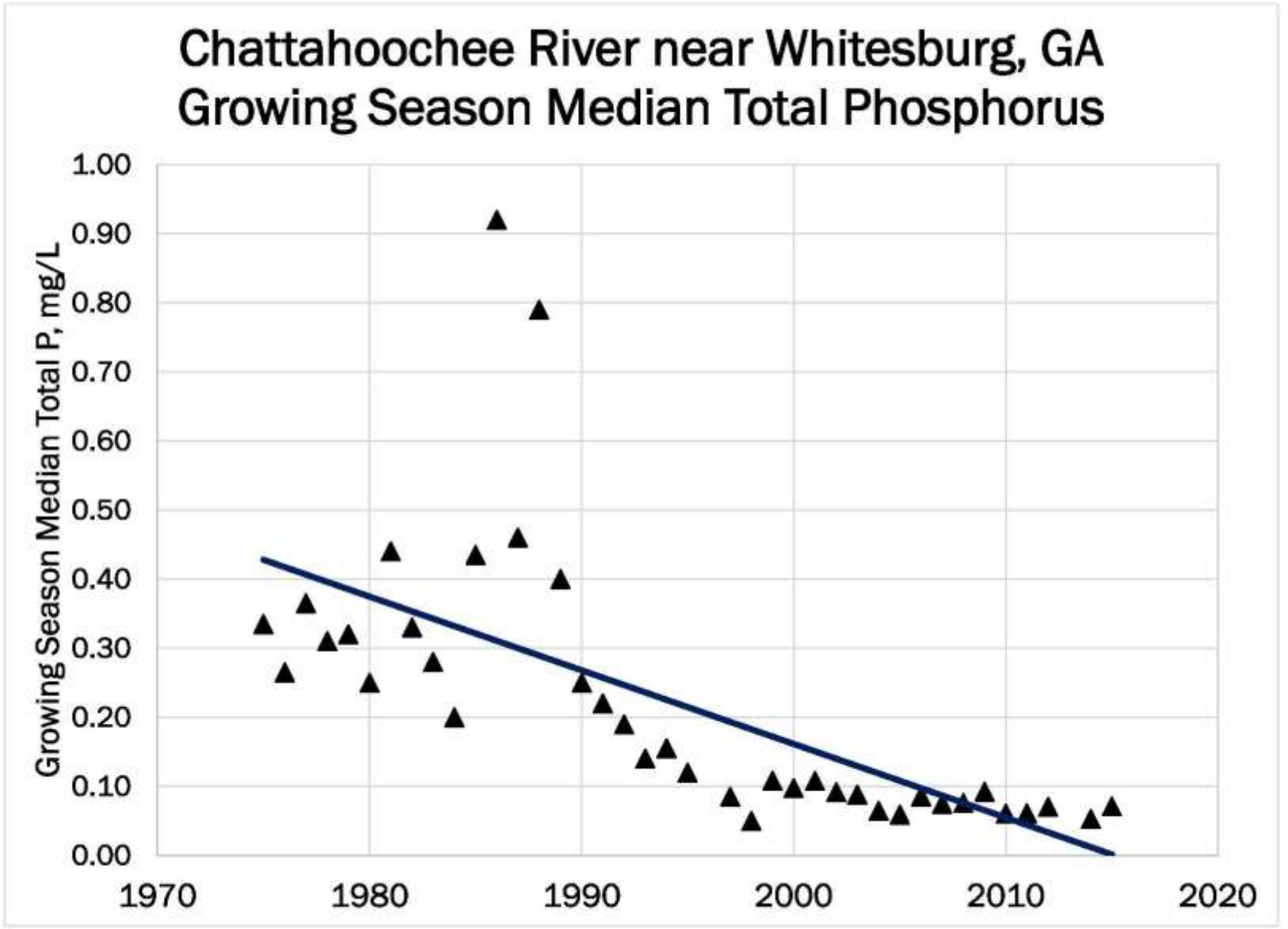

Chattahoochee River Upstream of Peachtree Creek
DA = 1480 sq. miles
Dry
Normal
Wet
Gainesville
Cumming
Buford
Roswell
Duluth
Lawrenceville
Marietta
Tucker
Athens
dstock

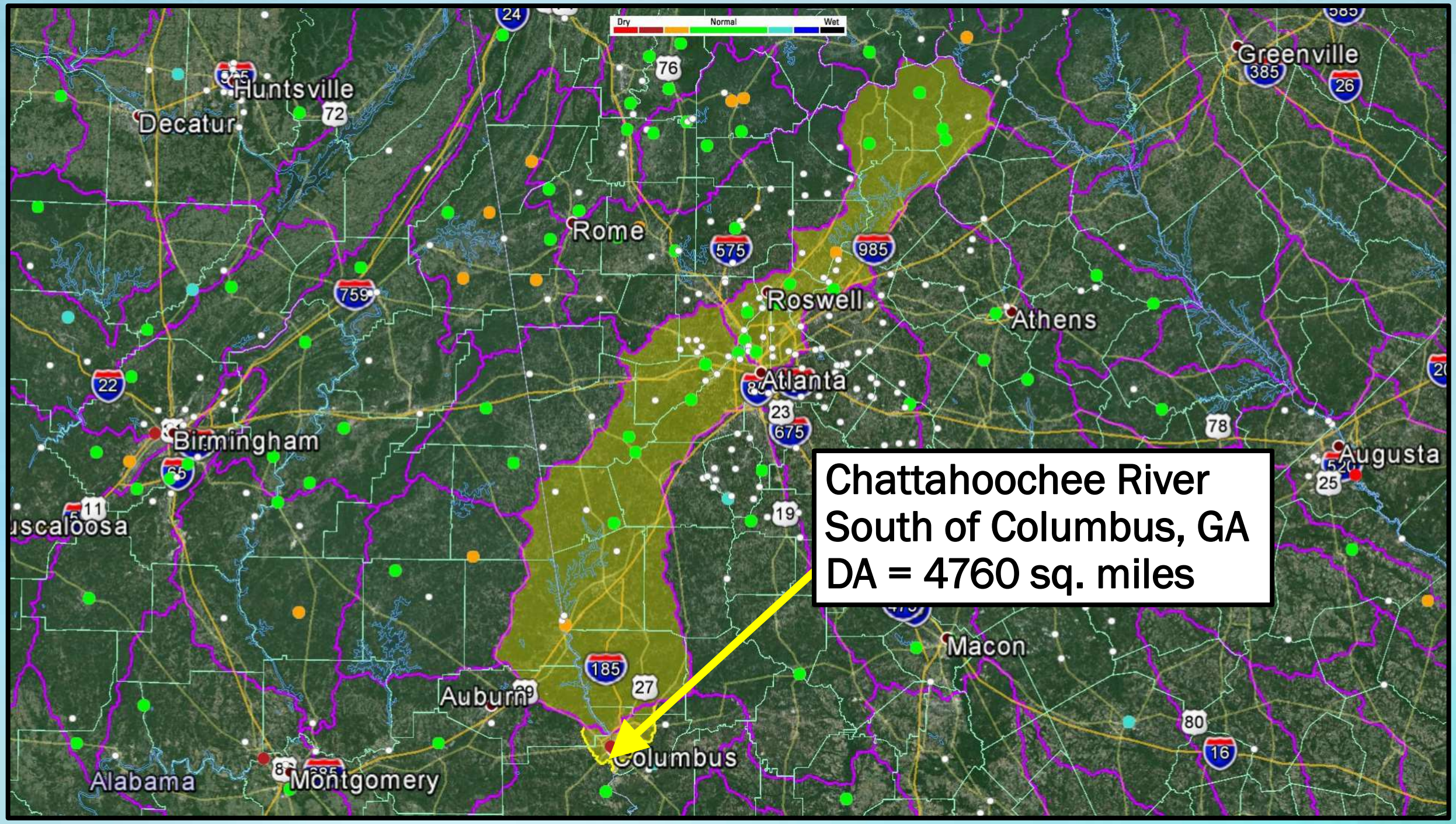

Chattahoochee River Upstream of Peachtree Creek
Total Phosphorus
1971 - 2014
Total Phosphorus, mg/L
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10/24/1969
4/16/1975
10/6/1980
3/29/1986
9/19/1991
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019

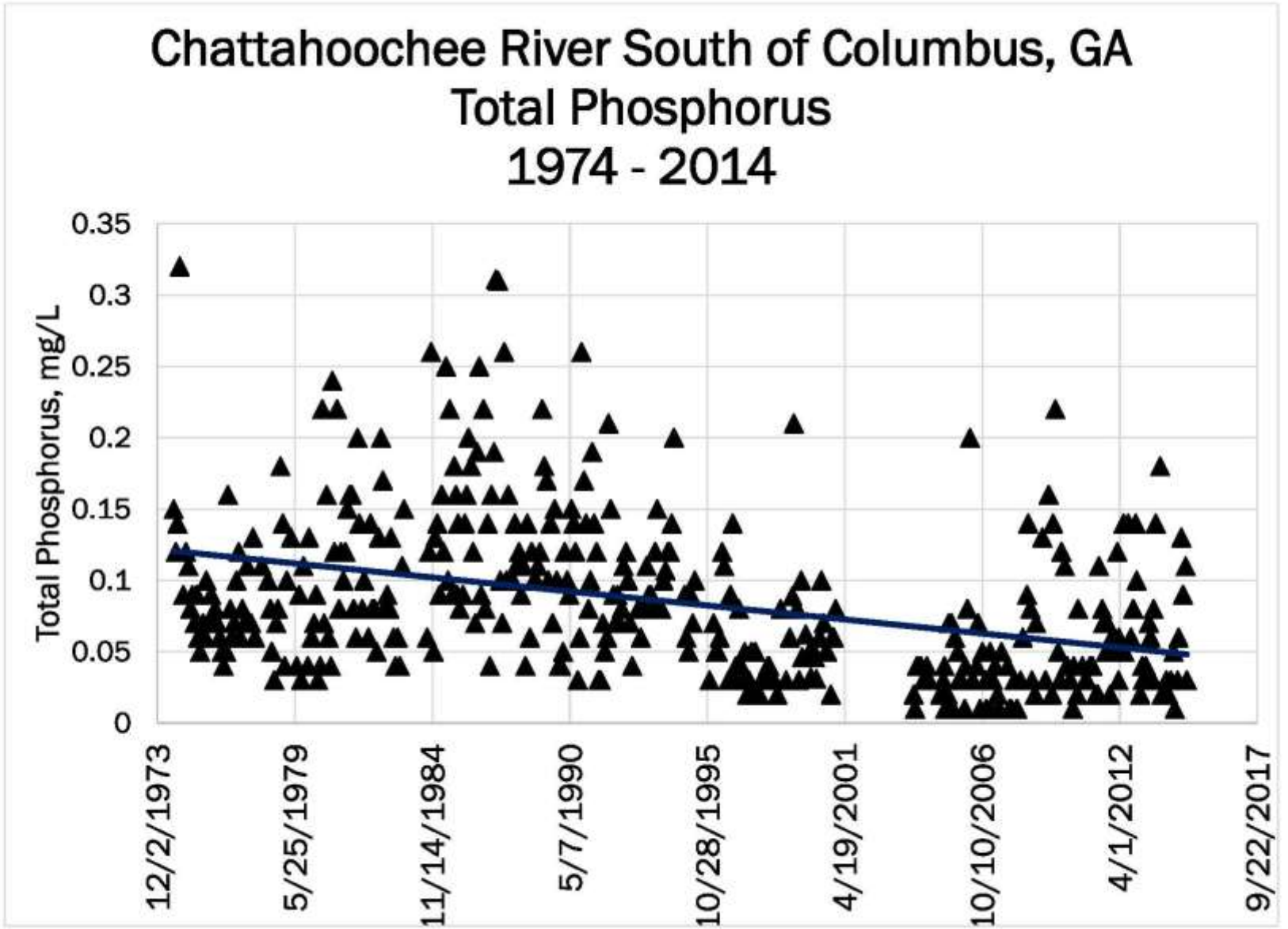

Chattahoochee River Upstream of Peachtree Creek
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.25
0.20
0.15
0.10
0.05
0.00
1960
1970
1980
1990
2000
2010
2020

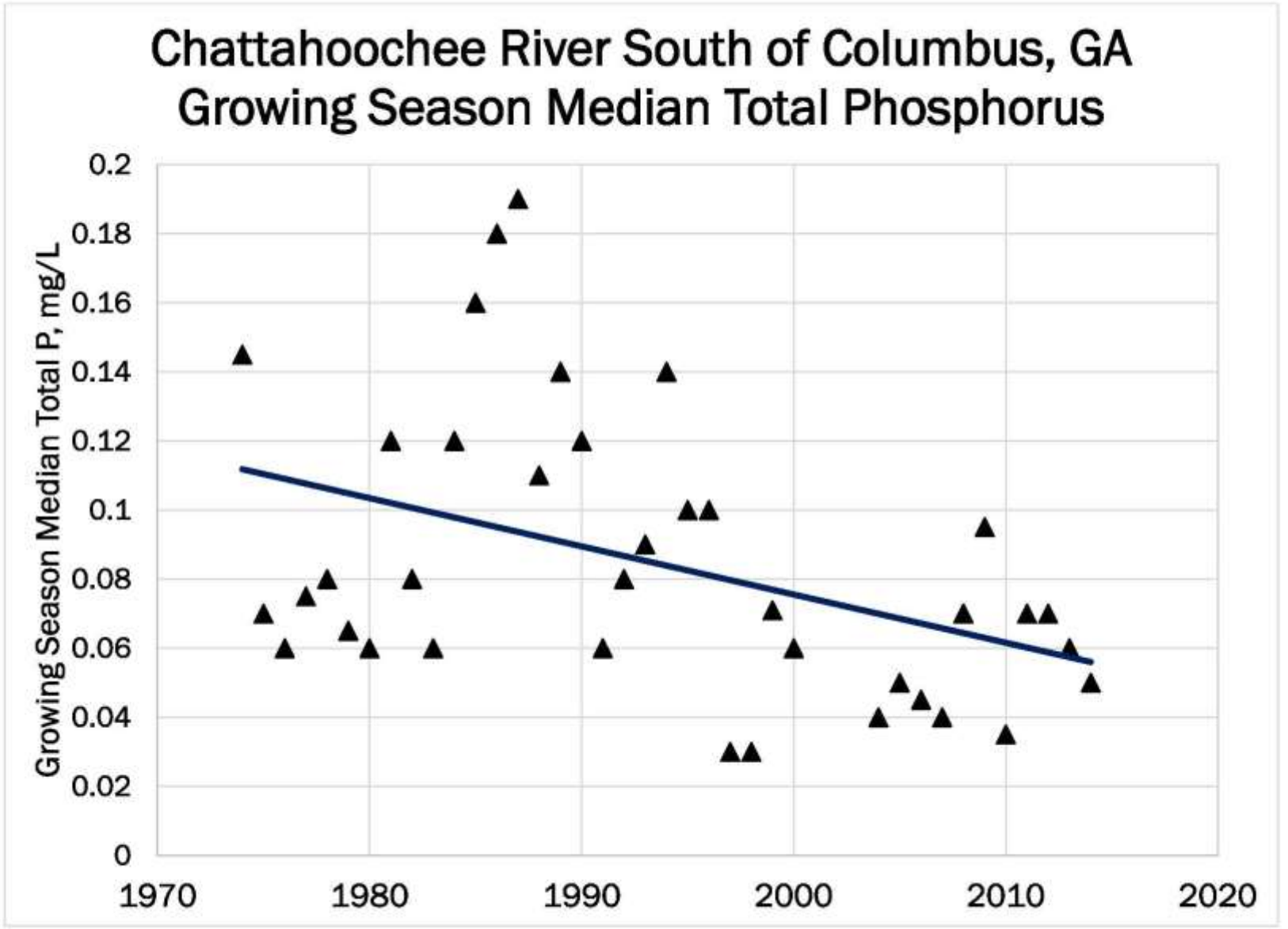

Dry
Normal
Wet
Chattahoochee River
near Whitesburg, GA
DA = 2,430 sq. miles
Rome
Cartersville
Woodstock
Acworth
Marietta
Roswell
Cumming
Gainesville
Buford
Duluth
Lawrenceville
Athens
Tucker
Douglasville
Atlanta
Conyers
Covington
Carrollton
Riverdale
McDonough
Peachtree City

