USGS
science for a changing world

History of *Cylindrospermopsis* in a Large Flood-Control, Hydroelectric, and Water-Supply Reservoir in Northwest Arkansas

Oklahoma Clean Lakes and Watersheds Conference, April 2-3, 2014, Stillwater, Oklahoma

W. Reed Green, USGS Arkansas Water Science Center and
Russell G. Rhodes, Missouri State University

U.S. Department of the Interior
U.S. Geological Survey

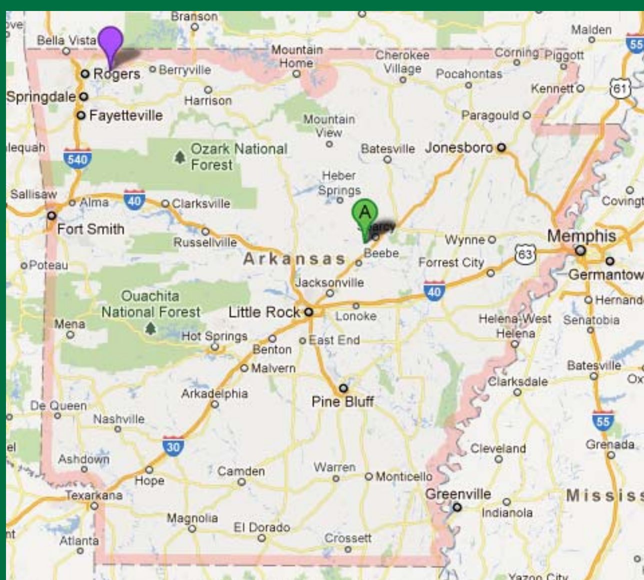
Outline

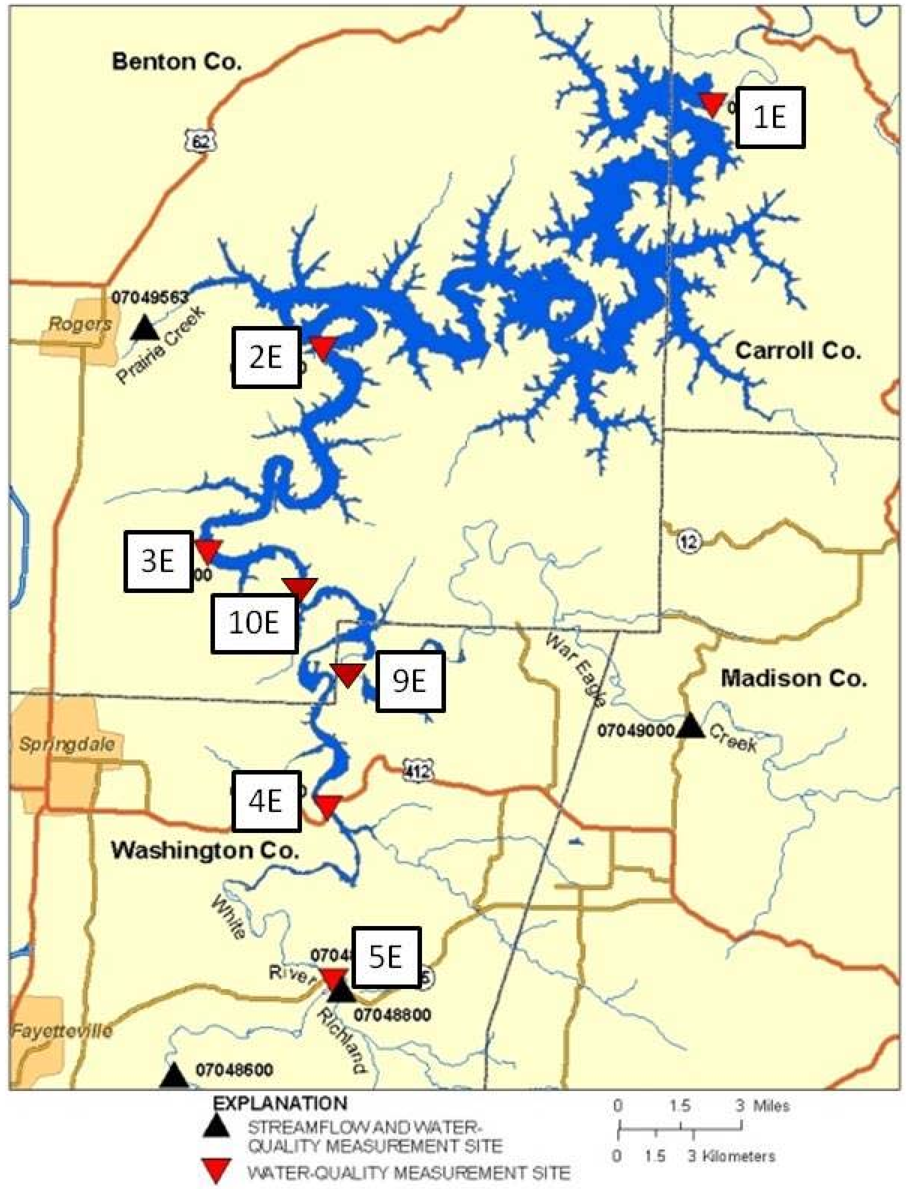
- Describe the study area
- Summarize the data collected
- Examine total phytoplankton biomass over time at each site
- Examine percent composition of phytoplankton biomass over time at each site
- Examine *Cylindrospermopsis* biomass at each site
- Examine *Cylindrospermopsis* biomass relations
  - over time, and
  - with water temperature, total nitrogen, and total phosphorus

