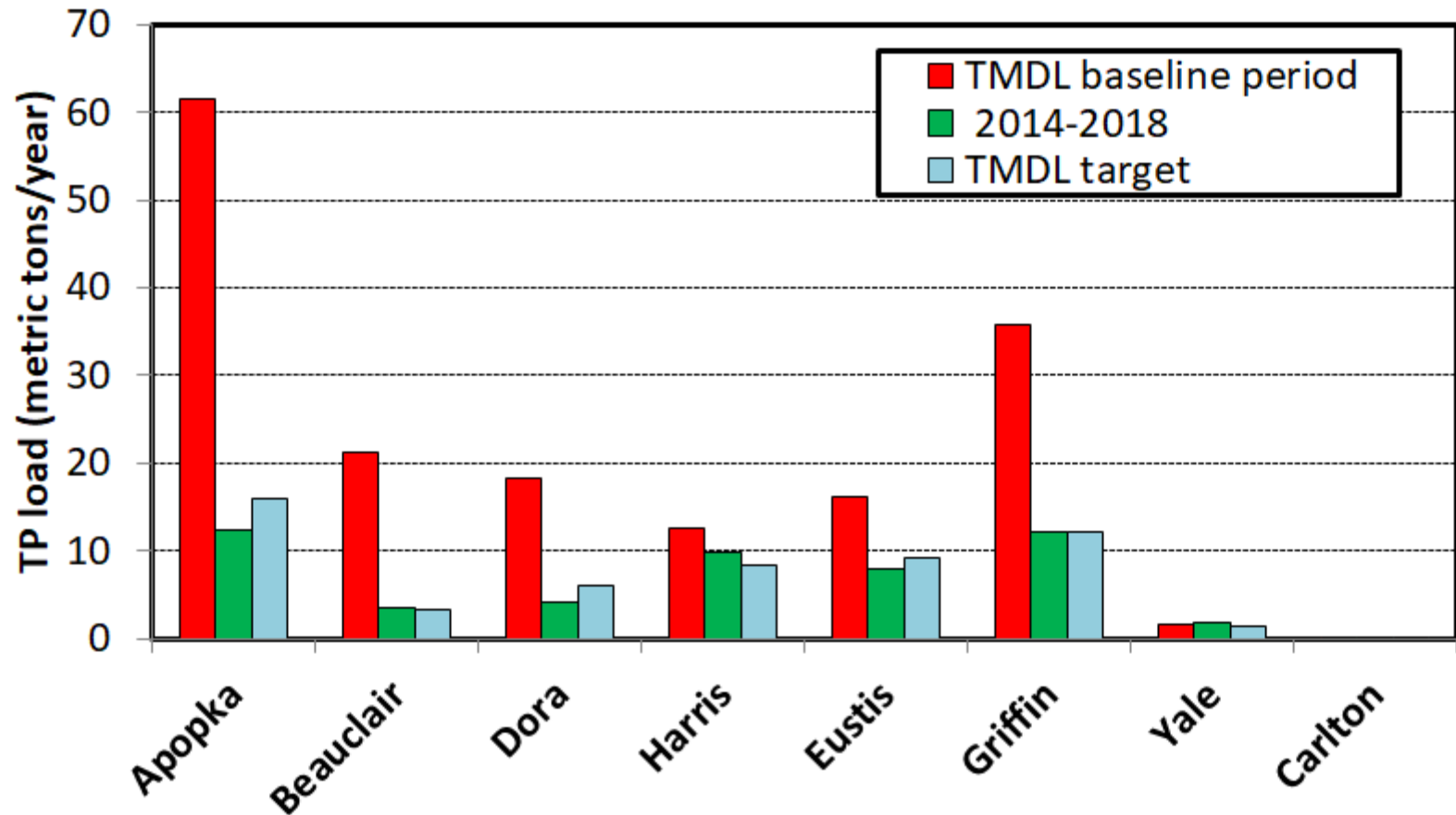


Trends in total phosphorus loading, water quality and phytoplankton in the Upper Ocklawaha BMAP lakes