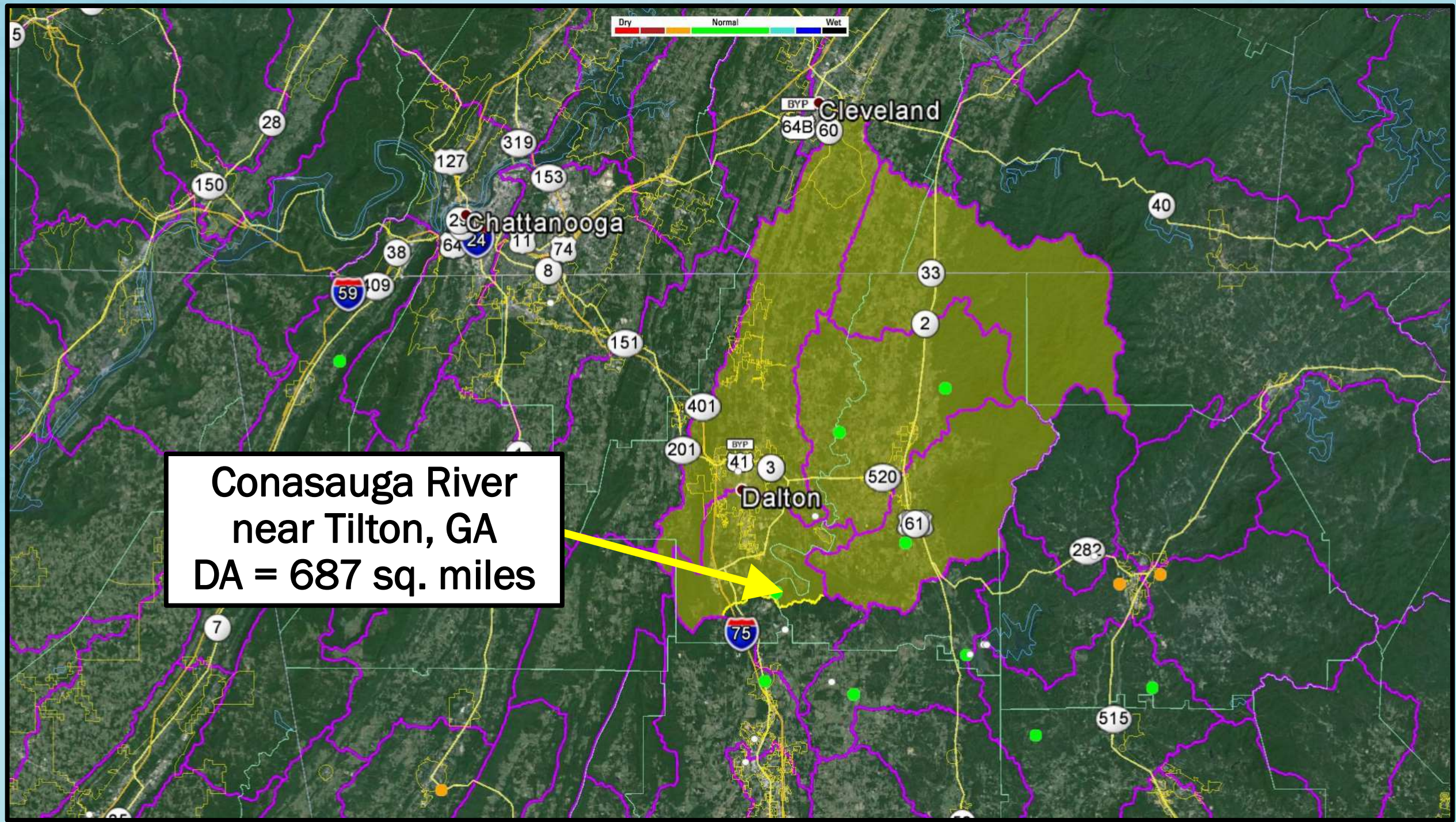

Chattahoochee River near Whitesburg, GA
Total Phosphorus
1971 - 2015
Total Phosphorus, mg/L
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
9/15/1965
3/8/1971
8/28/1976
2/18/1982
8/11/1987
1/31/1993
7/24/1998
1/14/2004
7/6/2009
12/27/2014
6/18/2020

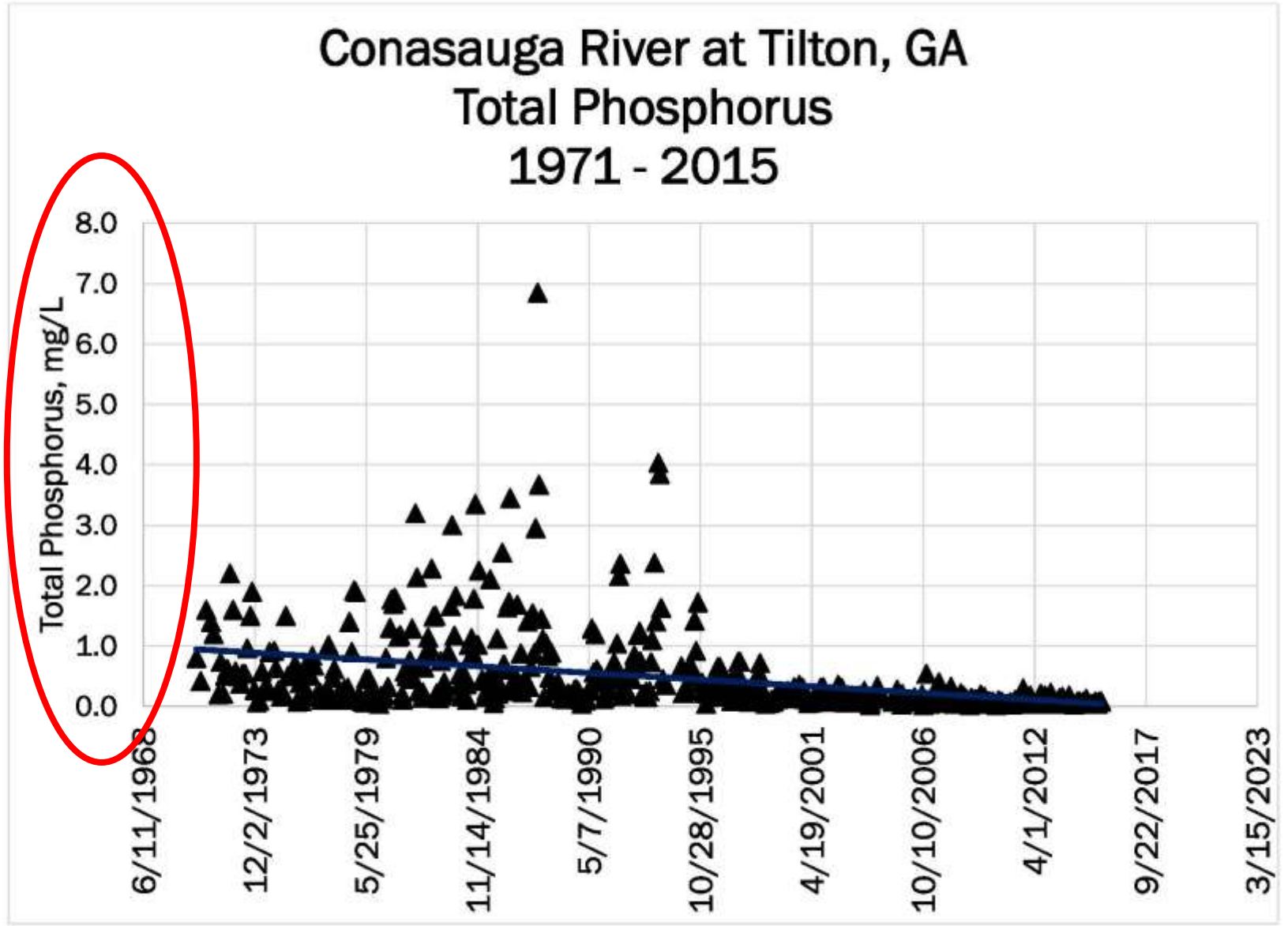

Chattahoochee River near Whitesburg, GA
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1970
1980
1990
2000
2010
2020

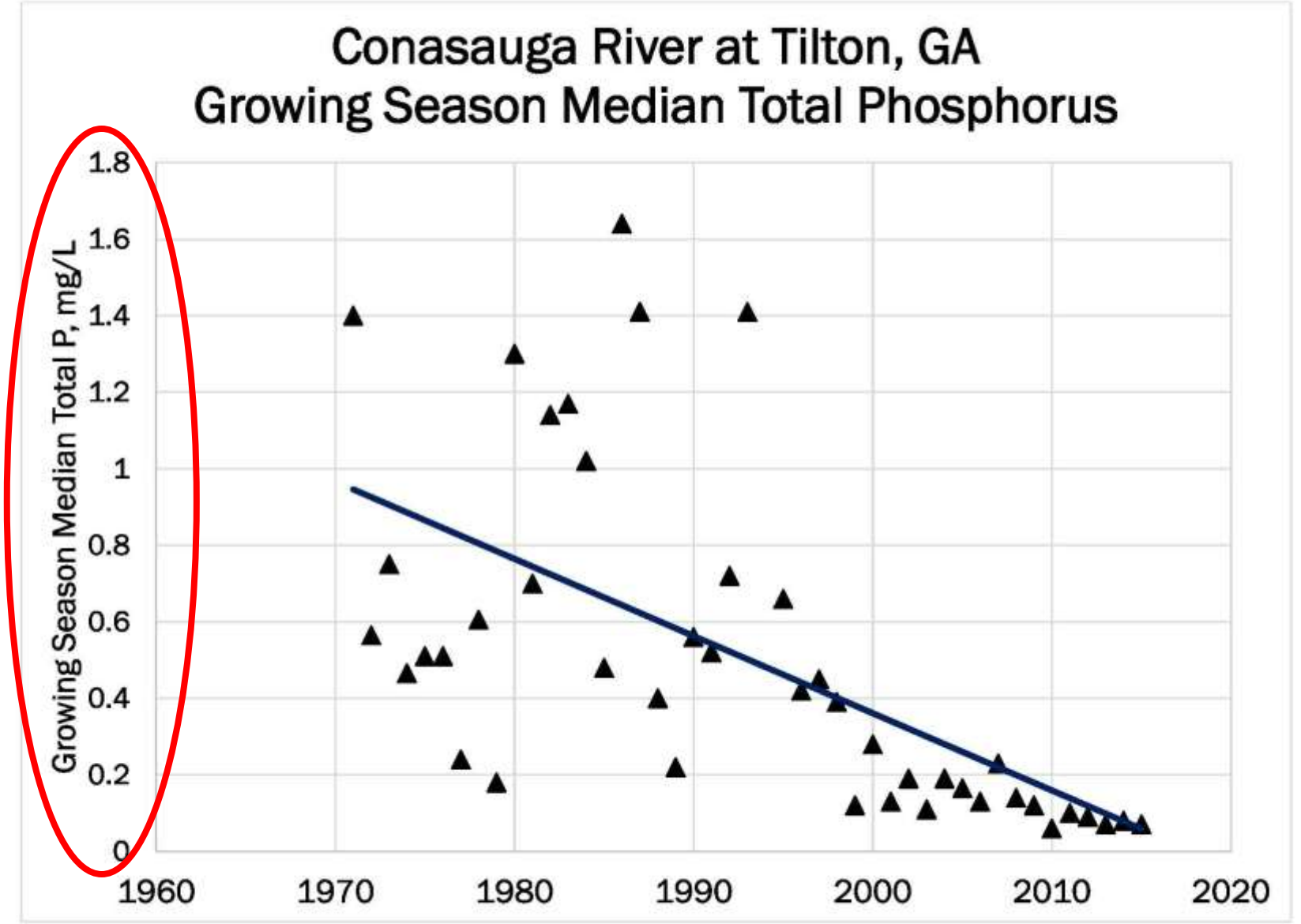

Dry
Normal
Wet
Huntsville
Decatur
Rome
Greenville
Roswell
Athens
Atlanta
Birmingham
Augusta
Macon
Auburn
Columbus
Montgomery
Alabama
Chattahoochee River
South of Columbus, GA
DA = 4760 sq. miles

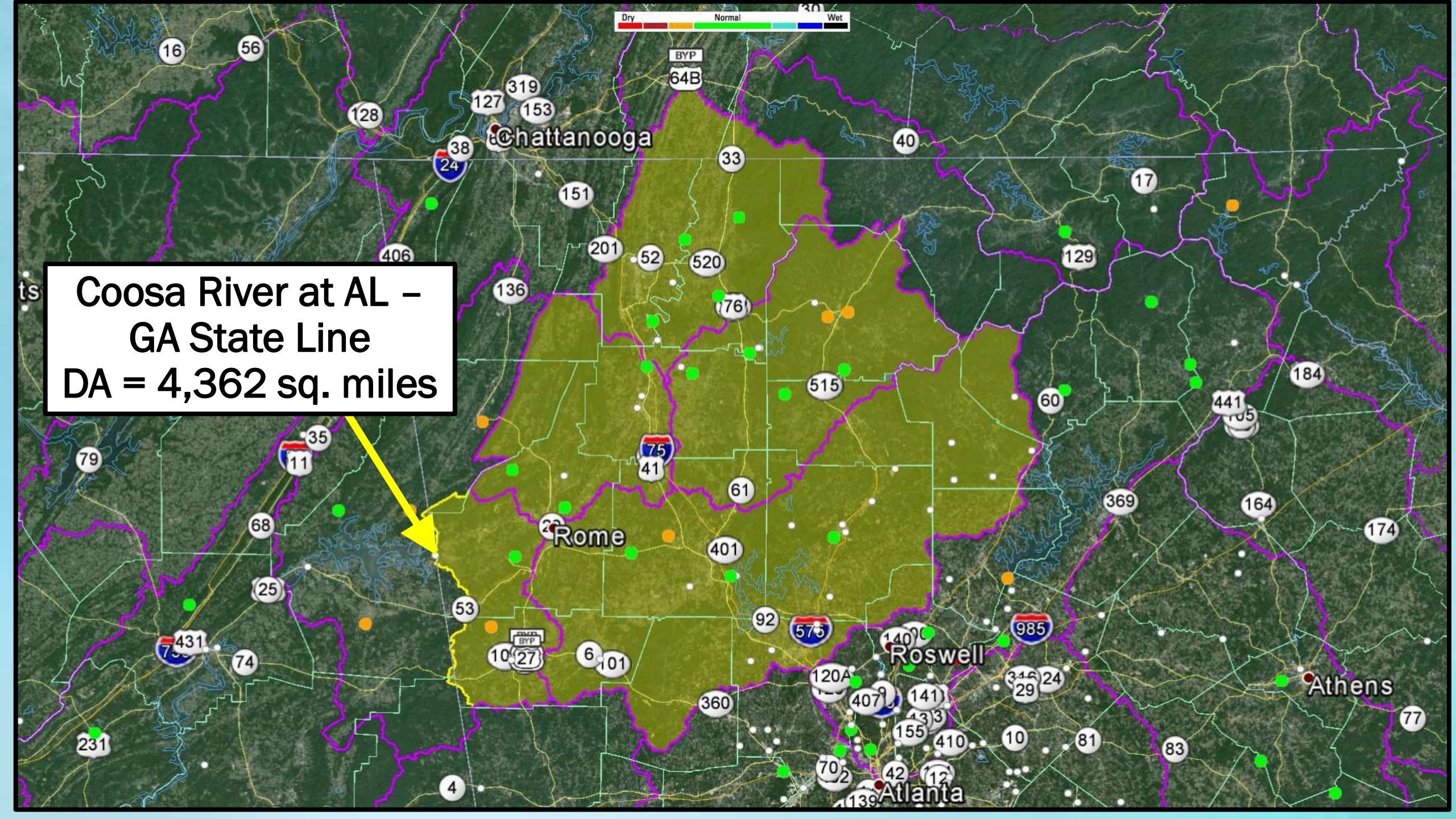

Chattahoochee River South of Columbus, GA
Total Phosphorus
1974 - 2014
Total Phosphorus, mg/L
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
12/2/1973
5/25/1979
11/14/1984
5/7/1990
10/28/1995
4/19/2001
10/10/2006
4/1/2012
9/22/2017