USGS

Study Area

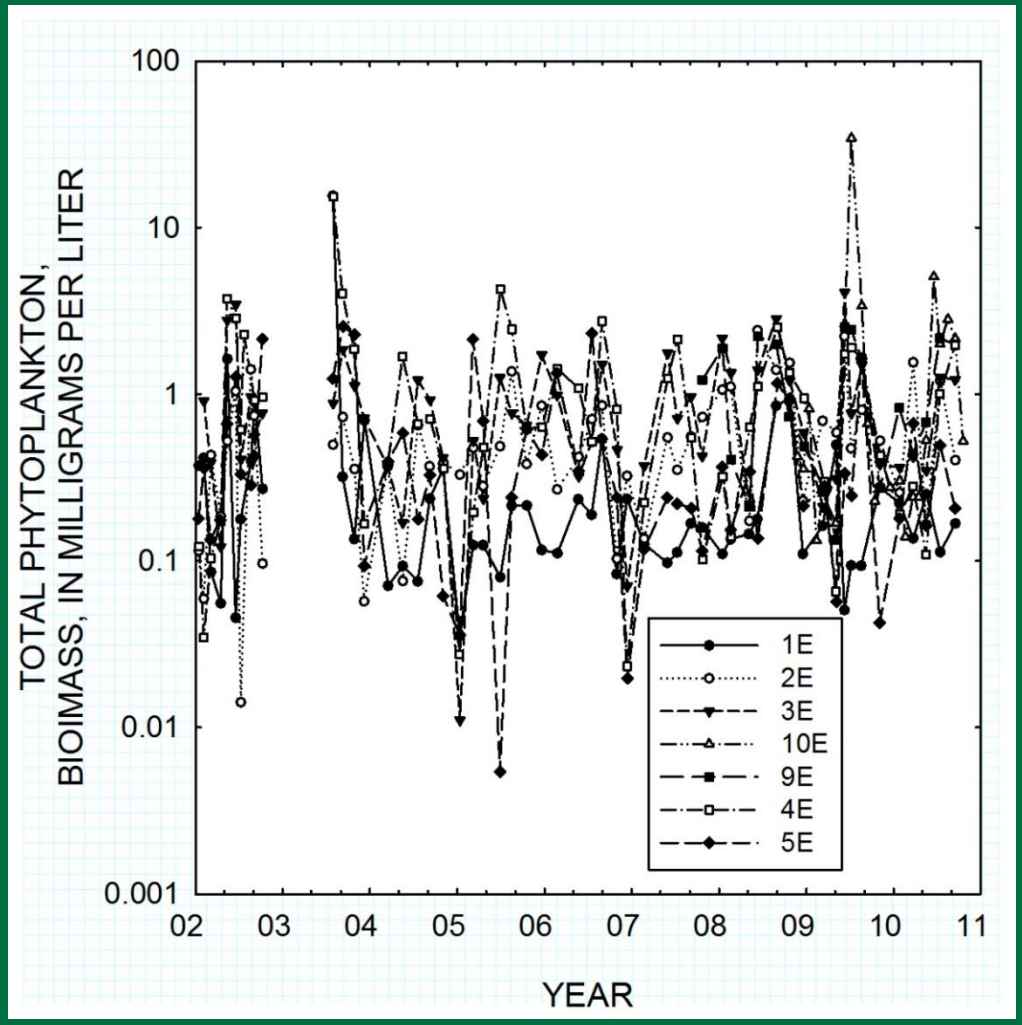

Montana
North Dakota
Minnesota
South Dakota
Wisconsin
Michigan
Wyoming
Nebraska
Iowa
Illinois
Indiana
Ohio
Pennsylvania
New York
Oregon
Idaho
Nevada
Utah
Colorado
Kansas
California
Oklahoma
Arkansas
Tennessee
Kentucky
Virginia
North Carolina
South Carolina
Georgia
Alabama
Mississippi
Louisiana
Texas
Florida
New Mexico
Arizona
Washington
United States
Gulf of Mexico


Branson
Bella Vista
Rogers
Berryville
Springdale
Fayetteville
Harrison
Mountain Home
Ozark National Forest
Fort Smith
Clarksville
Russellville
Arkansas
Jonesboro
Memphis
Little Rock
Ouachita National Forest
Hot Springs
Pine Bluff
Texarkana
El Dorado
Greenville


Benton Co.
1E
07049563
Rogers
Prairie Creek
2E
Carroll Co.
3E
10E
9E
Madison Co.
War Eagle
07049000
Creek
Springdale
4E
Washington Co.
White
River
5E
07048800
Richland
Fayetteville
07048600
EXPLANATION
STREAMFLOW AND WATER-QUALITY MEASUREMENT SITE
WATER-QUALITY MEASUREMENT SITE
0 1.5 3 Miles
0 1.5 3 Kilometers

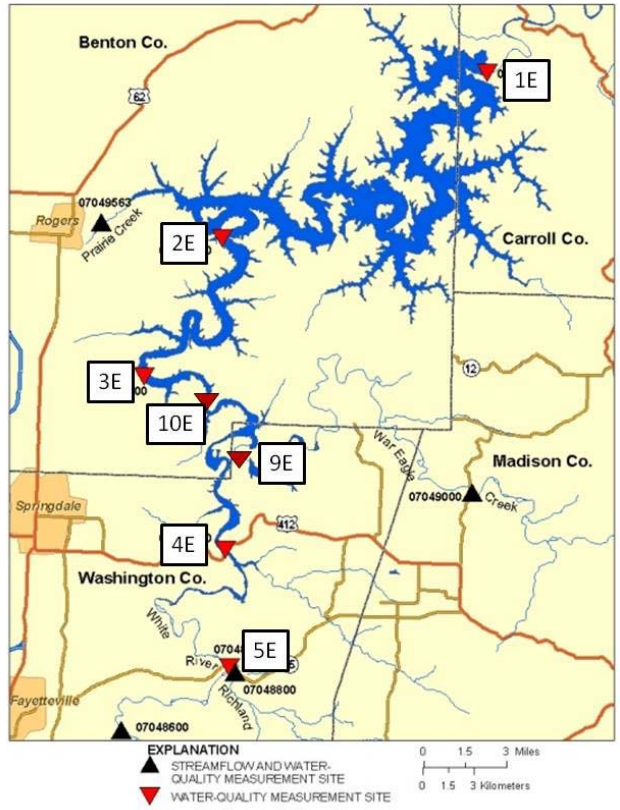
Background

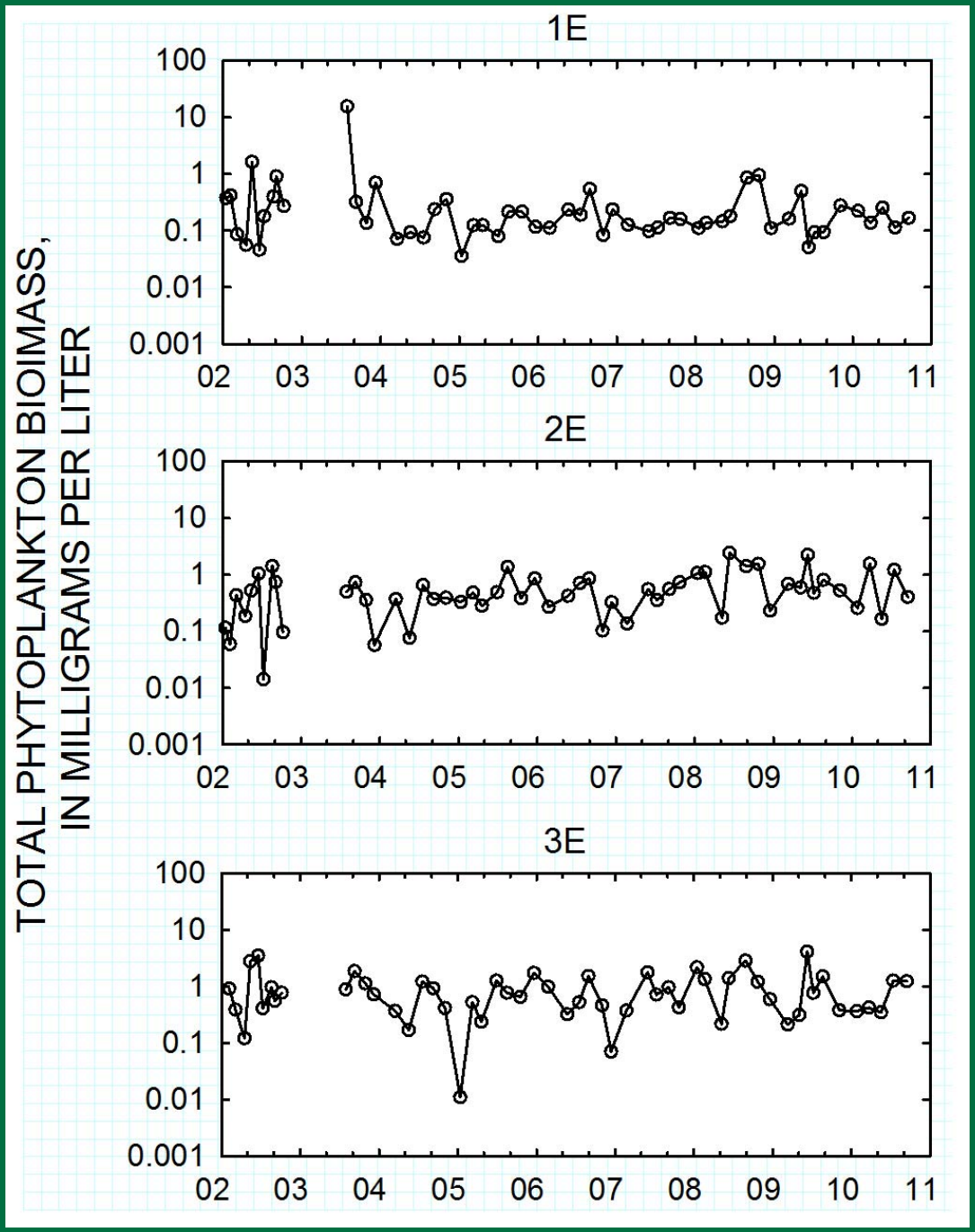
- Conducted in cooperation with Beaver Water District
- 2002 – 2010
- 7 sites
- 317 samples analyzed
- 113 unique taxa identified
- Aggregated into four groups:
  1. Greens
  2. Cyanobacteria
  3. Diatoms
  4. Flagellates
- Focus on *Cylindrospermopsis*