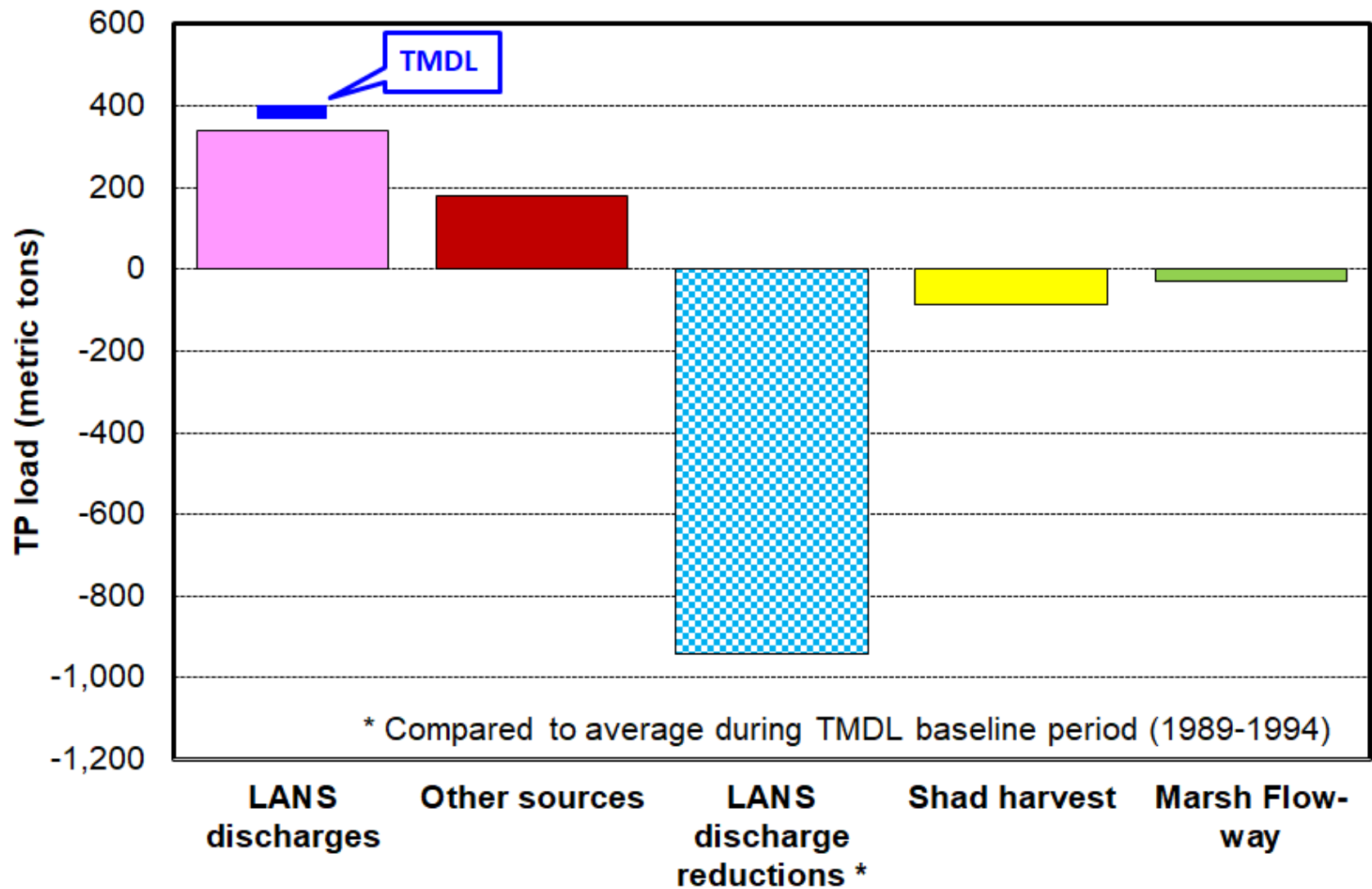
Rolland Fulton
August 21, 2019



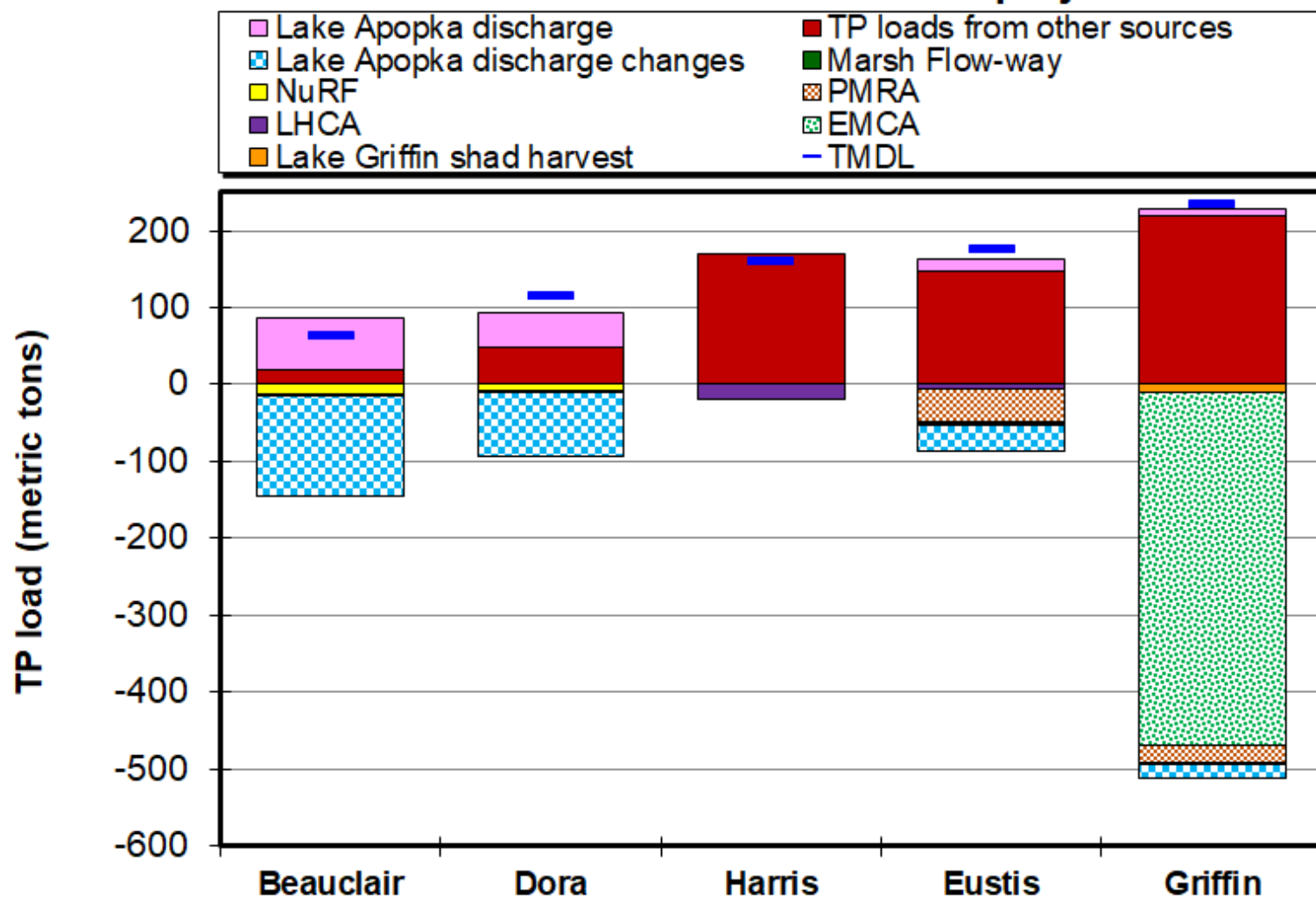
Upper Ocklawaha Basin lakes total phosphorus load