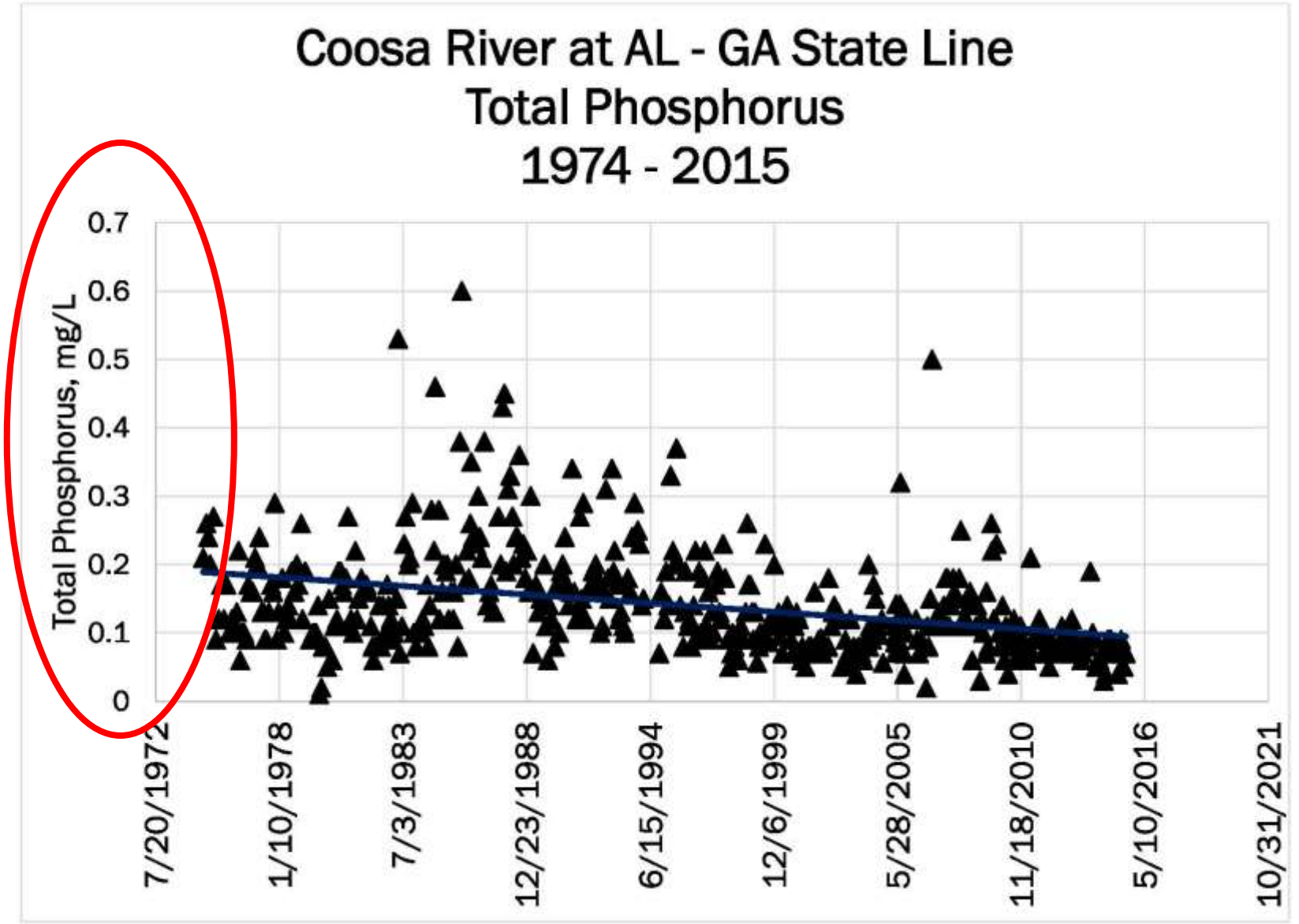

Chattahoochee River South of Columbus, GA
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1970
1980
1990
2000
2010
2020

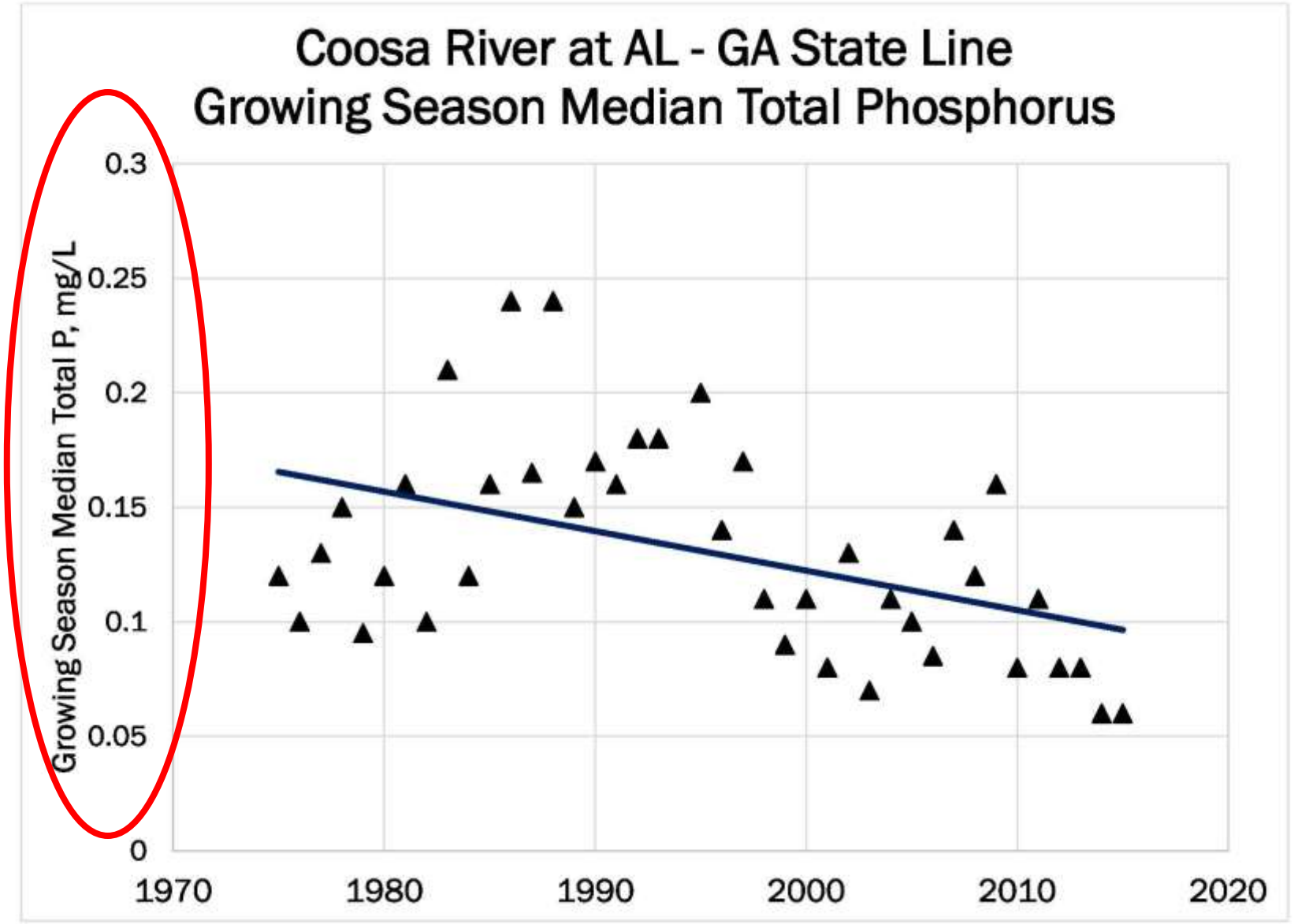

Dry
Normal
Wet
Cleveland
Chattanooga
Dalton
BYP
Conasauga River
near Tilton, GA
DA = 687 sq. miles

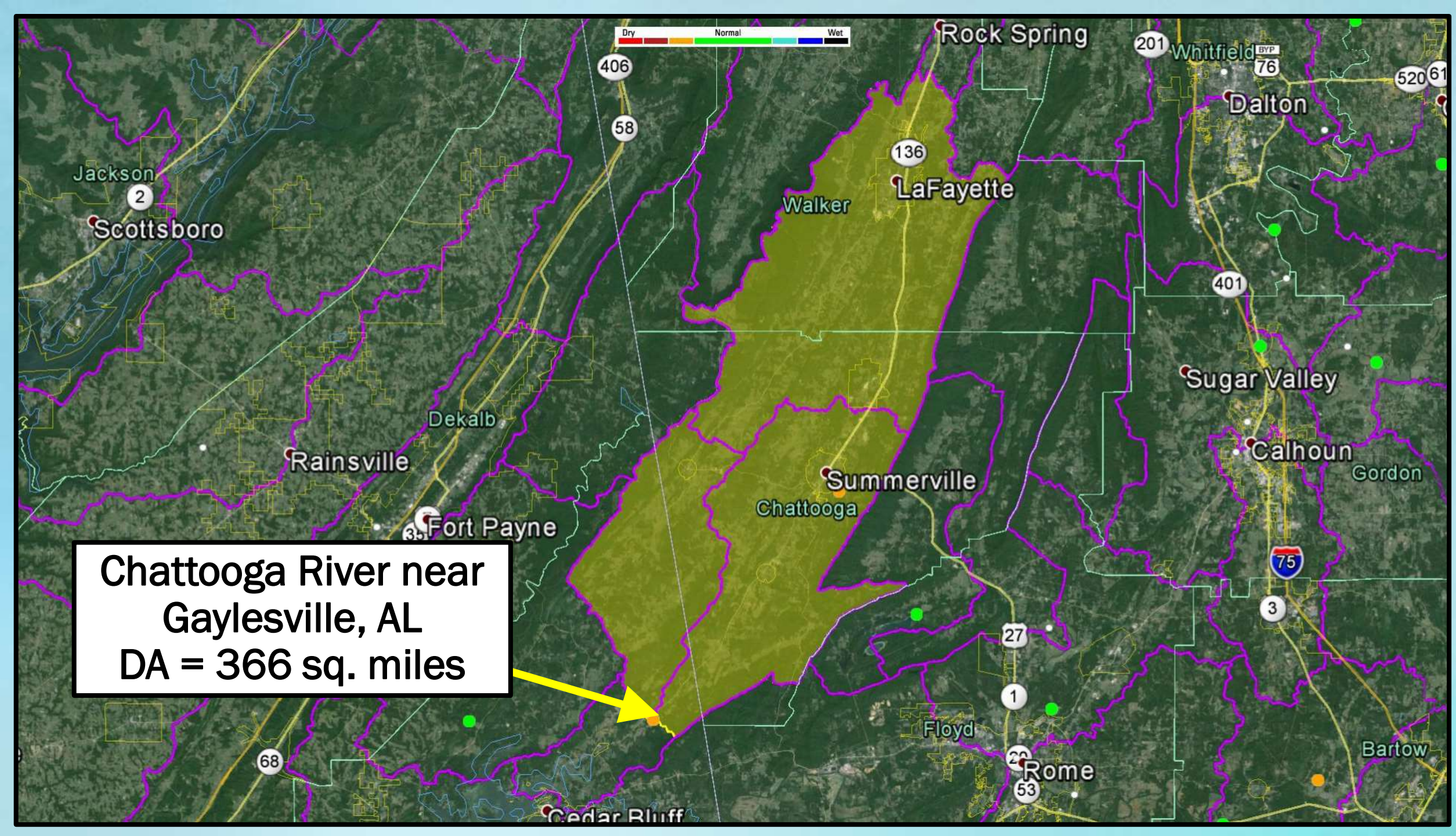

Conasauga River at Tilton, GA
Total Phosphorus
1971 - 2015
Total Phosphorus, mg/L
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
6/11/1968
12/2/1973
5/25/1979
11/14/1984
5/7/1990
10/28/1995
4/19/2001
10/10/2006
4/1/2012
9/22/2017
3/15/2023

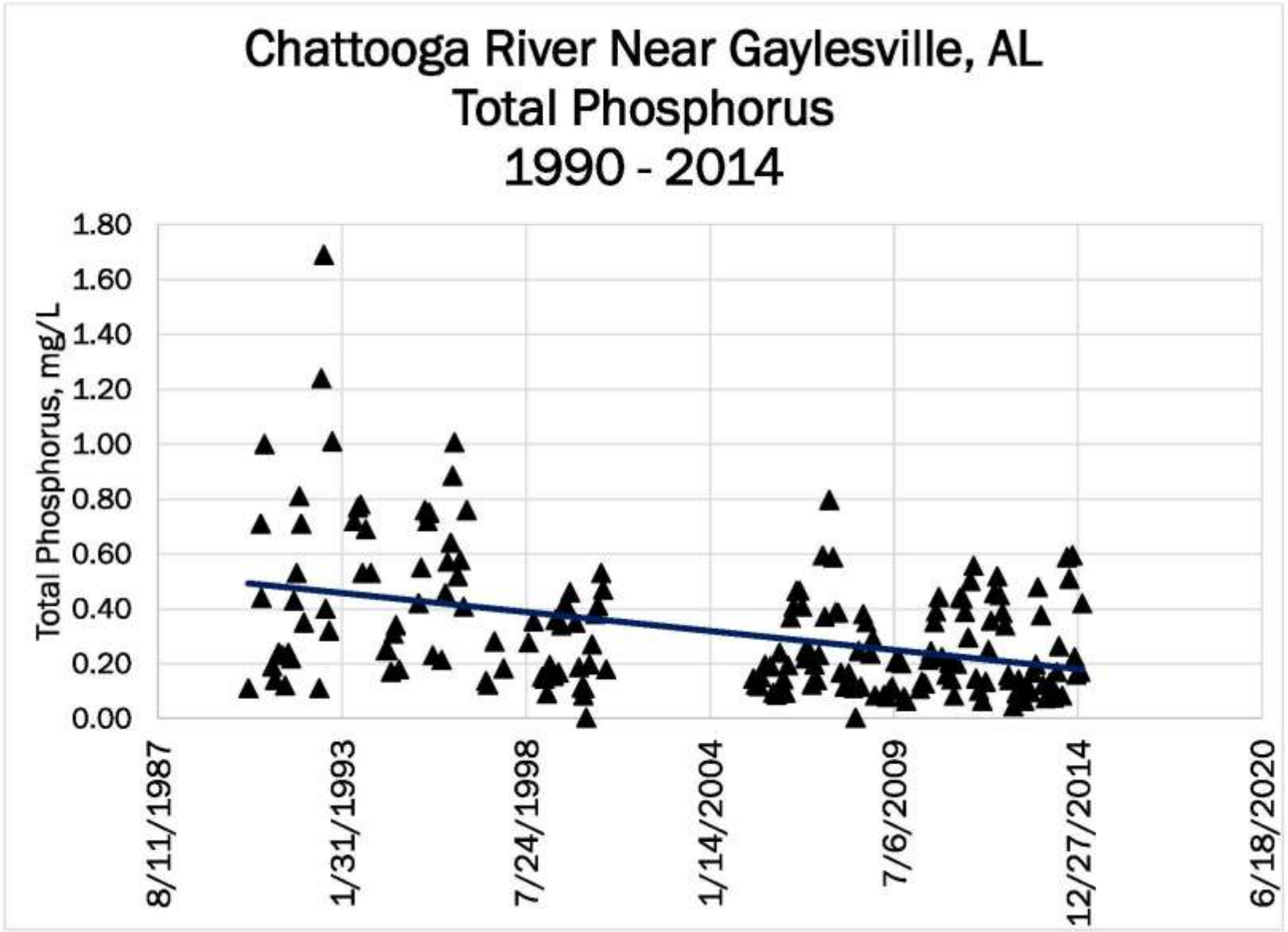

Conasauga River at Tilton, GA
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1960
1970
1980
1990
2000
2010
2020