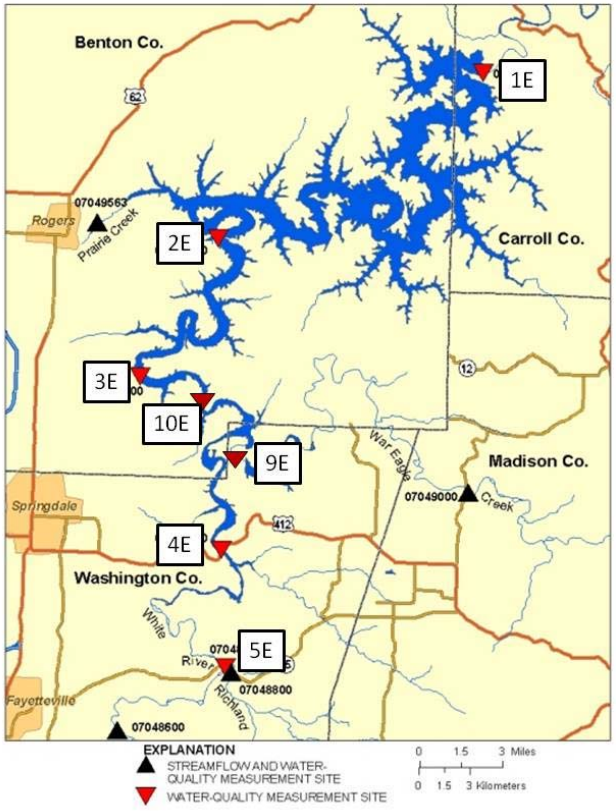
USGS

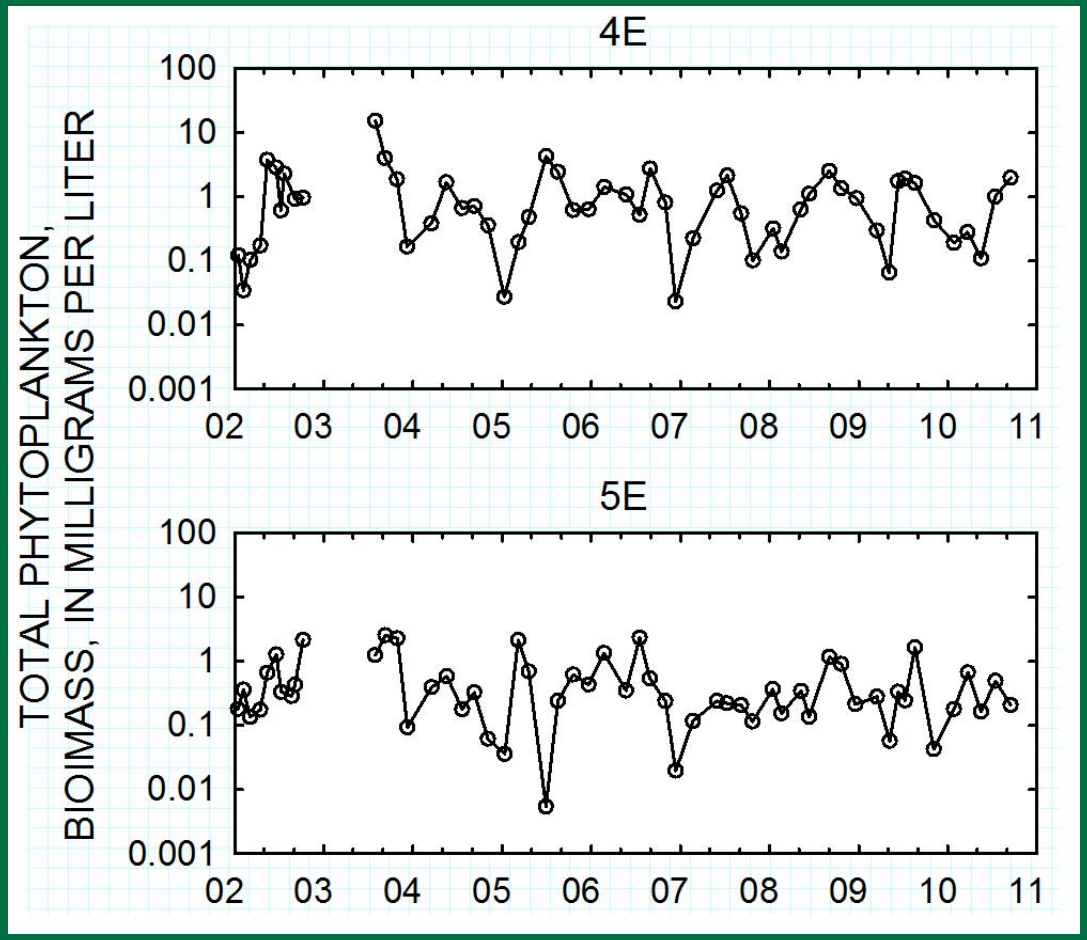
Total Phytoplankton Biomass



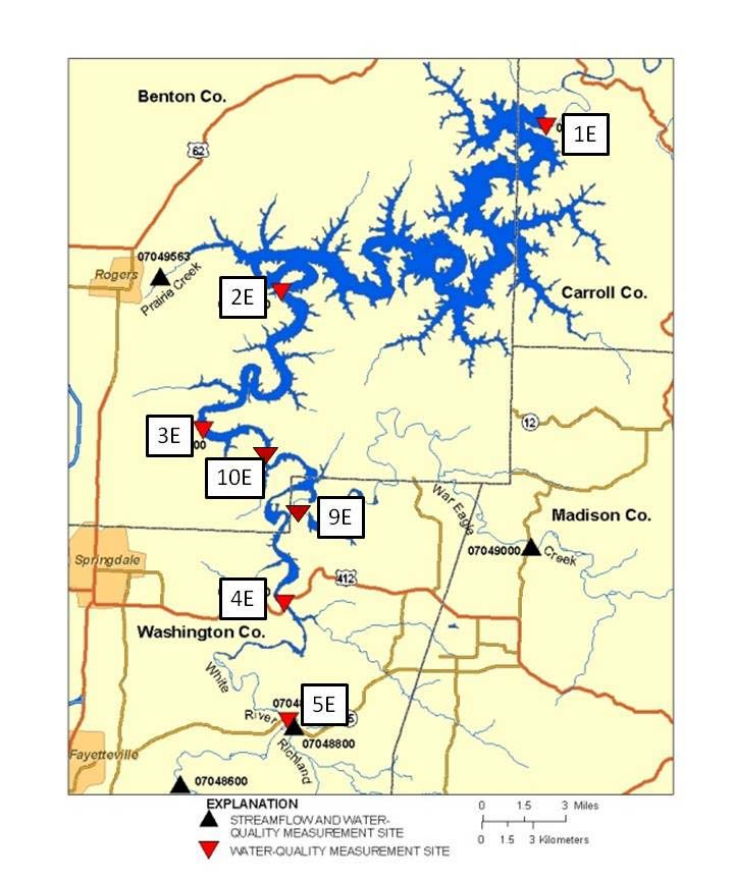


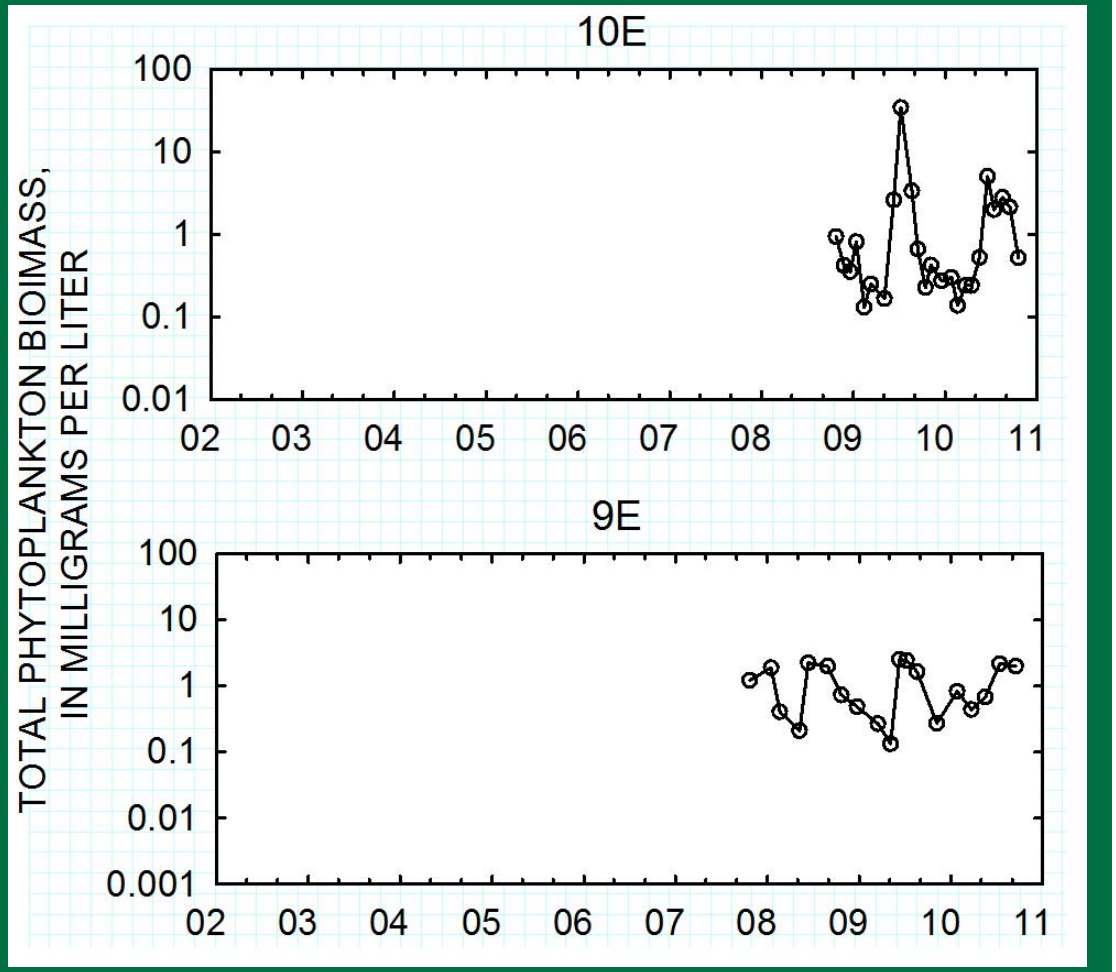
Total Phytoplankton Biomass



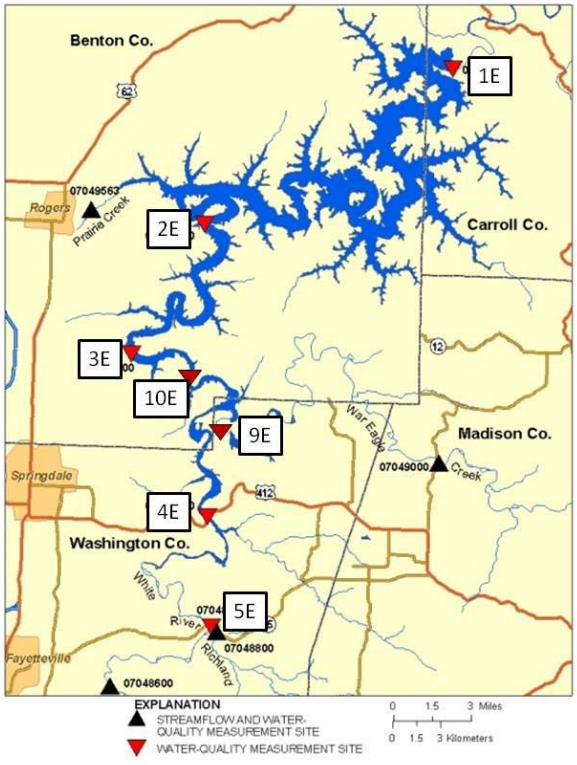