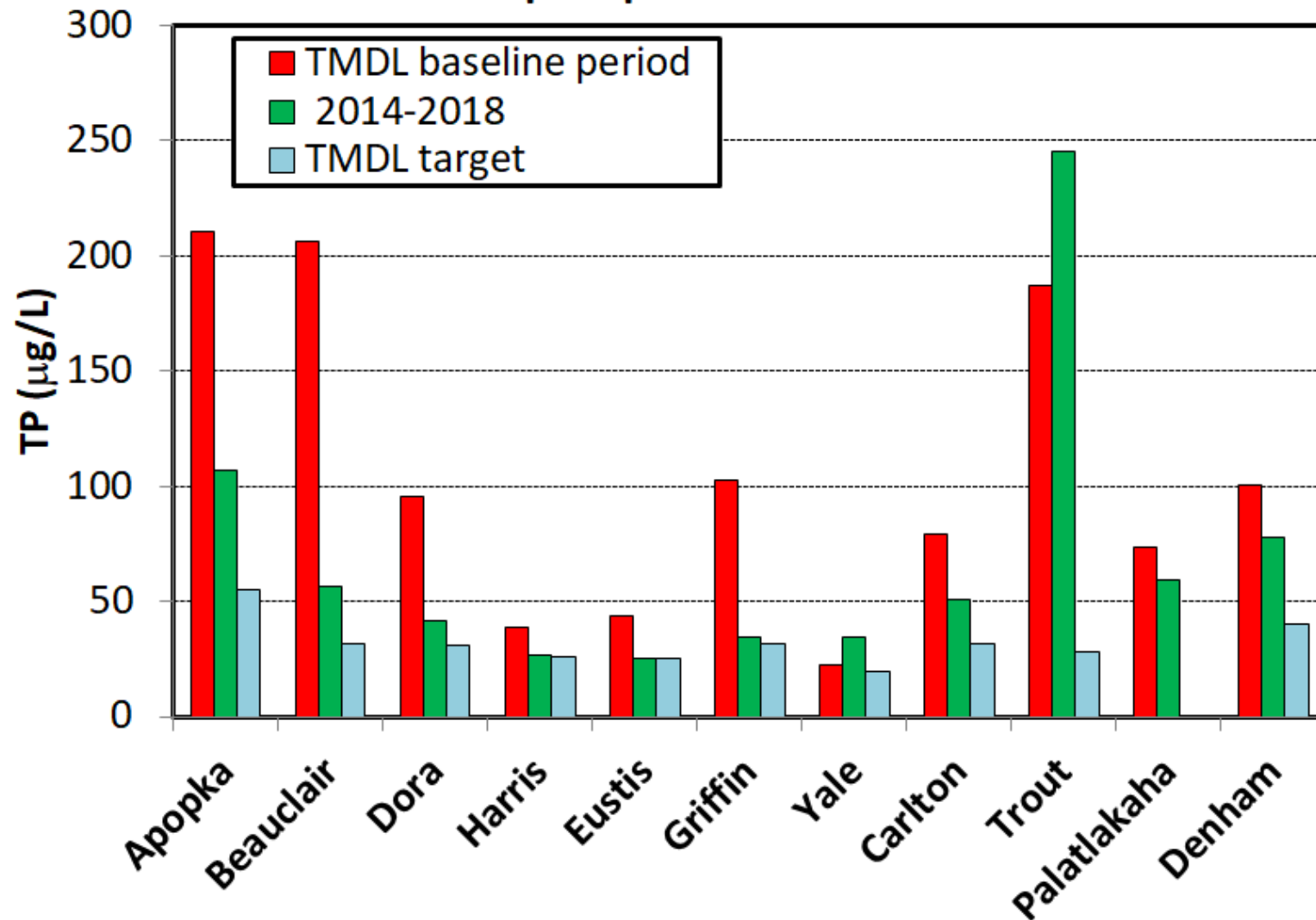
Lake Apopka. Estimated cumulative total phosphorus loads and reductions due to basin projects 1995-2018



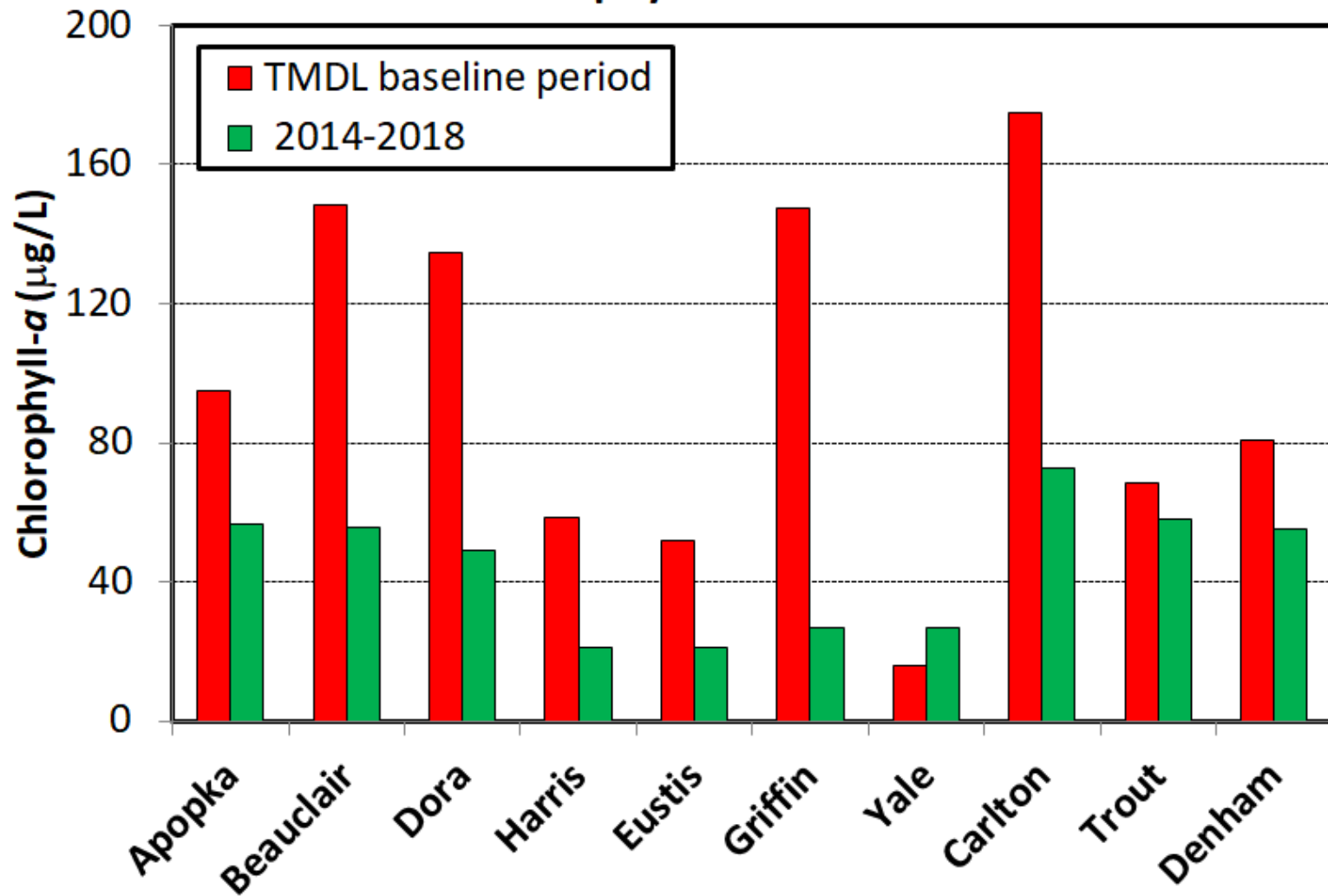
UORB Lakes. Estimated cumulative external total phosphorus loads and reductions due to restoration projects 2000-2018