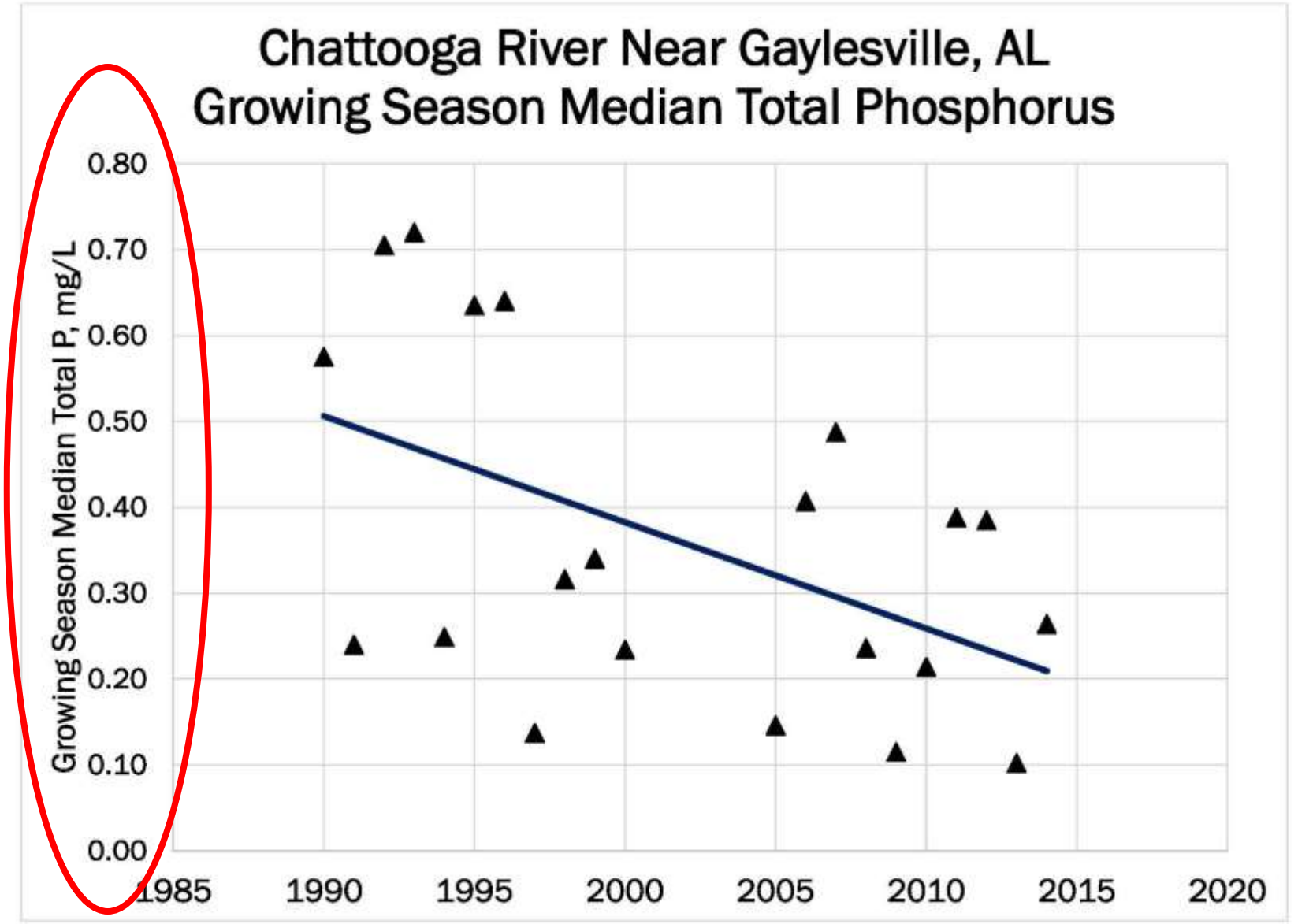

Dry
Normal
Wet
Coosa River at AL – GA State Line
DA = 4,362 sq. miles
Chattanooga
Rome
Roswell
Athens
Atlanta

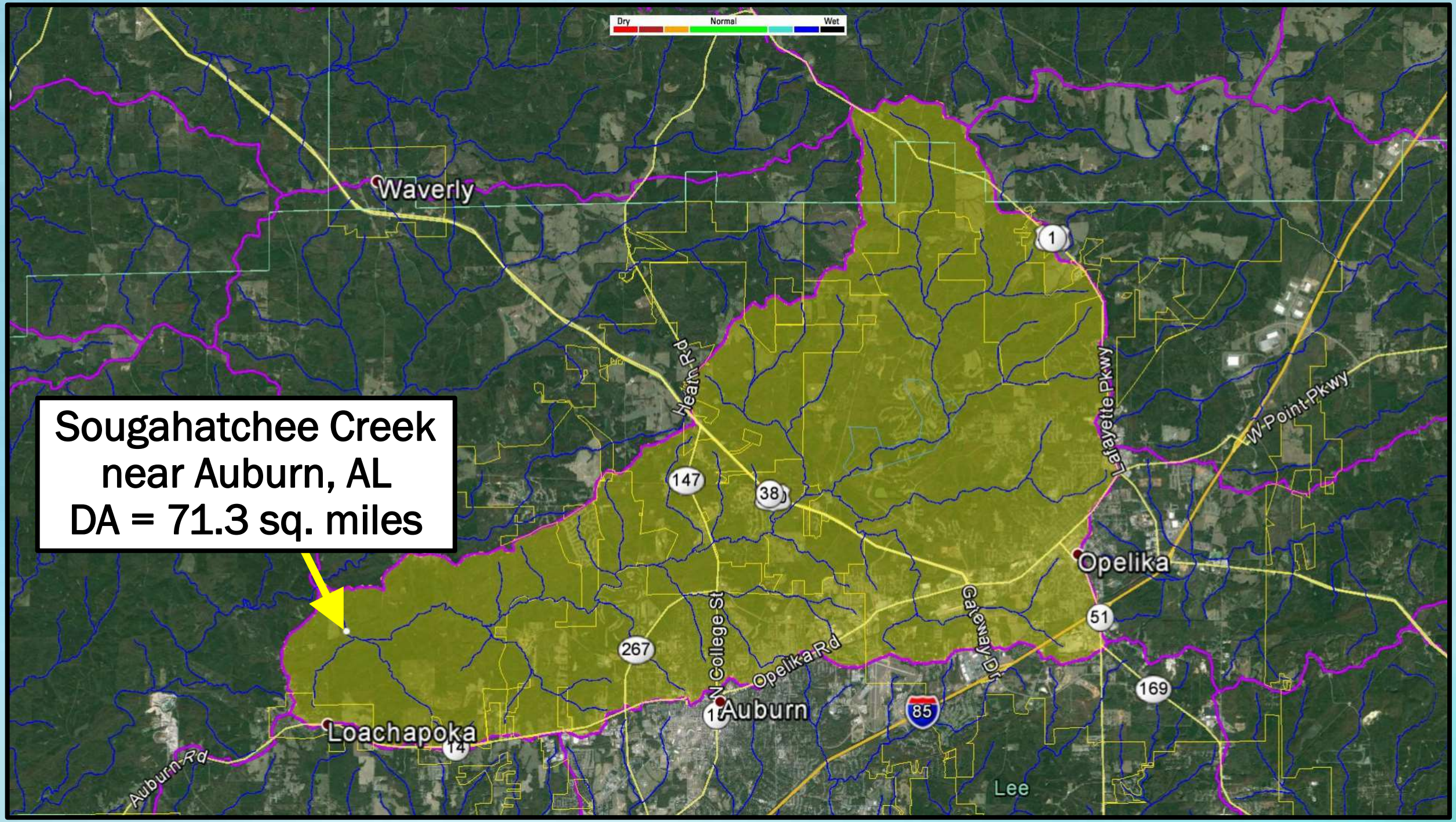

Coosa River at AL - GA State Line
Total Phosphorus
1974 - 2015
Total Phosphorus, mg/L
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
7/20/1972
1/10/1978
7/3/1983
12/23/1988
6/15/1994
12/6/1999
5/28/2005
11/18/2010
5/10/2016
10/31/2021

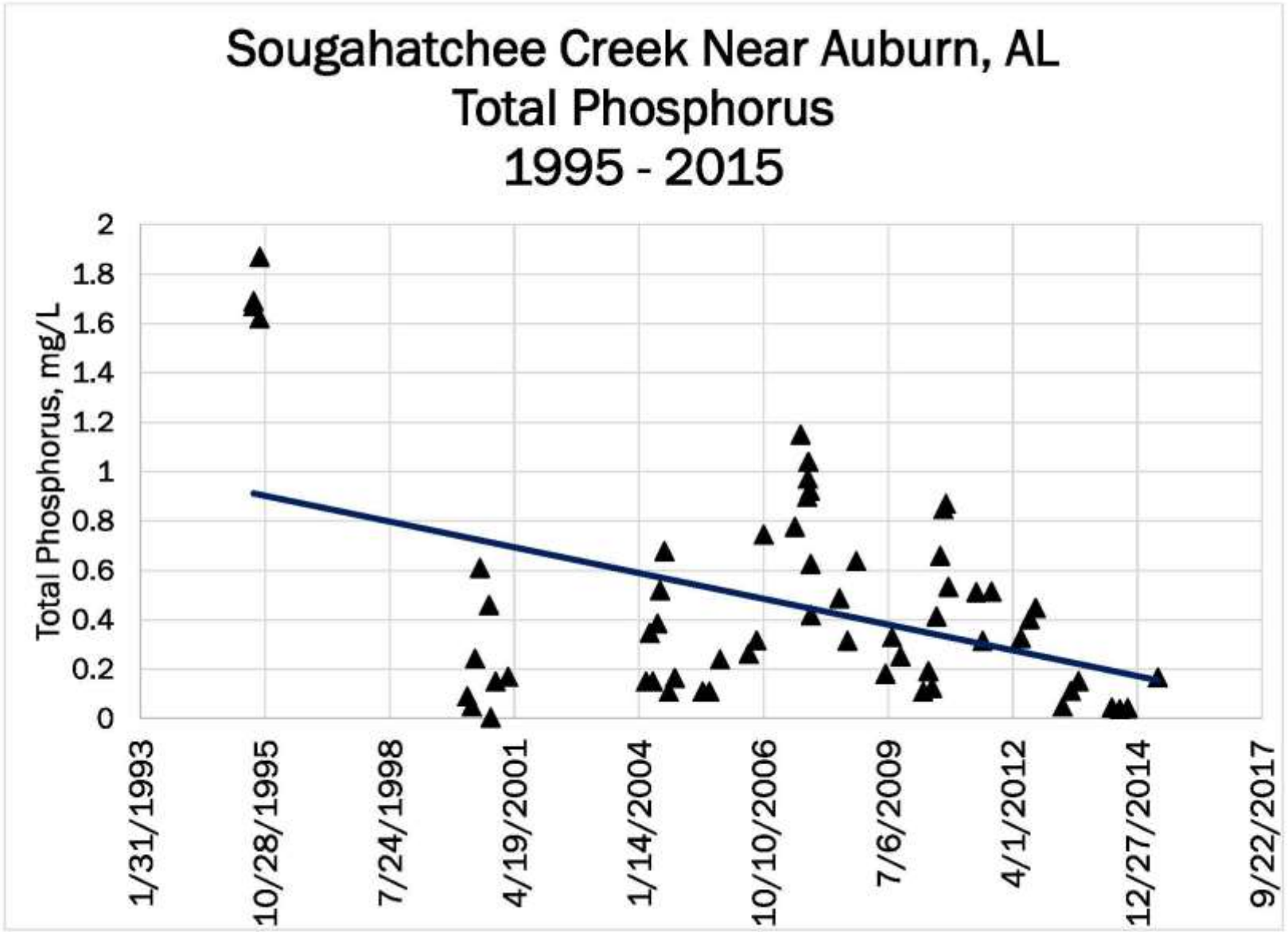

Coosa River at AL - GA State Line
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.3
0.25
0.2
0.15
0.1
0.05
0
1970
1980
1990
2000
2010
2020

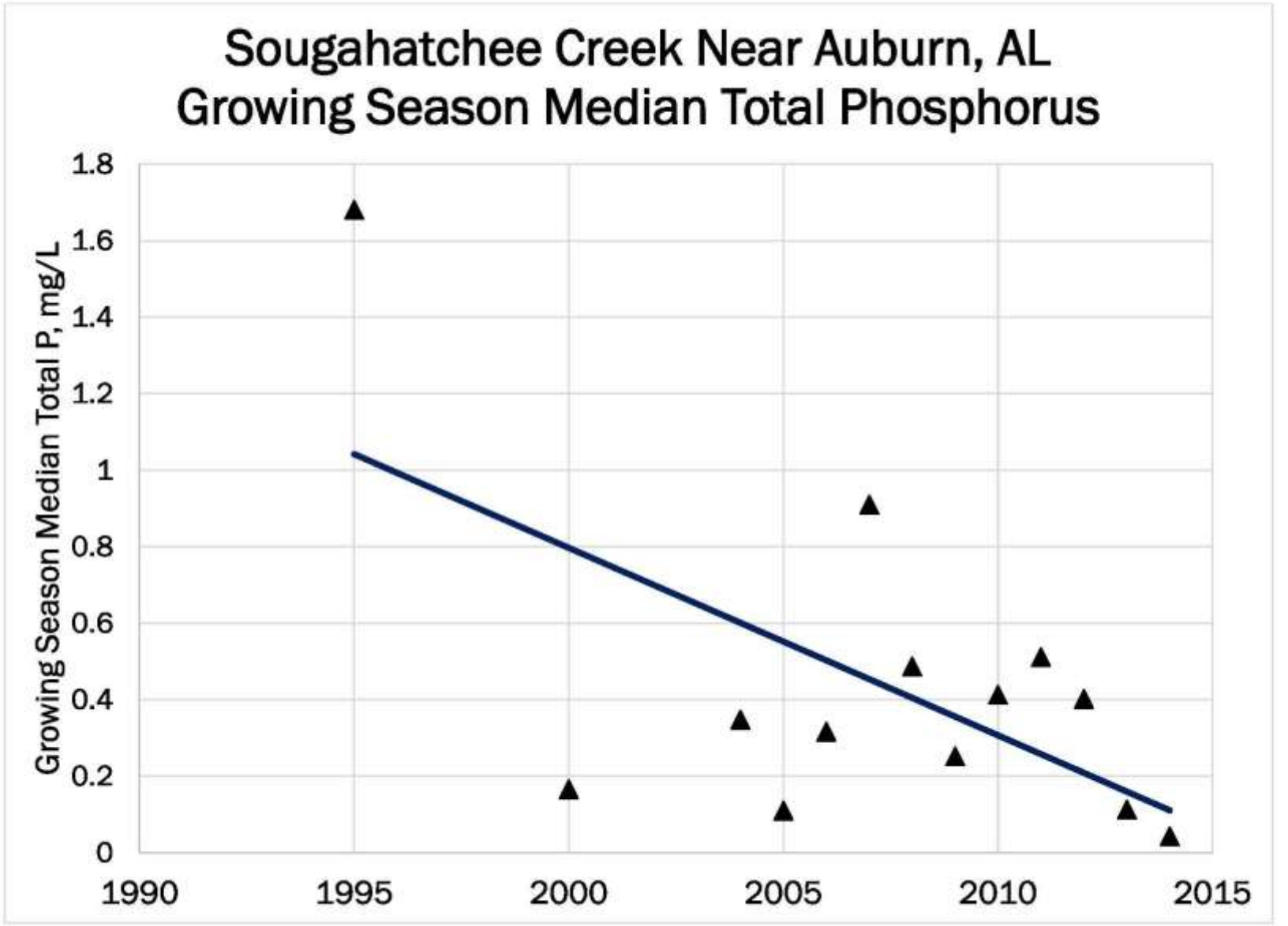

Dry
Normal
Wet
Rock Spring
406
58
201
Whitfield
BYP
76
520
61
Dalton
136
LaFayette
Walker
Jackson
2
Scottsboro
401
Sugar Valley
Dekalb
Rainsville
Calhoun
Gordon
Summerville
Chattooga
Fort Payne
75
3
27
1
Floyd
Rome
53
Bartow
68
Cedar Bluff
Chattooga River near
Gaylesville, AL
DA = 366 sq. miles