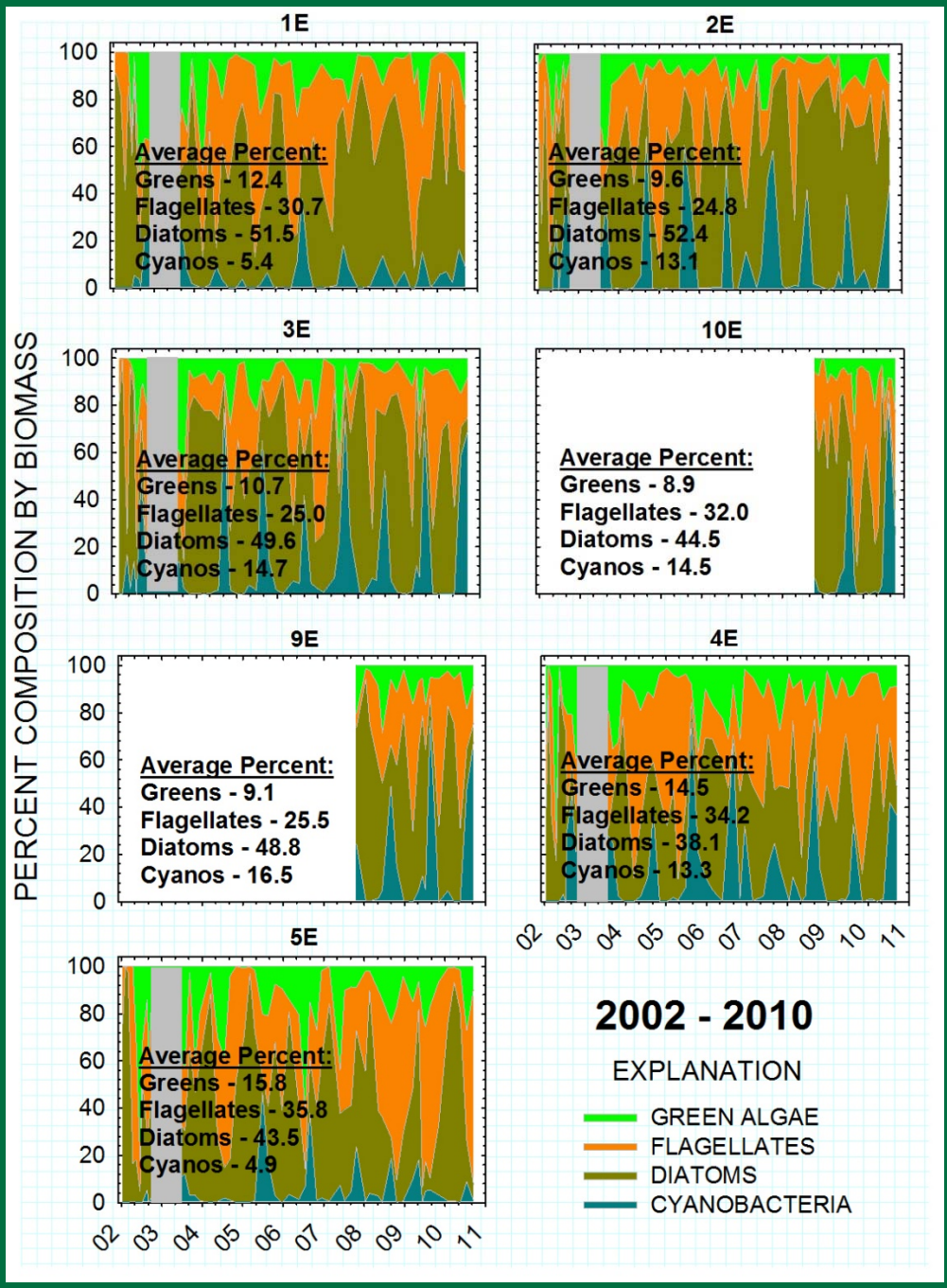
Total Phytoplankton Biomass



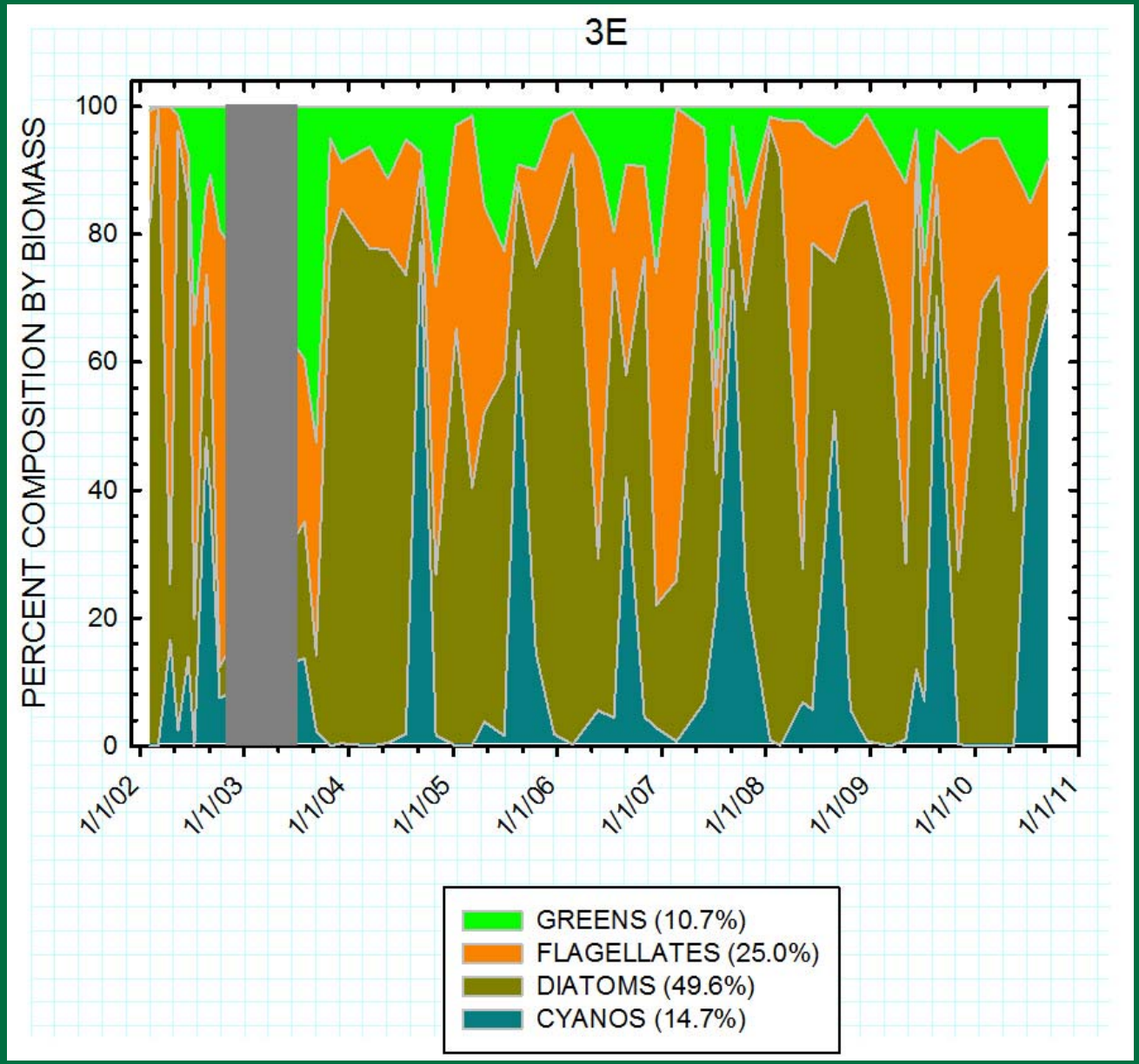


Percent Composition by Biomass



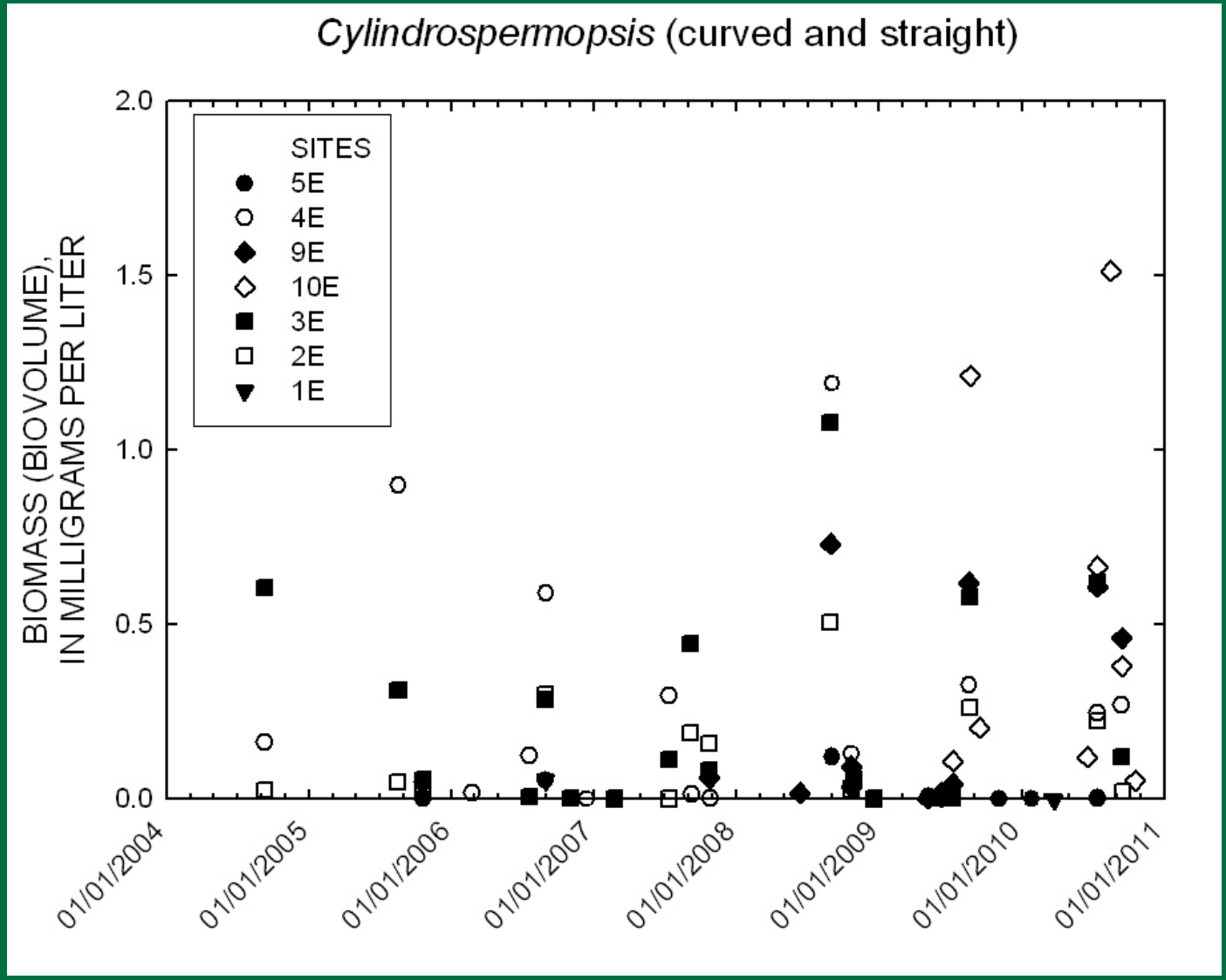


Percent Composition by Biomass at 3E



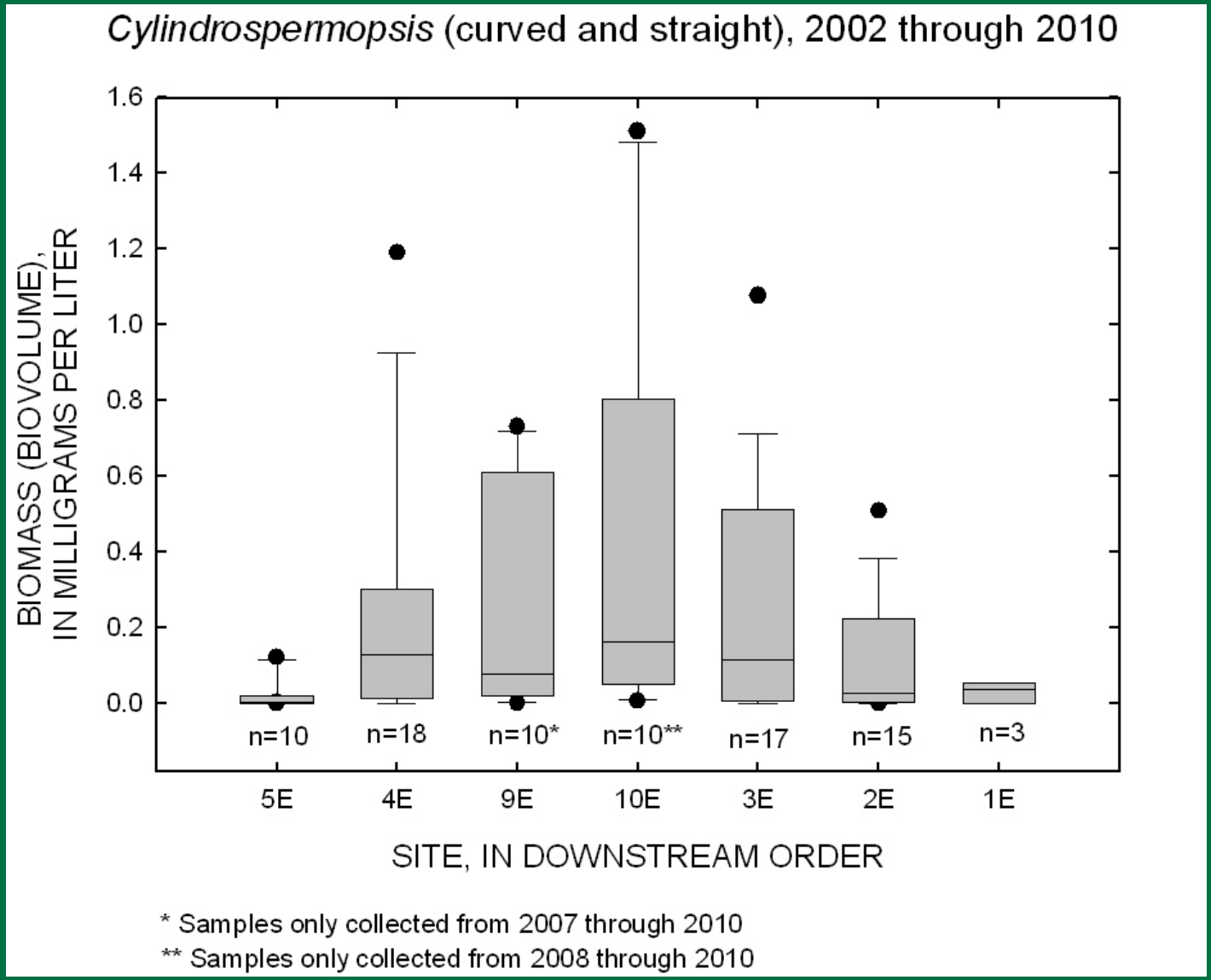