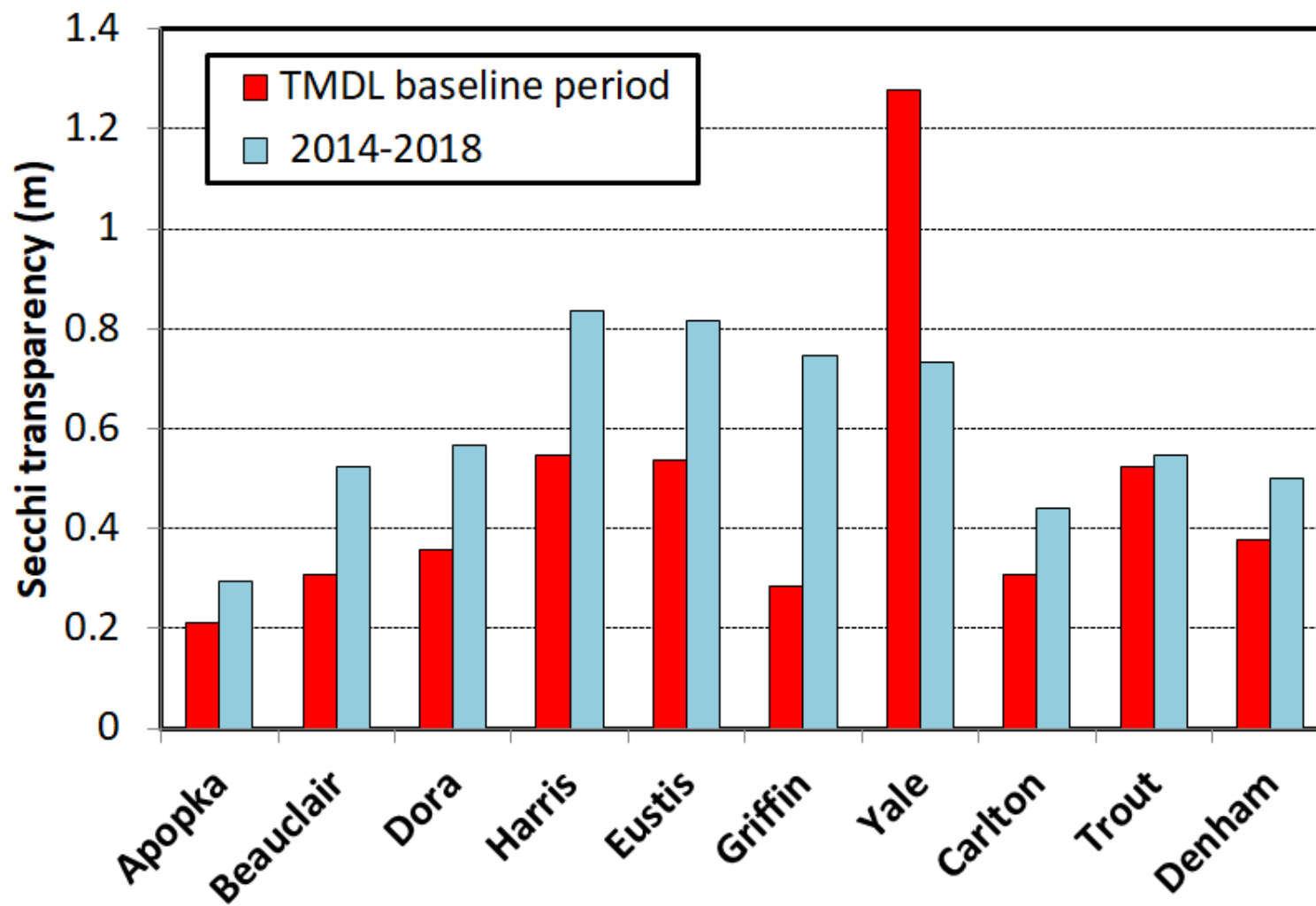
Upper Ocklawaha Basin Lakes Total phosphorus concentrations



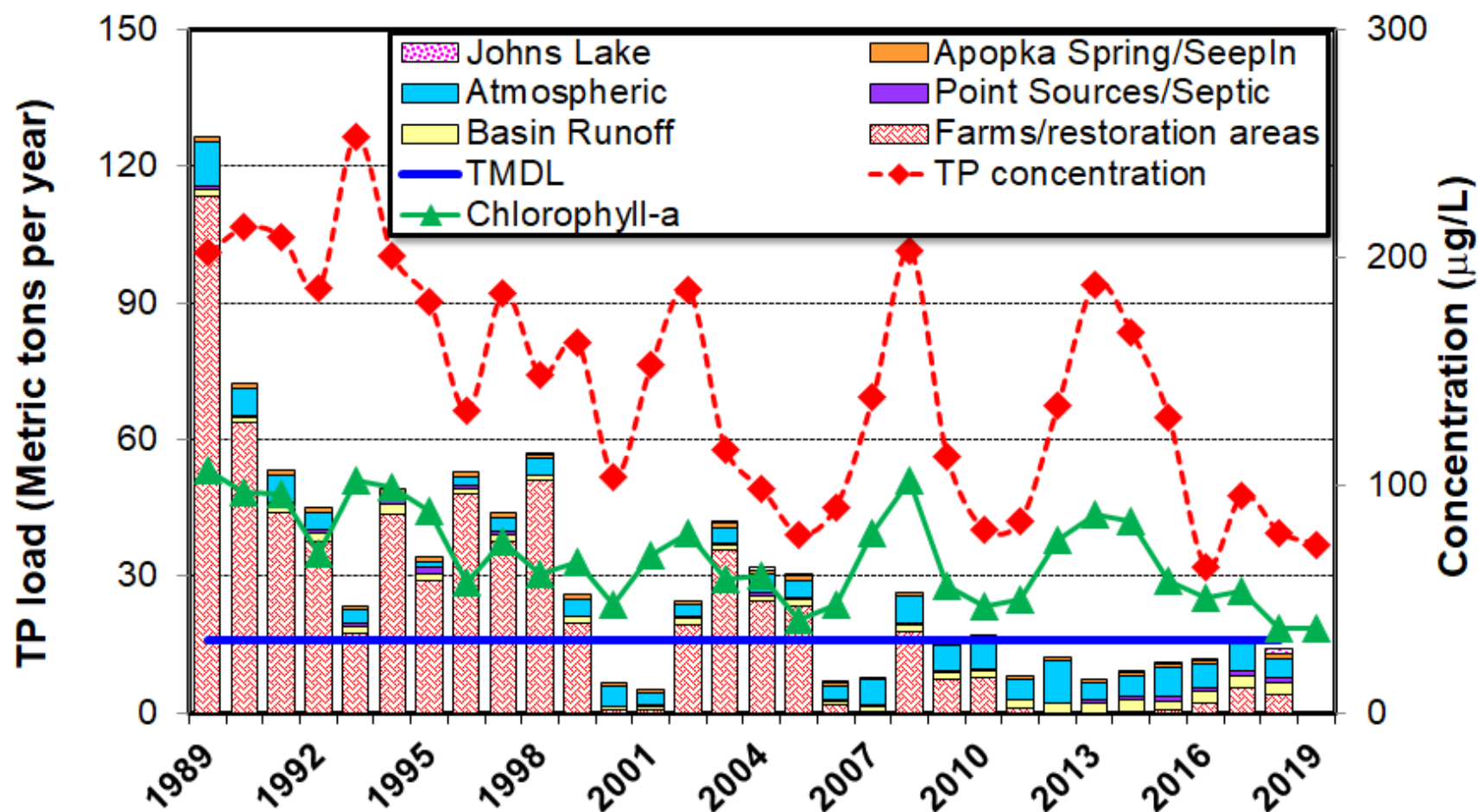
Upper Ocklawaha Basin Lakes Chlorophyll-*a* concentrations