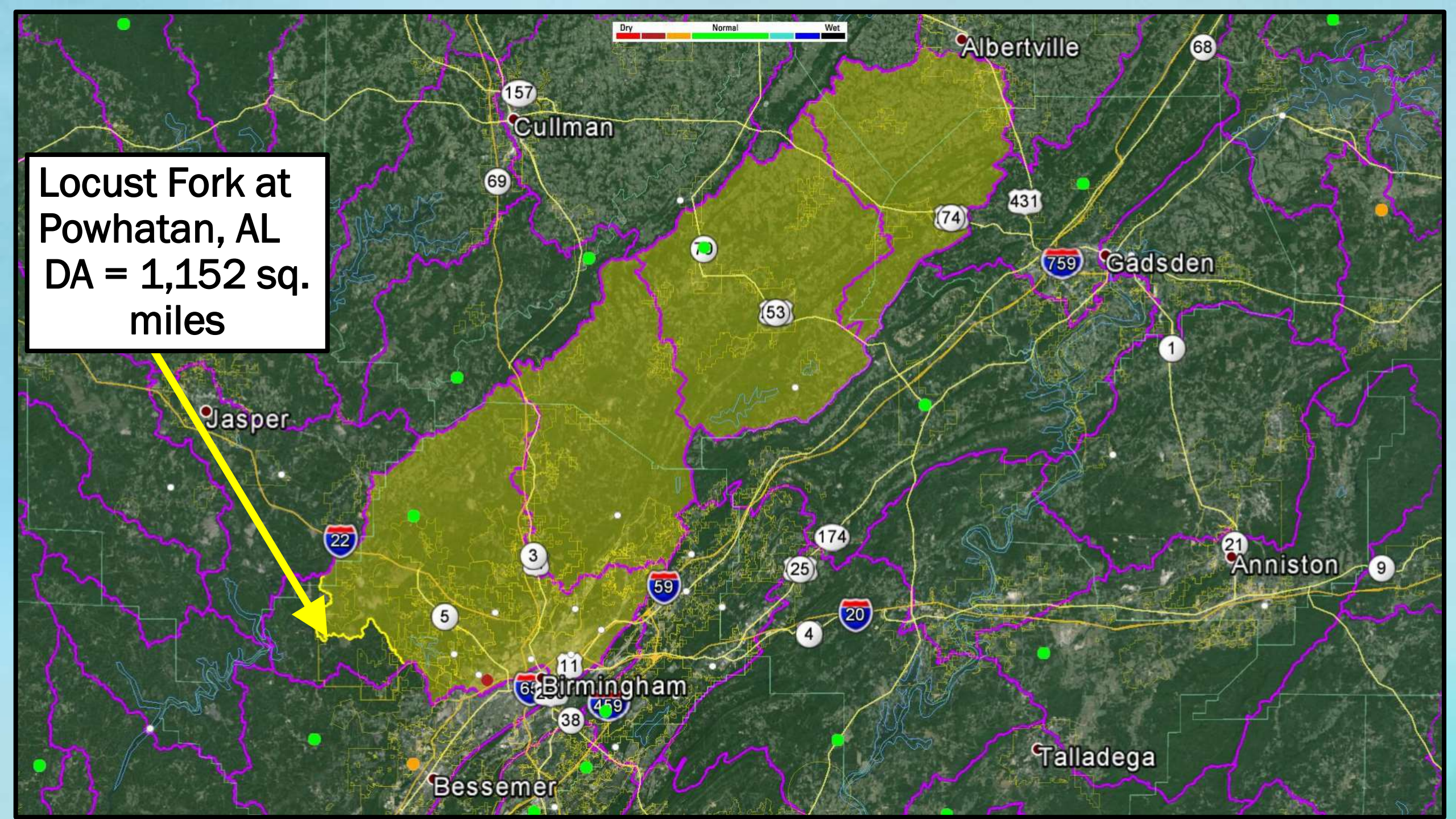

Chattooga River Near Gaylesville, AL
Total Phosphorus
1990 - 2014
Total Phosphorus, mg/L
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
8/11/1987
1/31/1993
7/24/1998
1/14/2004
7/6/2009
12/27/2014
6/18/2020

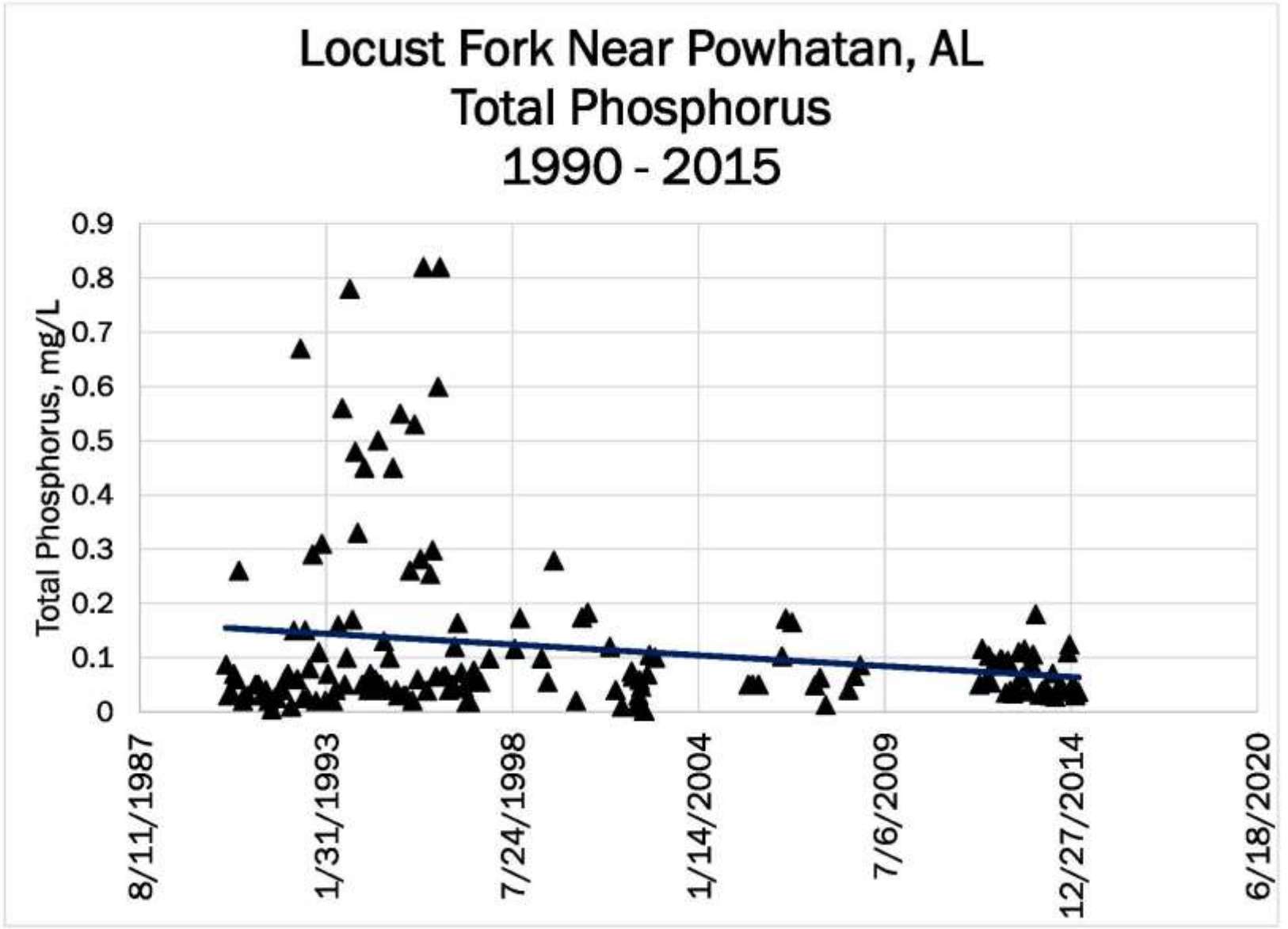

Chattooga River Near Gaylesville, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1985
1990
1995
2000
2005
2010
2015
2020

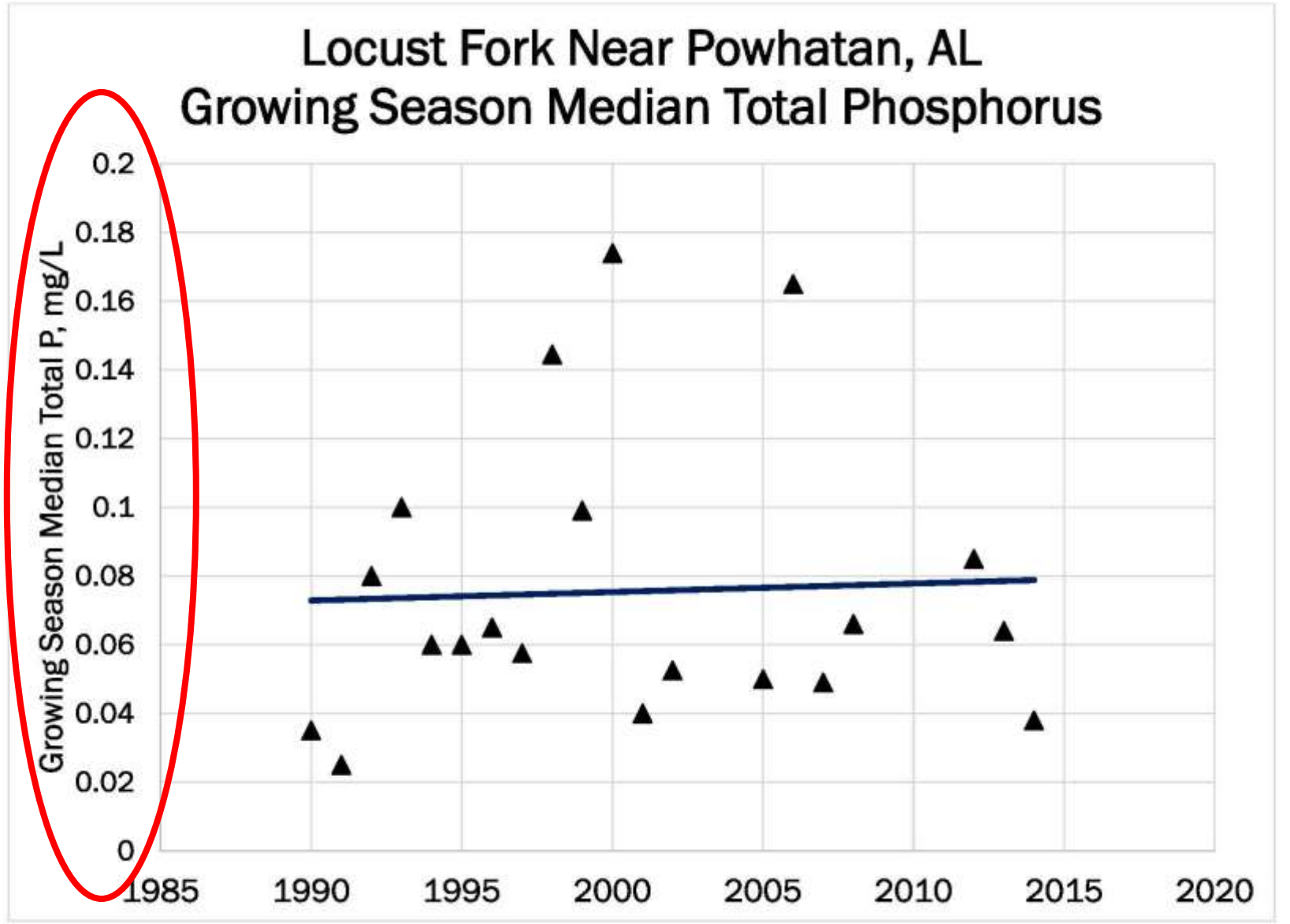

Dry
Normal
Wet
Sougahatchee Creek
near Auburn, AL
DA = 71.3 sq. miles
Waverly
Heath Rd
147
38
1
Lafayette Pkwy
W Point Pkwy
Opelika
51
169
Gateway Dr
N College St
267
Opelika Rd
Auburn
85
Loachapoka
14
Auburn Rd
Lee

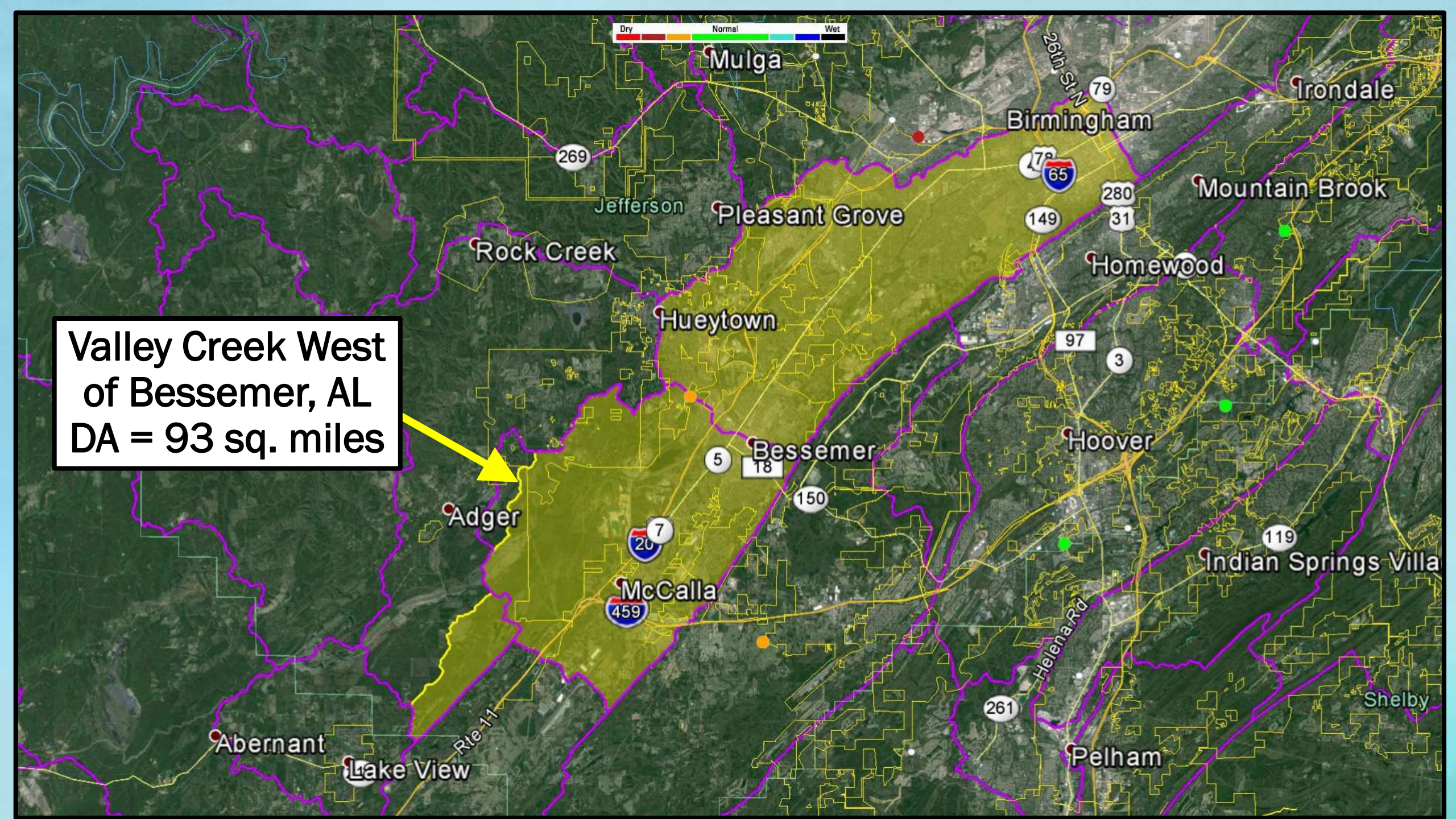

Sougahatchee Creek Near Auburn, AL
Total Phosphorus
1995 - 2015
Total Phosphorus, mg/L
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017