USGS

Cylindrospermopsis Over Time



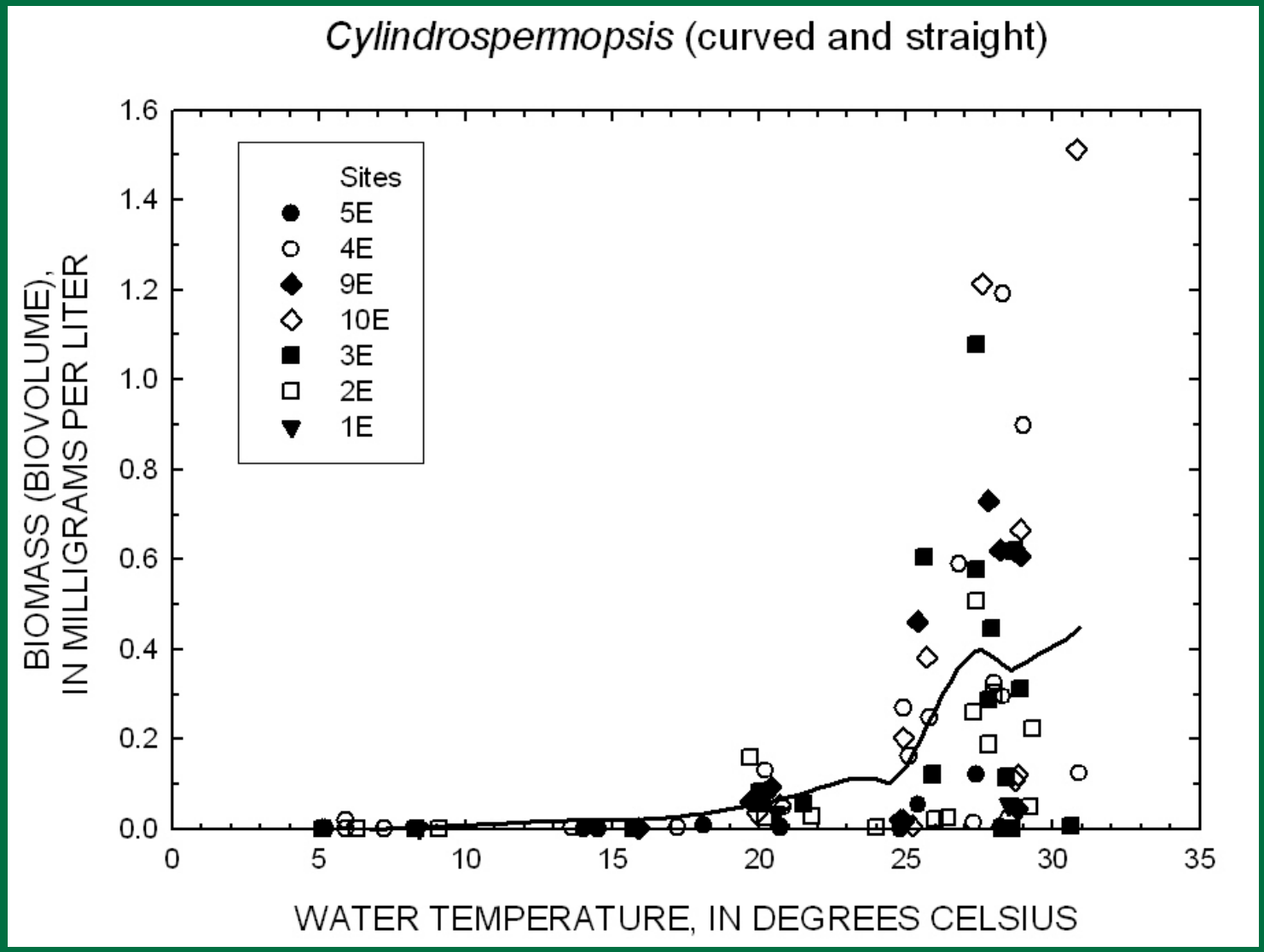
USGS

Cylindrospermopsis by Site



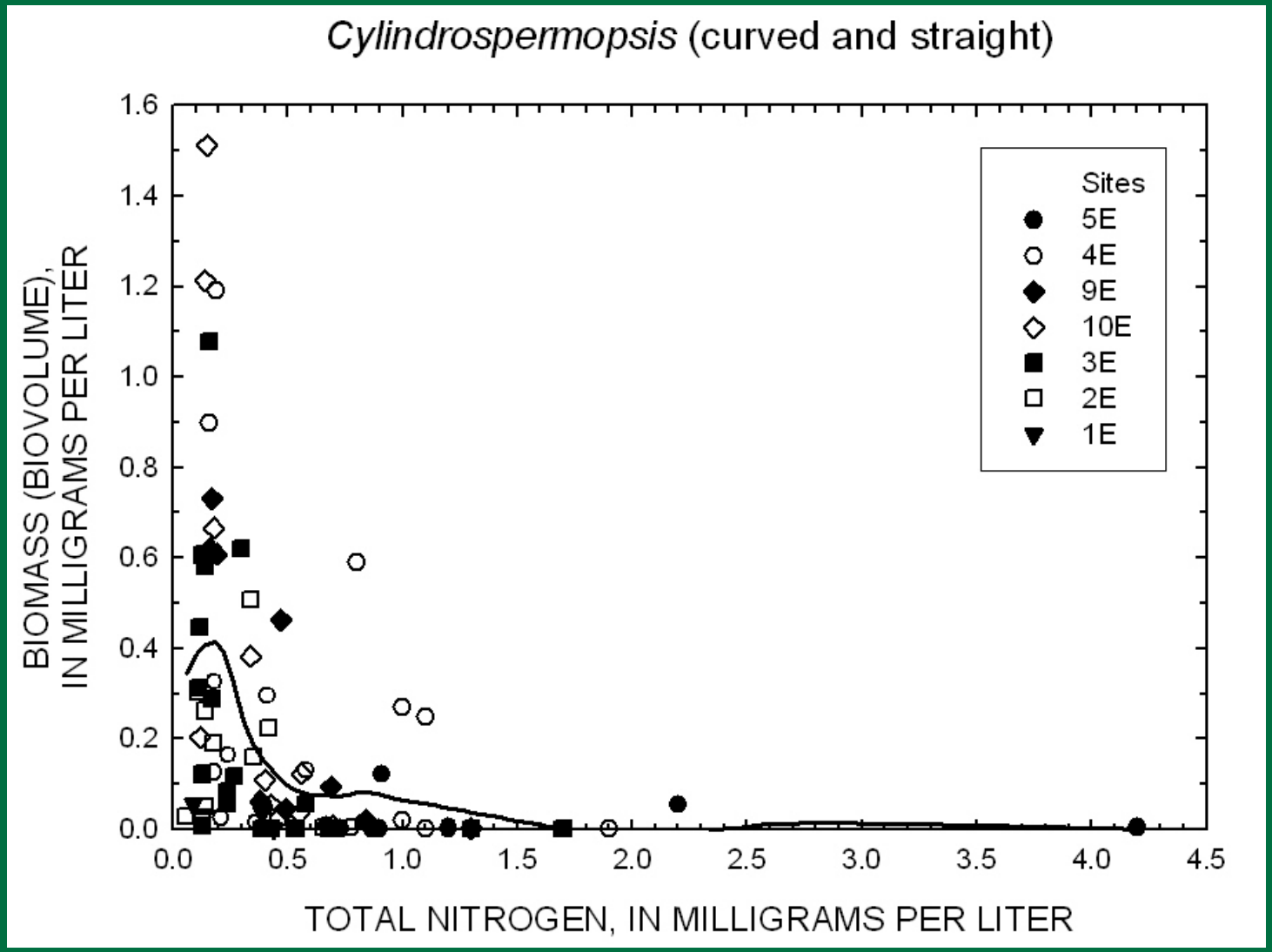
USGS

Cylindrospermopsis and Temperature



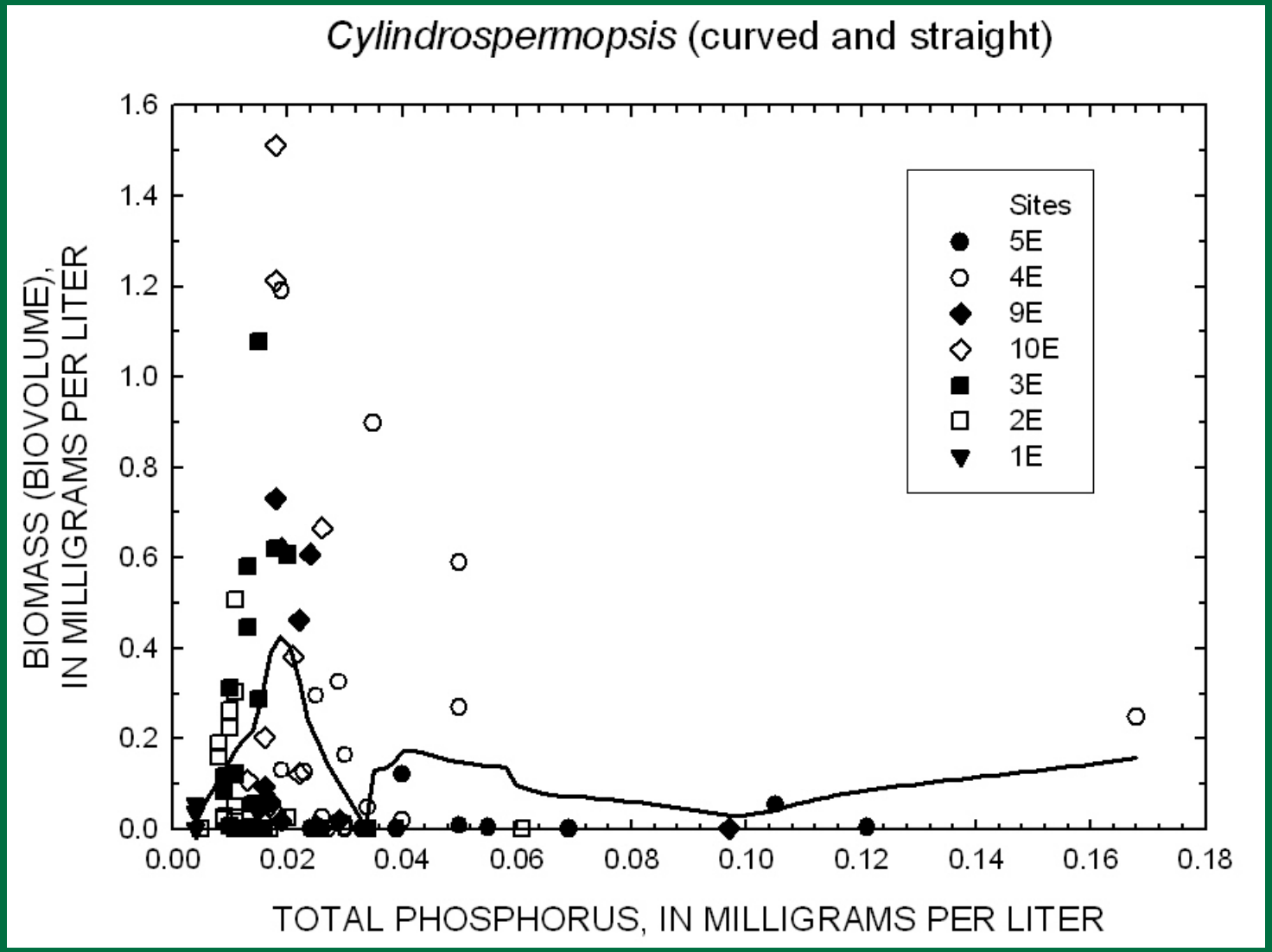
USGS

Cylindrospermopsis and Nitrogen



USGS

Cylindrospermopsis and Phosphorus



USGS

Summary

- *Cylindrospermopsis* was first observed in September, 2004.
- Since then, *Cylindrospermopsis* has increased about three times in the most dense samples.
- *Cylindrospermopsis* has been identified in all seven sites.
- *Cylindrospermopsis* biomass was greatest when water temperatures were between 25 and 32 degrees Celsius.

USGS

Summary (cont.)

- *Cylindrospermopsis* biomass was greatest when total phosphorus concentrations were around 0.02 mg/L.
- *Cylindrospermopsis* biomass was greatest when total nitrogen concentrations were around 0.2 mg/L; the ratio of TN:TP = 10
- Preliminary results indicate that both the upper White River and War Eagle Creek may be major contributors of *Cylindrospermopsis.*

USGS