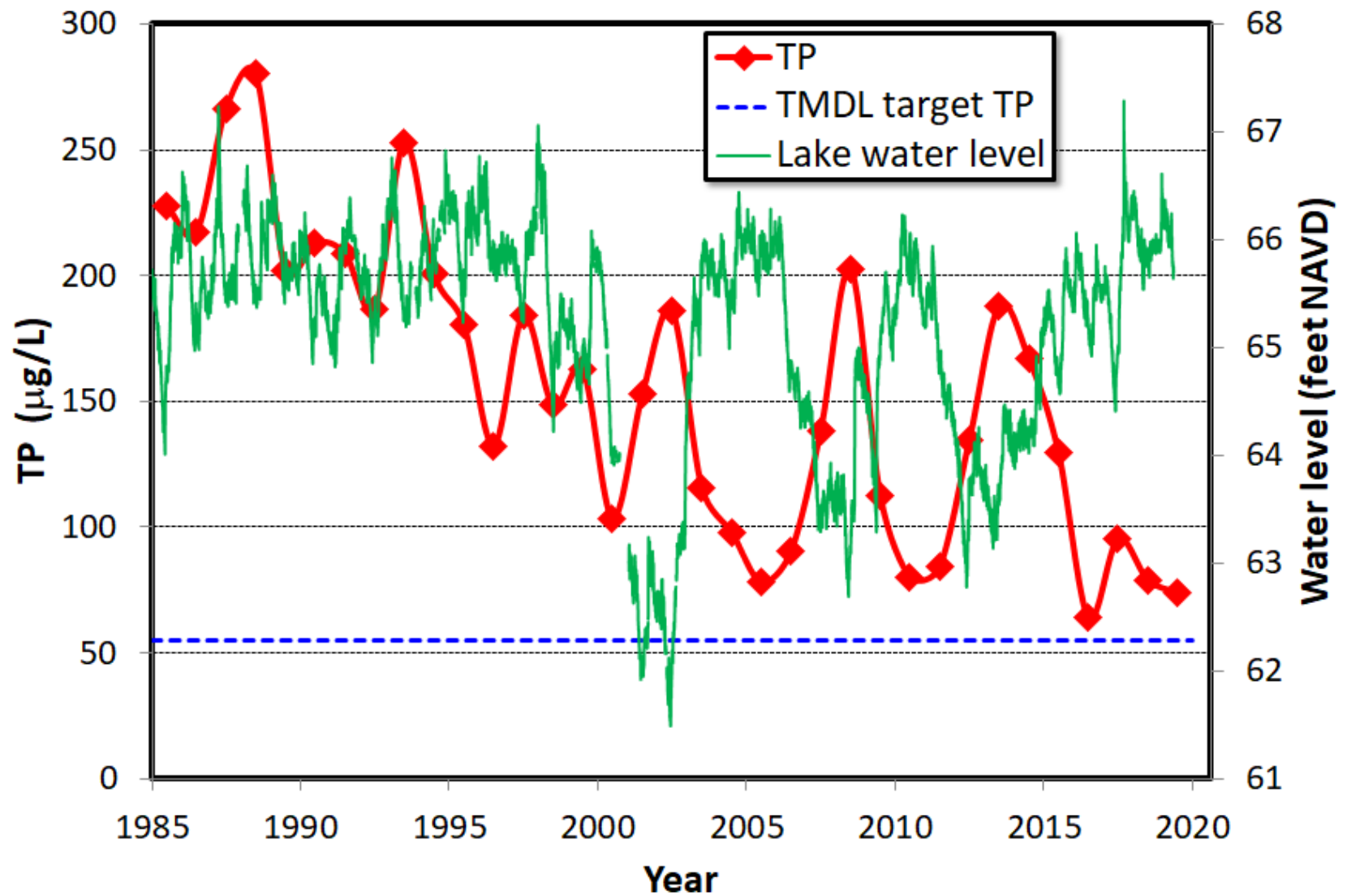
Upper Ocklawaha Basin Lakes Secchi transparency