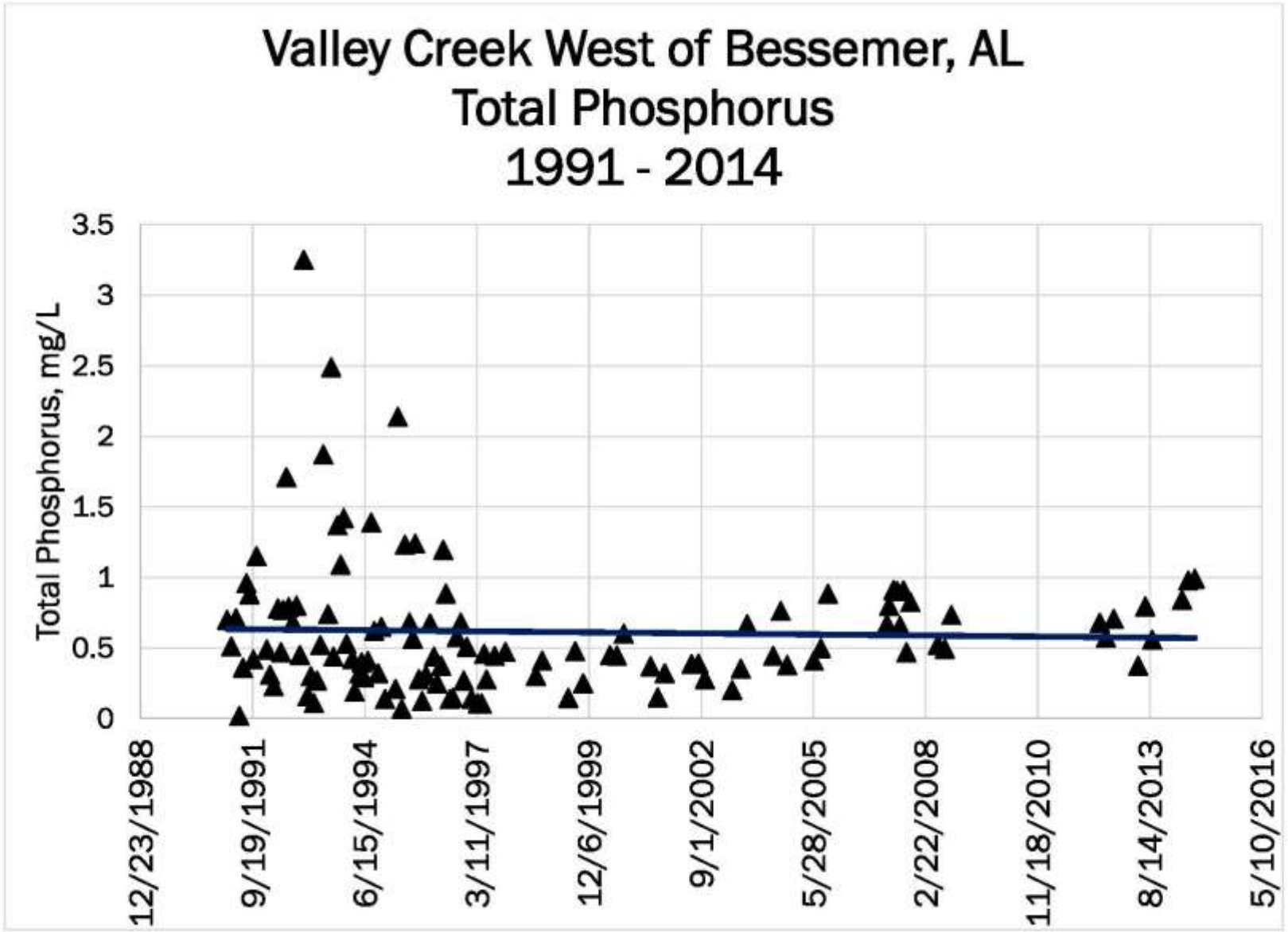

Sougahatchee Creek Near Auburn, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015

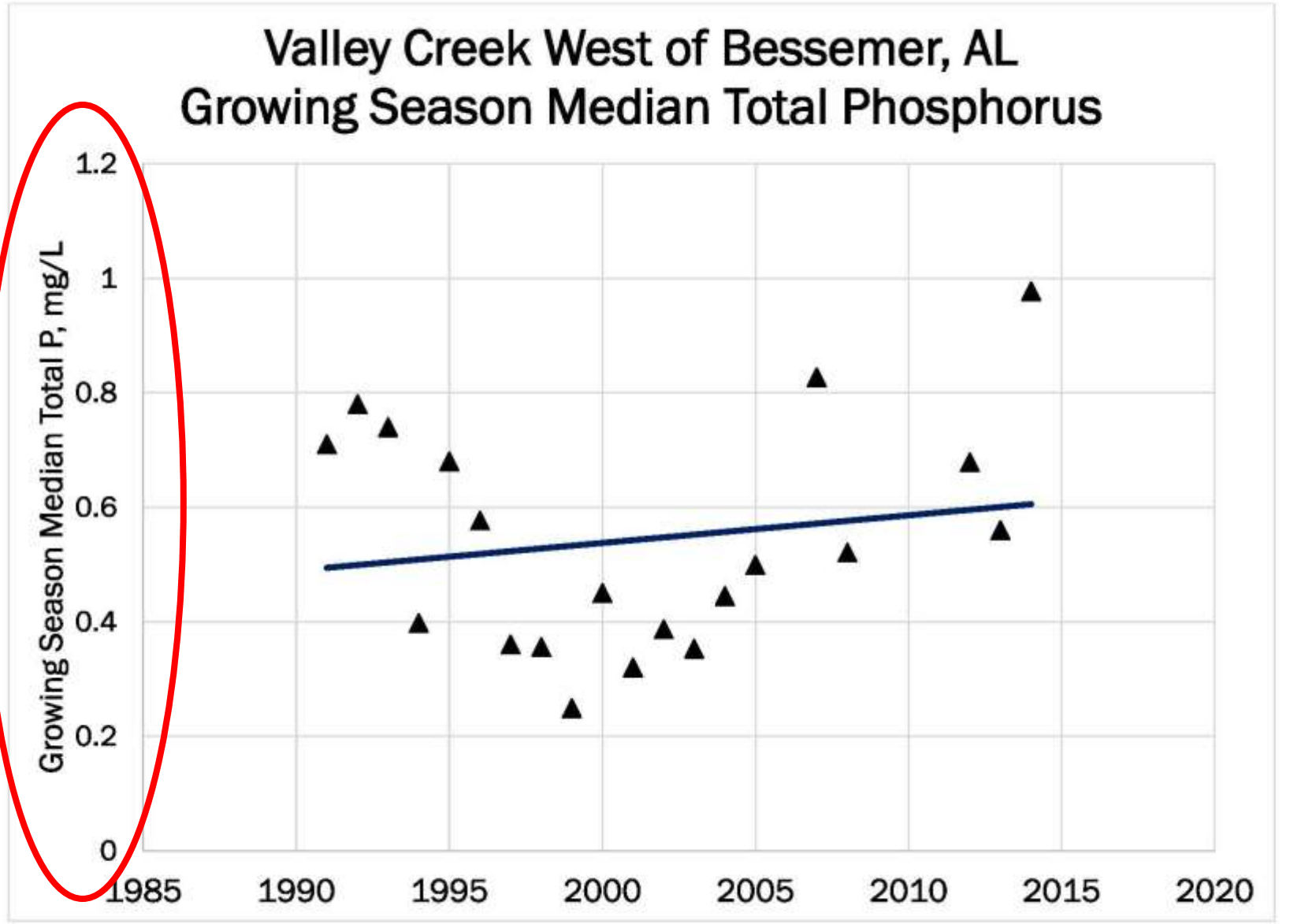

Locust Fork at Powhatan, AL
DA = 1,152 sq. miles
Dry
Normal
Wet
Albertville
Cullman
Gadsden
Jasper
Anniston
Birmingham
Talladega
Bessemer
157
69
68
431
74
759
53
1
22
3
59
174
25
21
9
5
20
4
11
38
459

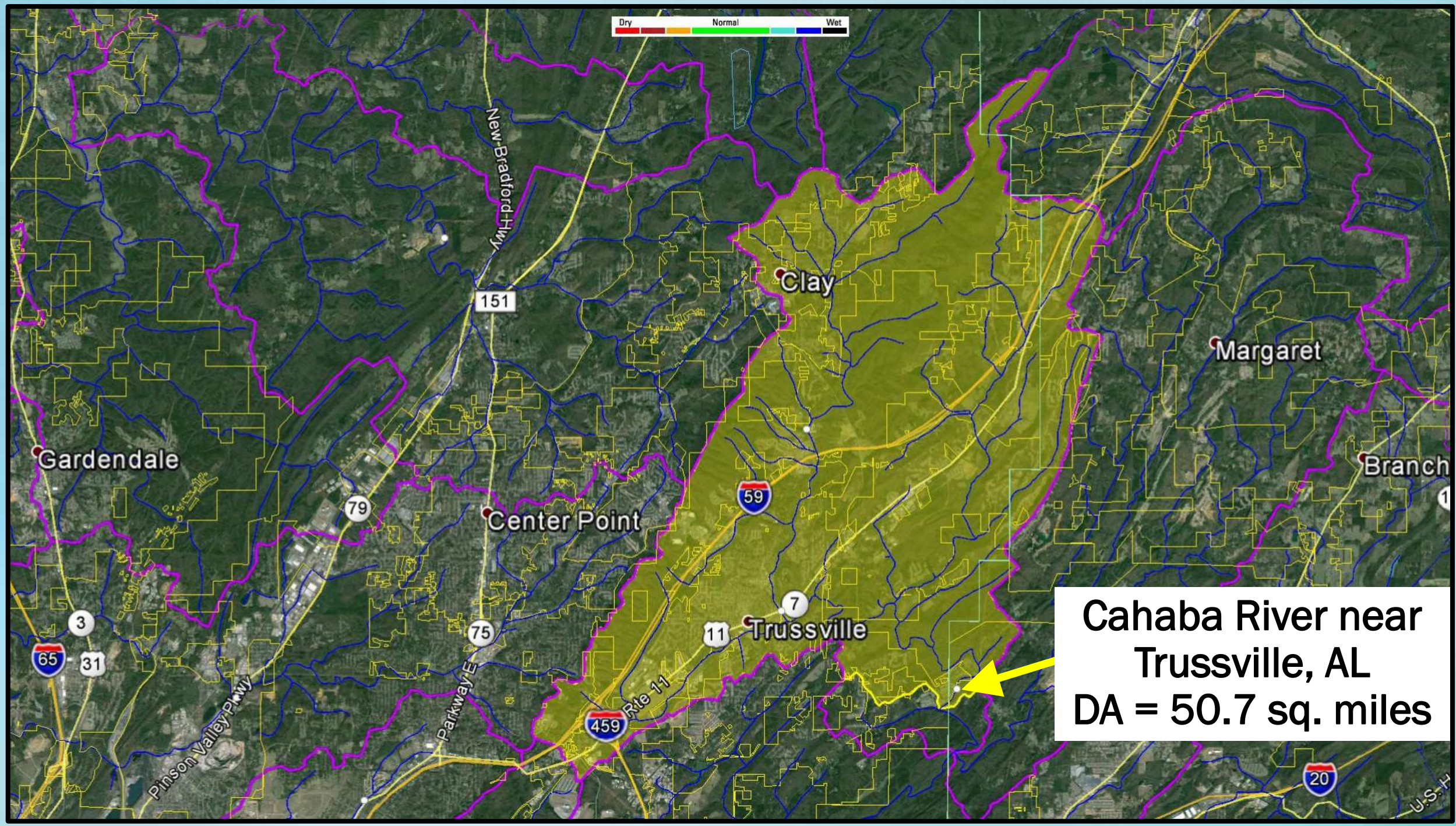

Locust Fork Near Powhatan, AL
Total Phosphorus
1990 - 2015
Total Phosphorus, mg/L
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
8/11/1987
1/31/1993
7/24/1998
1/14/2004
7/6/2009
12/27/2014
6/18/2020

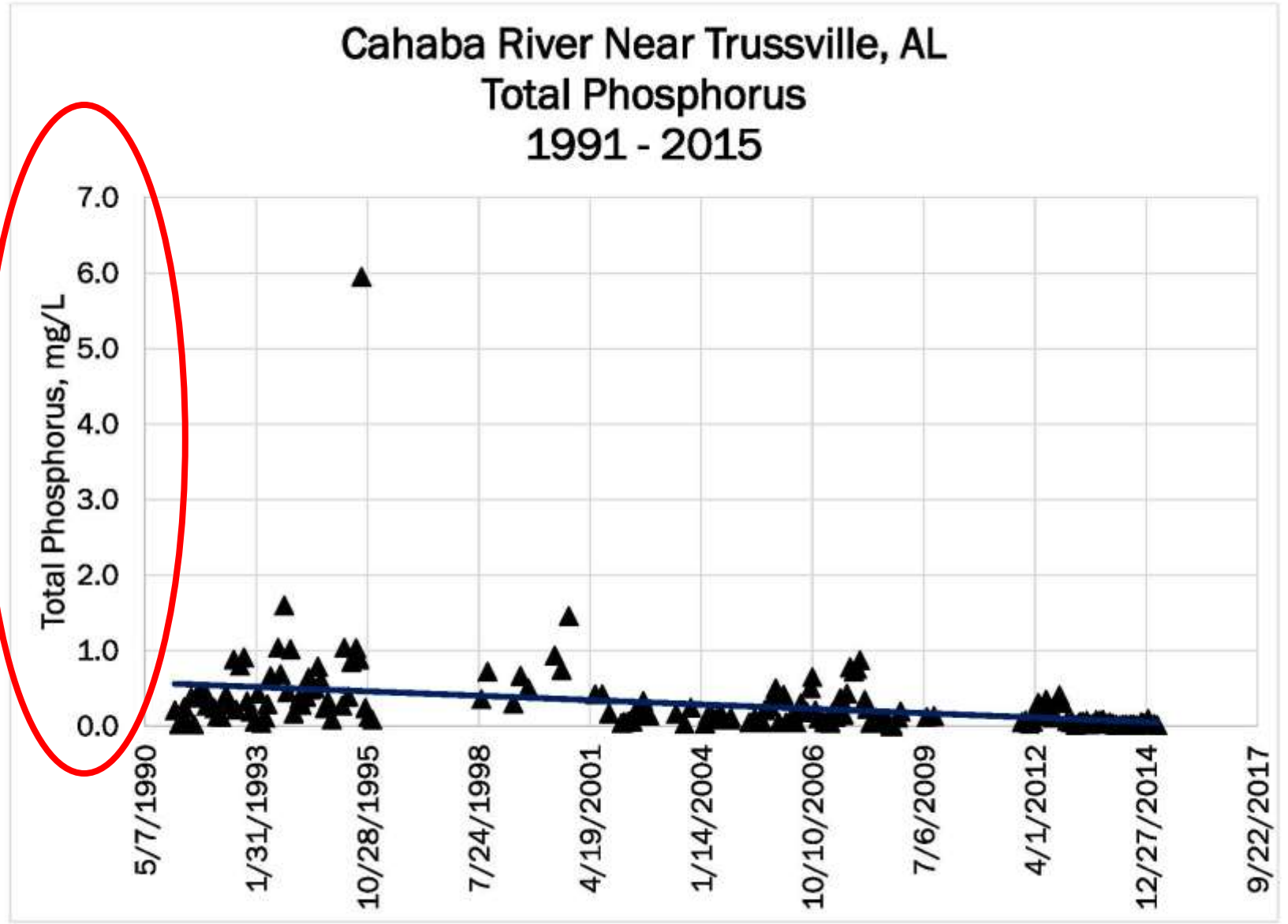

Locust Fork Near Powhatan, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1985
1990
1995
2000
2005
2010
2015
2020

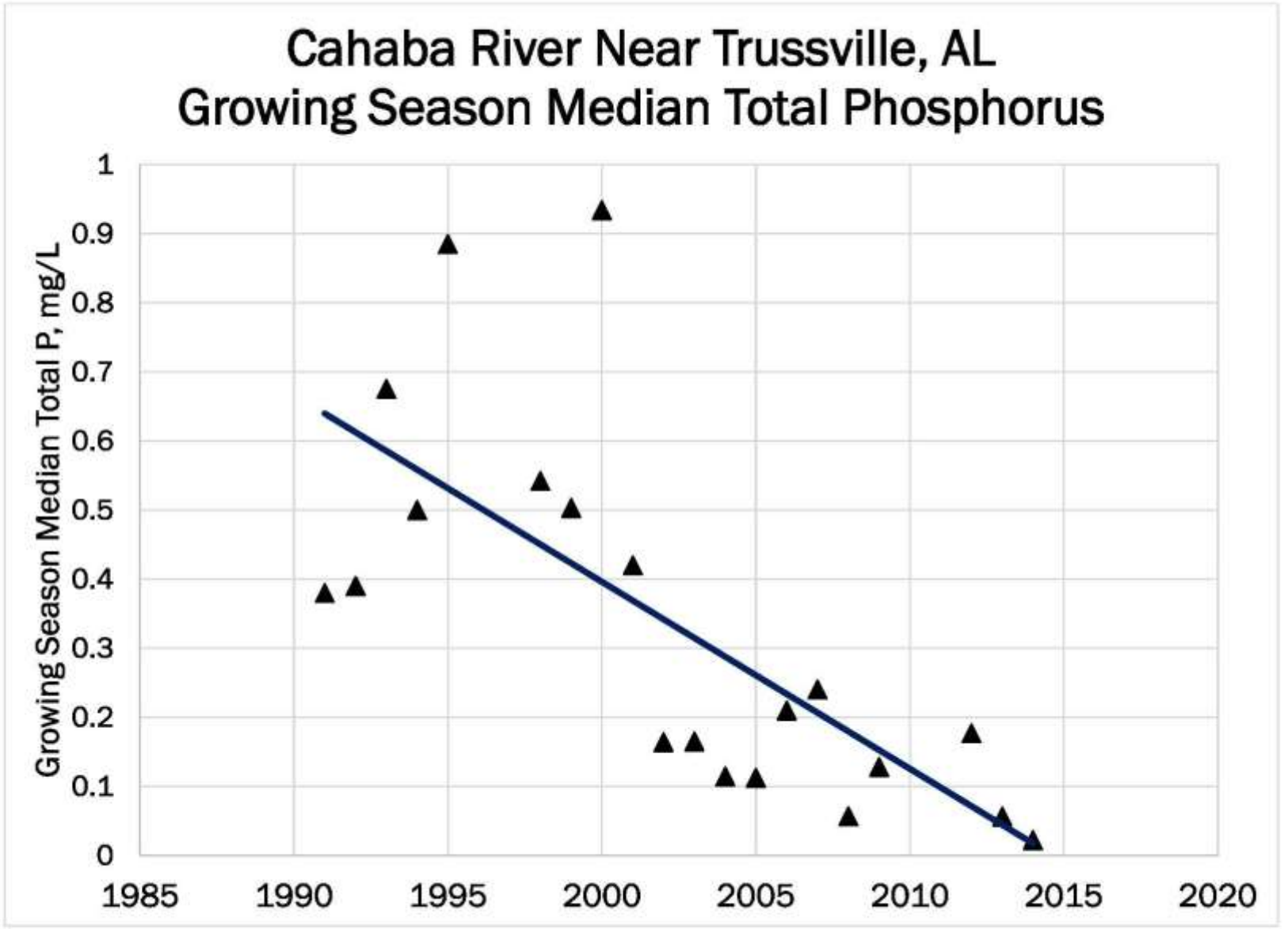

Dry
Normal
Wet
Valley Creek West of Bessemer, AL
DA = 93 sq. miles
Mulga
26th St N
79
Birmingham
Irondale
269
65
Jefferson
Pleasant Grove
280
31
149
Mountain Brook
Rock Creek
Homewood
Hueytown
97
3
Hoover
Bessemer
5
18
150
Adger
7
20
McCalla
459
119
Indian Springs Villa
Helena Rd
261
Shelby
Abernant
Rte 11
Lake View
Pelham

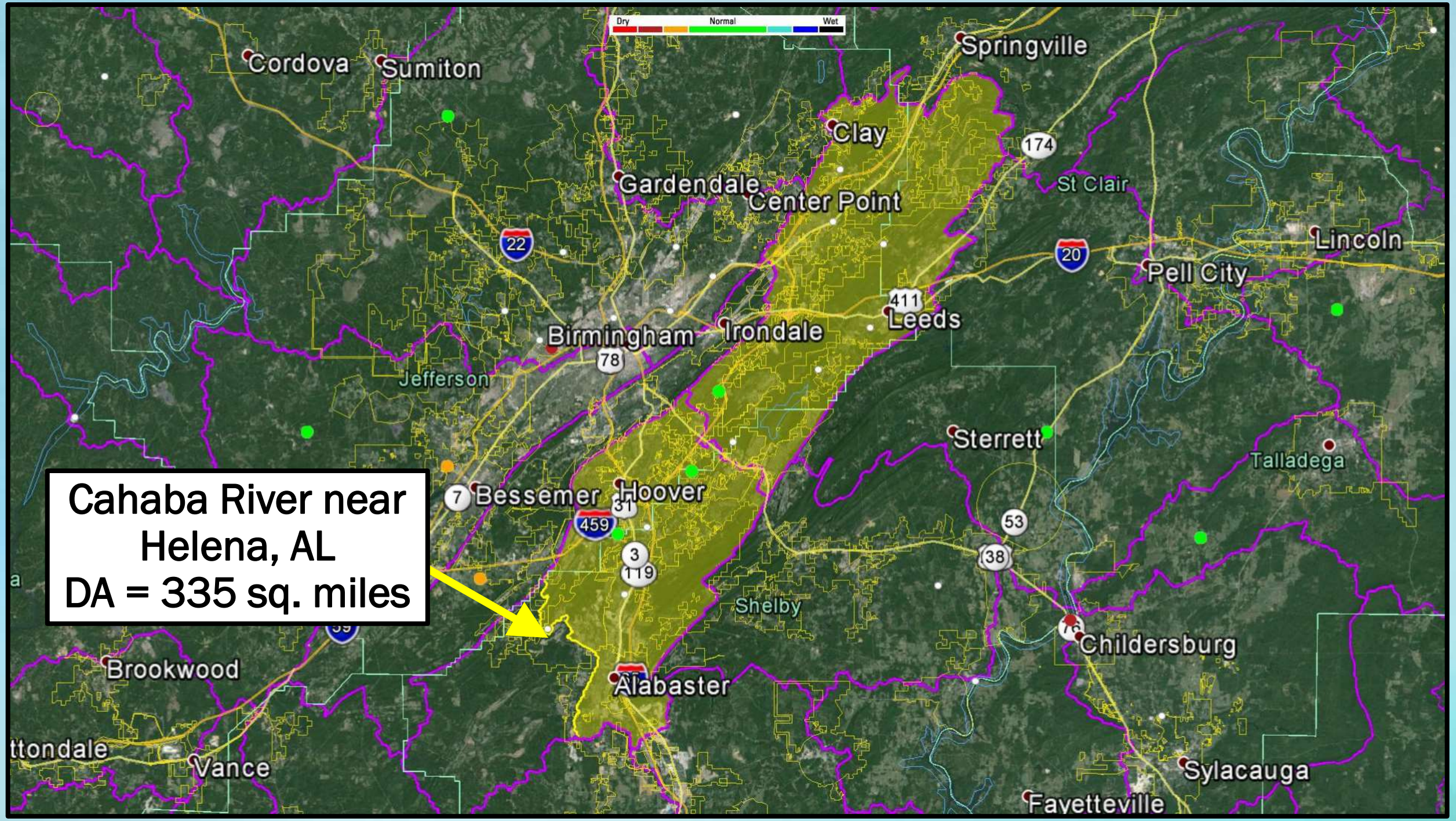

Valley Creek West of Bessemer, AL
Total Phosphorus
1991 - 2014
Total Phosphorus, mg/L
3.5
3
2.5
2
1.5
1
0.5
0
12/23/1988
9/19/1991
6/15/1994
3/11/1997
12/6/1999
9/1/2002
5/28/2005
2/22/2008
11/18/2010
8/14/2013
5/10/2016

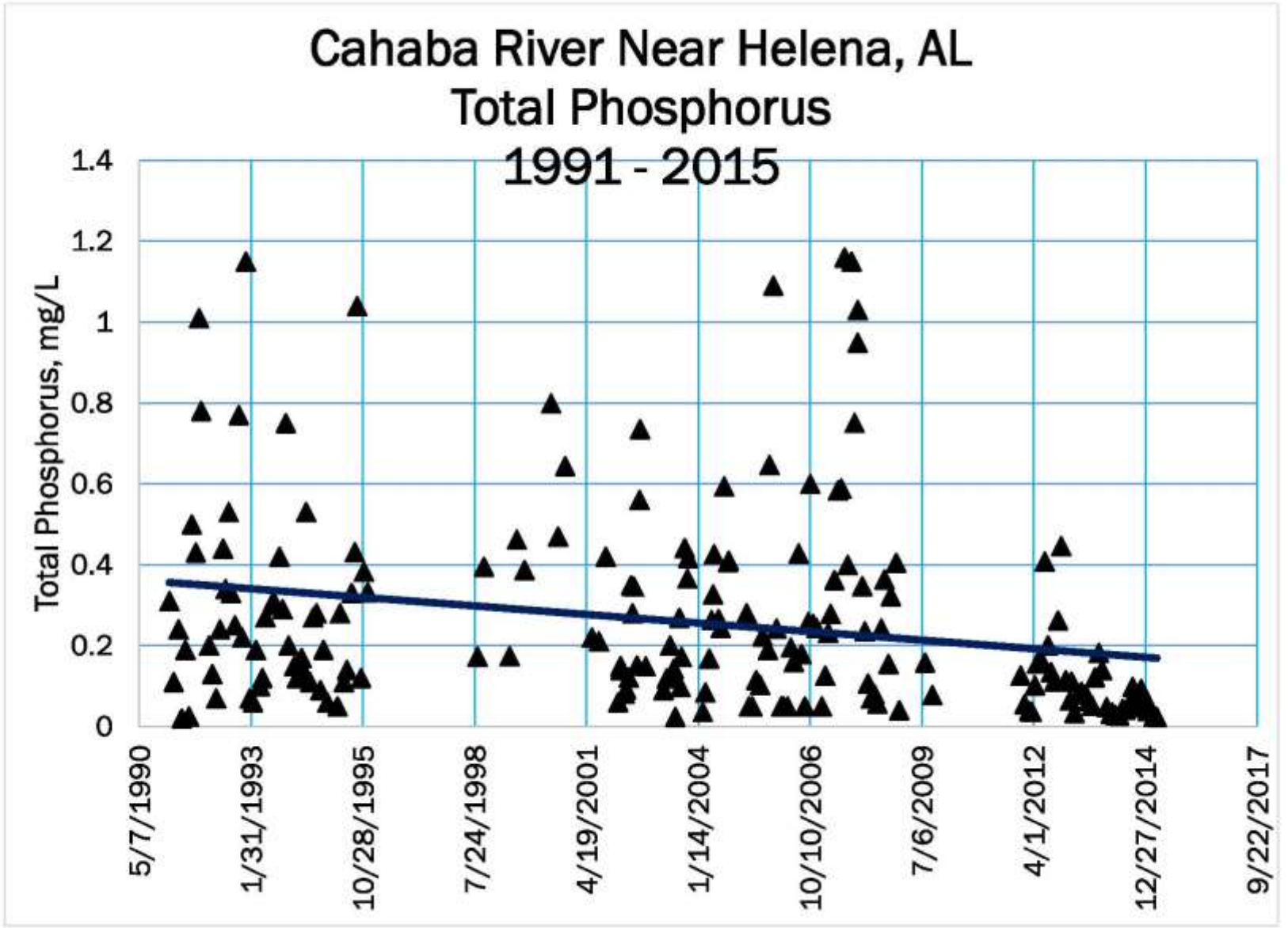

Valley Creek West of Bessemer, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
1.2
1
0.8
0.6
0.4
0.2
0
1985
1990
1995
2000
2005
2010
2015
2020

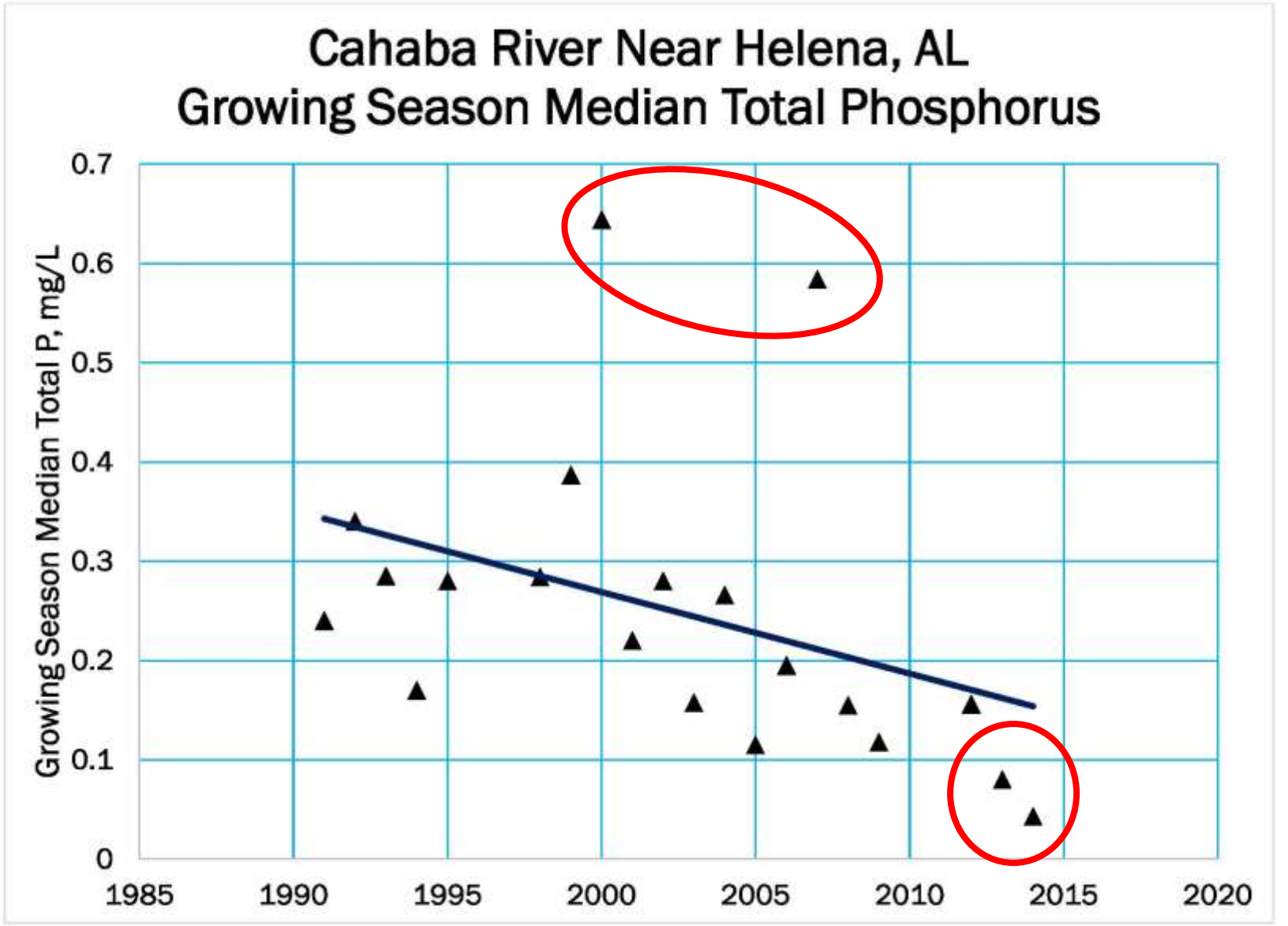

Dry
Normal
Wet
New Bradford Hwy
151
Clay
Margaret
Gardendale
79
Center Point
59
Branch
3
65
31
75
7
11
Trussville
Pinson Valley Pkwy
Parkway E
459
Rte 11
20
Cahaba River near
Trussville, AL
DA = 50.7 sq. miles