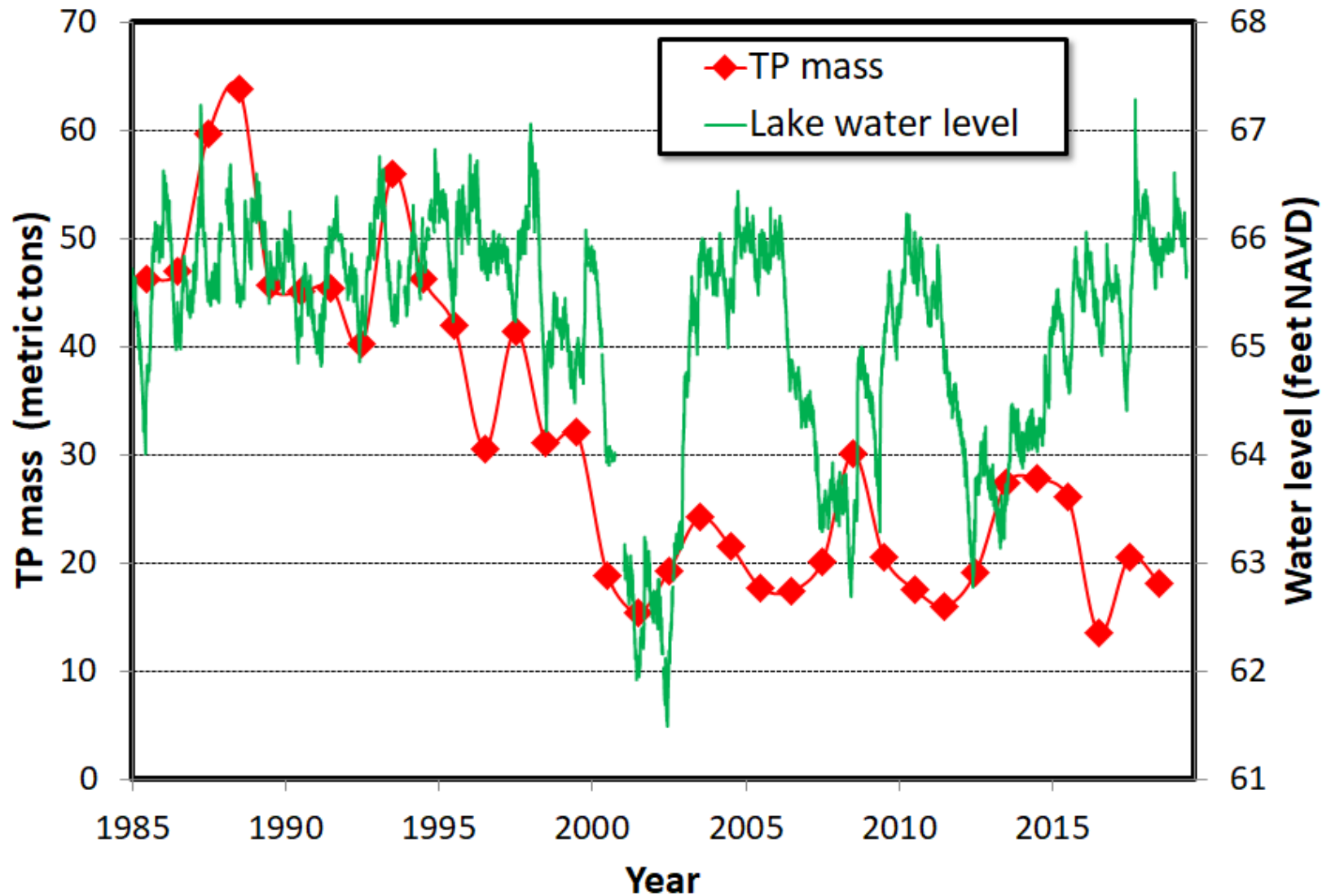
Lake Apopka estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



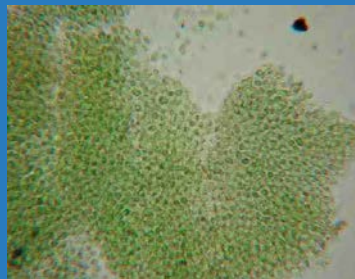
Lake Apopka total phosphorus concentrations



Lake Apopka total phosphorus mass



Common Bloom-Forming Cyanobacteria



Microcystis aeruginosa



Photo: Nate Gargaz; SJRWMD



Cylandrospermopsis spp.



Photo: N. Trombly; UWSP



Dolichospermum circinale
(*Anabaena circinalis*)

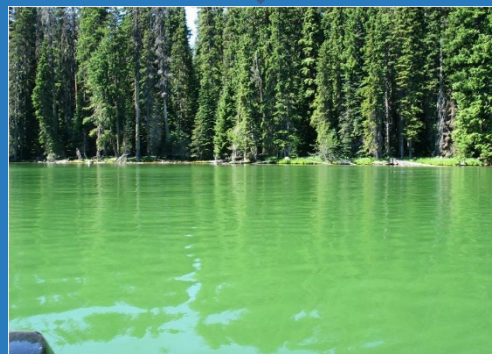
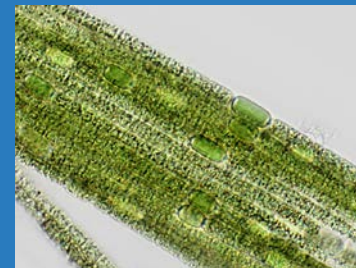


Photo: klcc.org

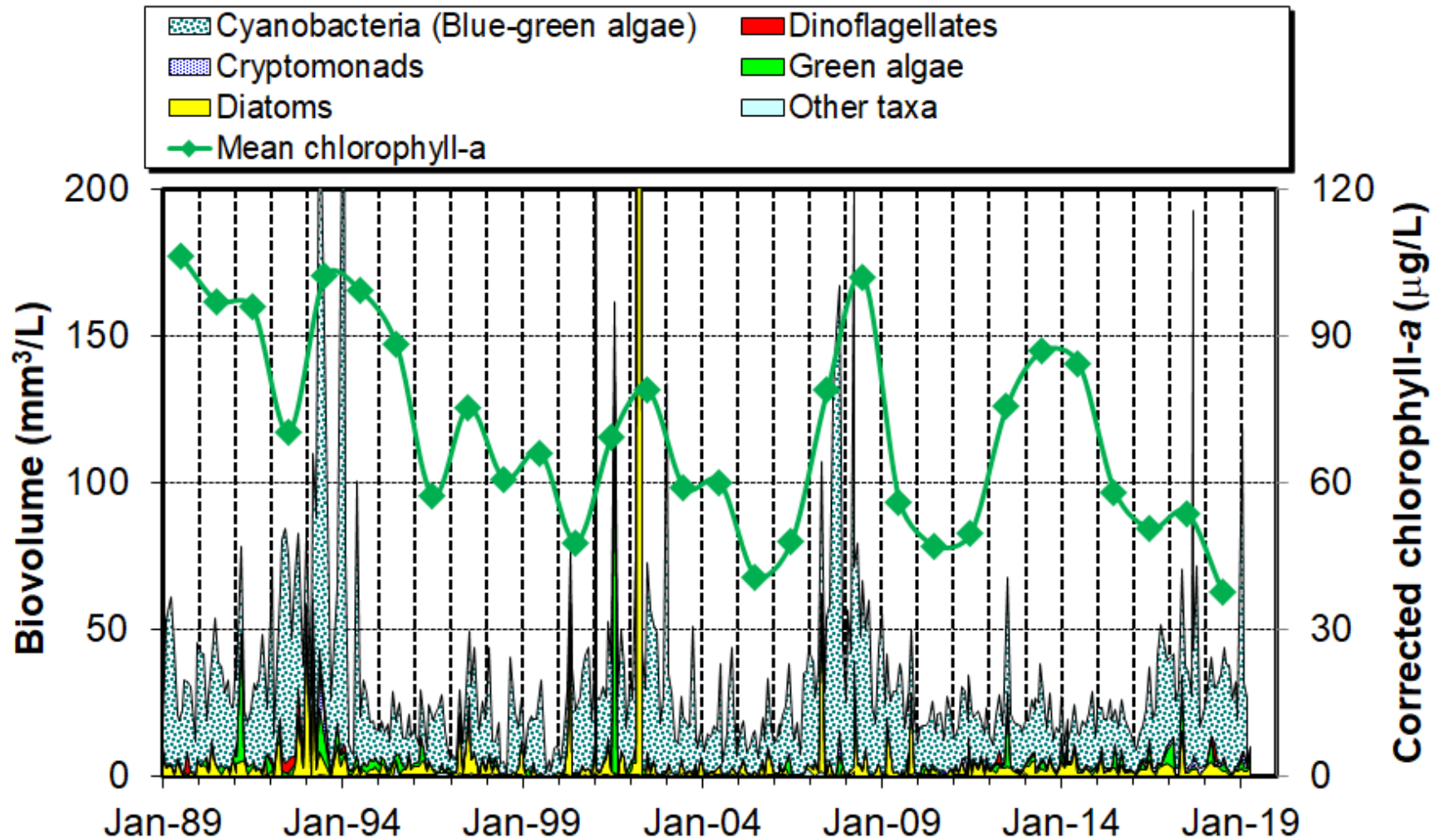


Aphanizomenon flos-aquae

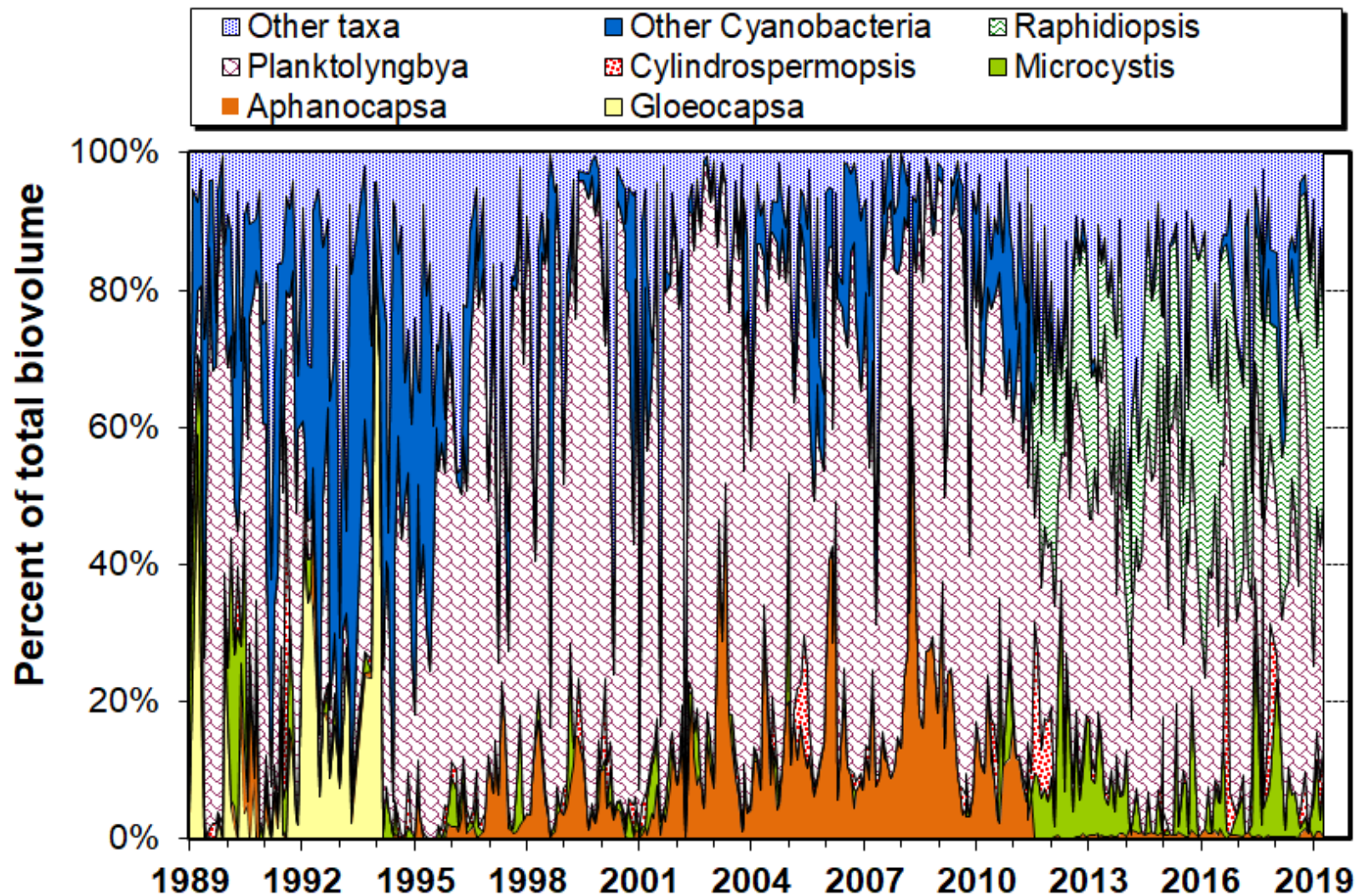


Photo: Meghan Mason; SJRWMD