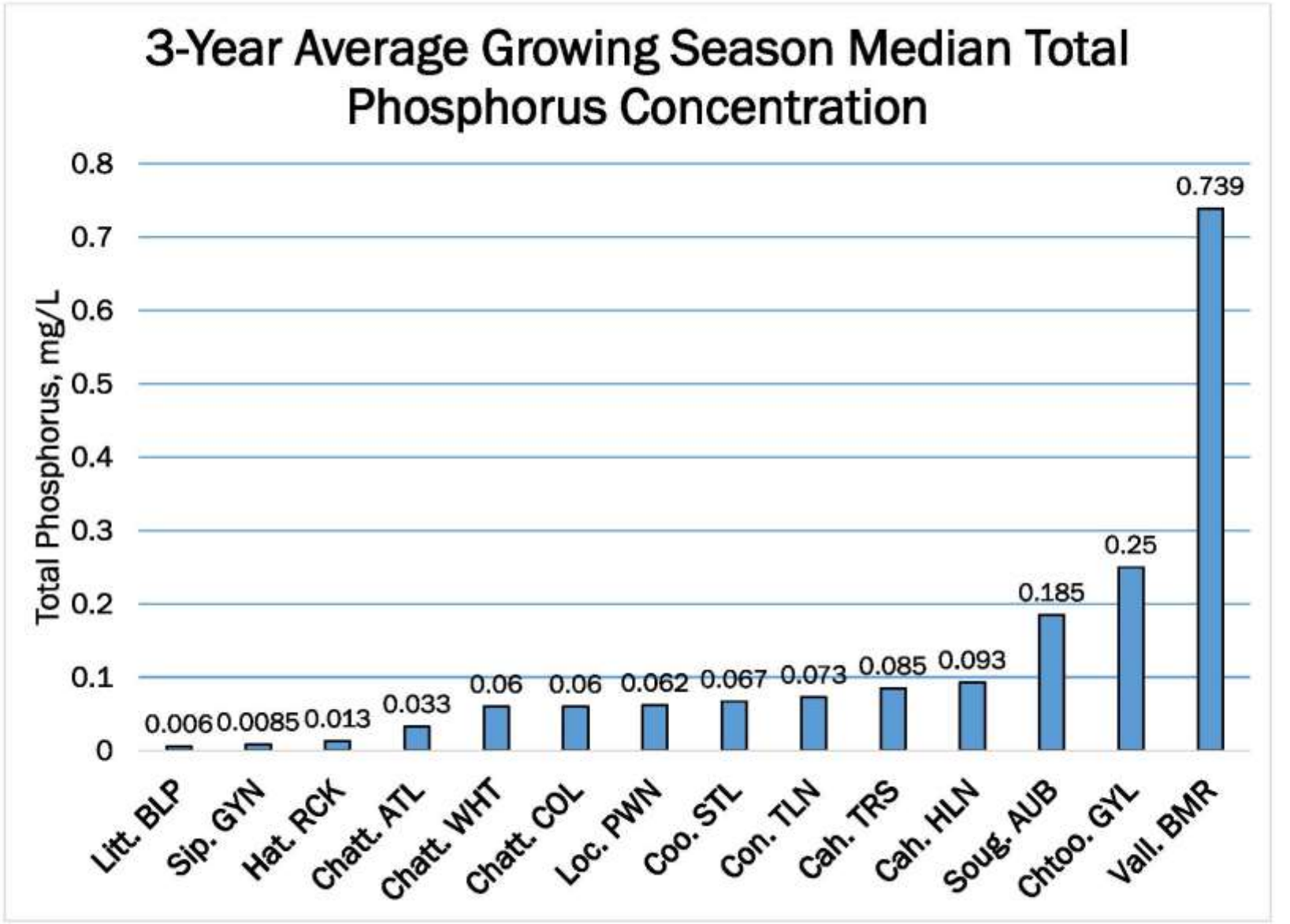

Cahaba River Near Trussville, AL
Total Phosphorus
1991 - 2015
Total Phosphorus, mg/L
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017


Cahaba River Near Trussville, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1985
1990
1995
2000
2005
2010
2015
2020


Dry
Normal
Wet
Cordova
Sumiton
Springville
Clay
Gardendale
Center Point
St Clair
Lincoln
Pell City
Leeds
Irondale
Birmingham
Jefferson
Sterrett
Talladega
Bessemer
Hoover
Shelby
Childersburg
Brookwood
Alabaster
Vance
Sylacauga
Fayetteville
22
20
174
411
78
459
31
3
119
53
38
Cahaba River near
Helena, AL
DA = 335 sq. miles


Cahaba River Near Helena, AL
Total Phosphorus
1991 - 2015
Total Phosphorus, mg/L
1.4
1.2
1
0.8
0.6
0.4
0.2
0
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017


Cahaba River Near Helena, AL
Growing Season Median Total Phosphorus
Growing Season Median Total P, mg/L
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1985
1990
1995
2000
2005
2010
2015
2020


3-Year Average Growing Season Median Total Phosphorus Concentration
Total Phosphorus, mg/L
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.006
0.0085
0.013
0.033
0.06
0.06
0.062
0.067
0.073
0.085
0.093
0.185
0.25
0.739
Litt. BLP
Sip. GYN
Hat. RCK
Chatt. ATL
Chatt. WHT
Chatt. COL
Loc. PWN
Coo. STL
Con. TLN
Cah. TRS
Cah. HLN
Soug. AUB
Chtoo. GYL
Vall. BMR

/quality/rivers/home

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Water Quality Summaries

Mississippi River Basin
Relative Nutrient Loading from Tributaries

Coastal Rivers
Nitrate Loads and Yields

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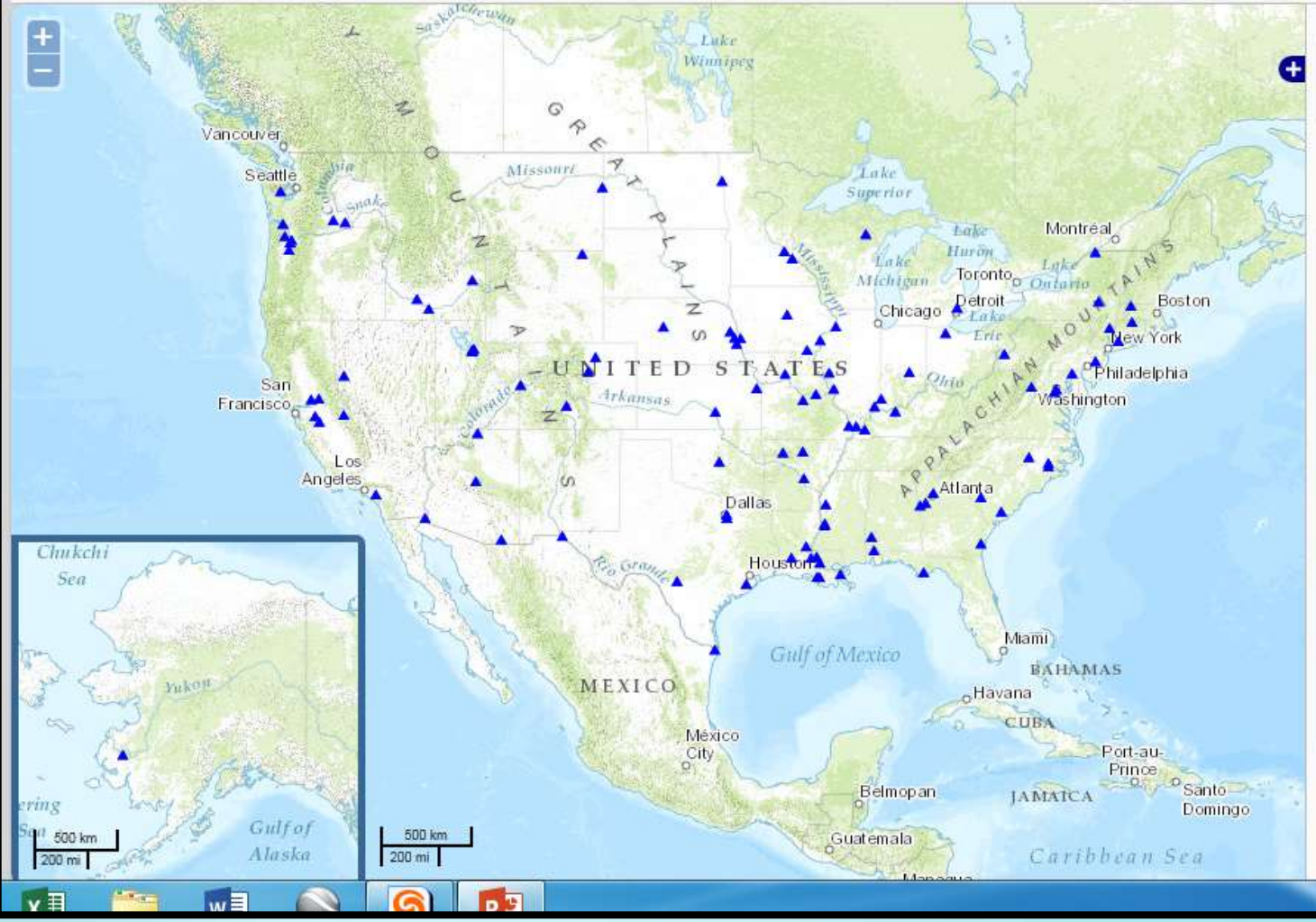
Rivers and Streams Across the United States - Water Quality Summaries



Hover over (or click) a ▲ for site information

Map View | Site List

Filter by Site Type

- ☐ Urban Streams
- ☐ Agriculture Streams
- ☐ Reference Streams
- ☐ Inland Rivers
- ☐ Coastal Rivers

Download Data

Chattahoochee River near Whitesburg, GA

Station ID: 02338000

Summary of Water-Quality Conditions for 2014

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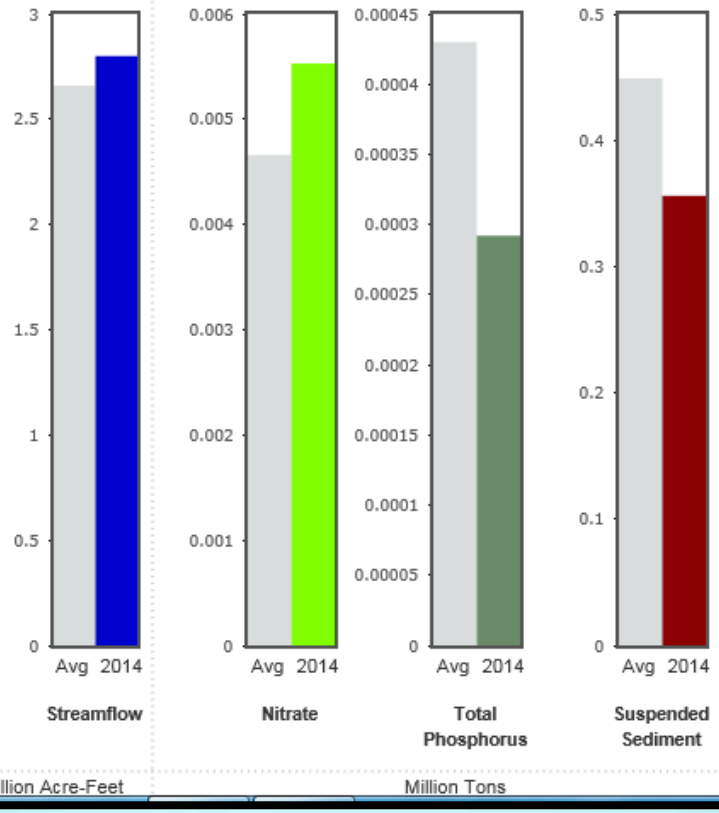
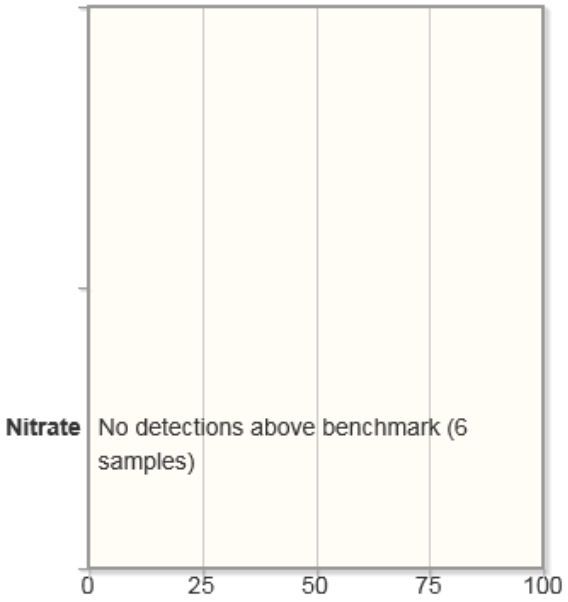
Detailed Graphs

Streamflow and Water Quality



Comparisons to Human-Health Benchmarks



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Chattahoochee River near Whitesburg, GA

Station ID: 02338000

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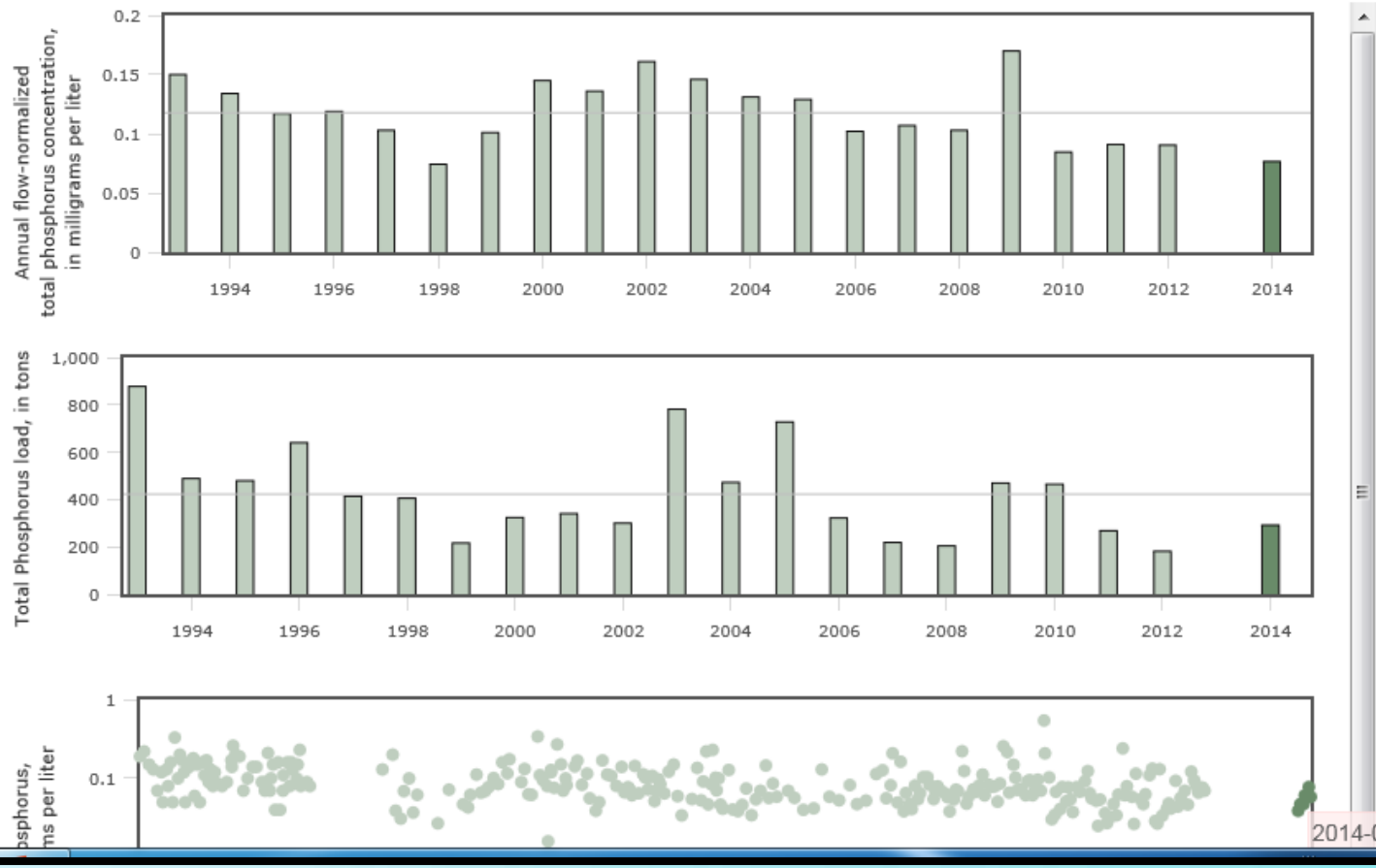
Summary Graphs

- Select All
  - Streamflow
  - Total Nitrogen
  - Nitrate
  - Total Phosphorus
    - Sample concentrations
    - Annual concentrations
    - Annual load
  - Suspended Sediment



Summary:

- TP concentrations are trending down in watersheds where significant phosphorus loading reductions have occurred
- Some watersheds have experienced dramatic declines in total phosphorus concentrations during the previous 30 years
- Phosphorus control / management efforts are resulting in lower phosphorus concentrations in rivers and streams

Questions ??

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LSISK@TTLUSA.COM

Thank You !