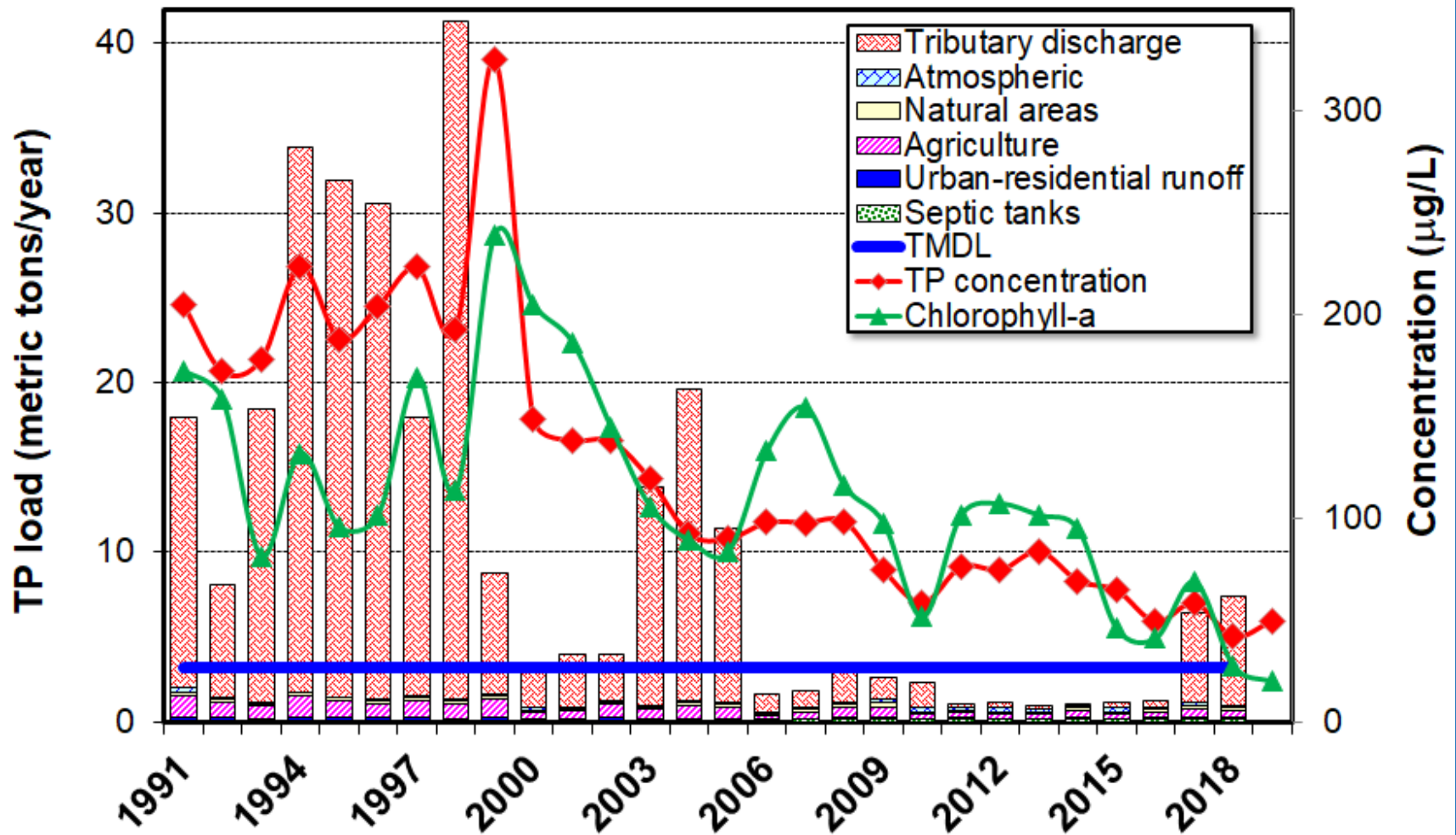
Lake Apopka phytoplankton taxa biovolume



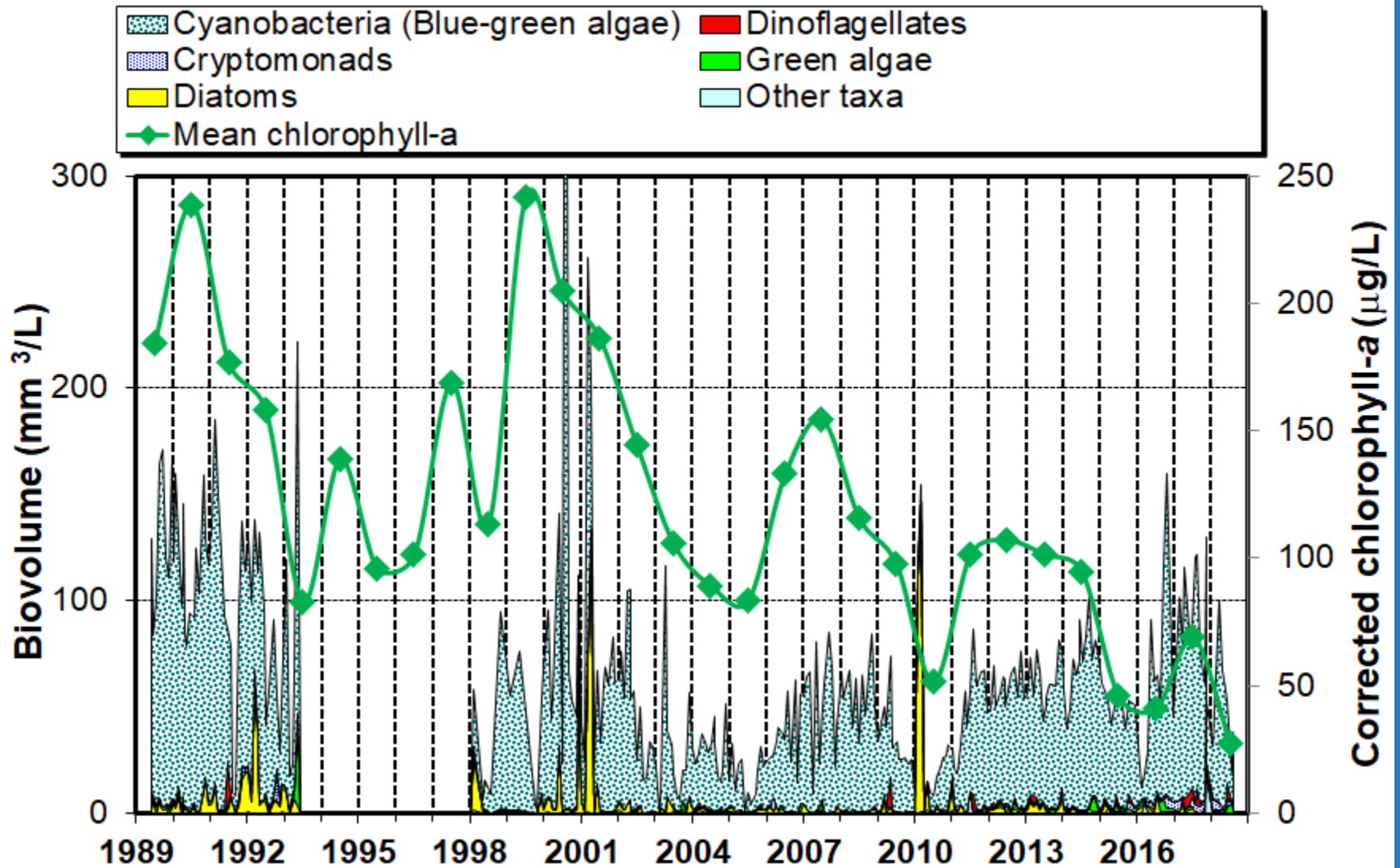
Lake Apopka phytoplankton percent composition



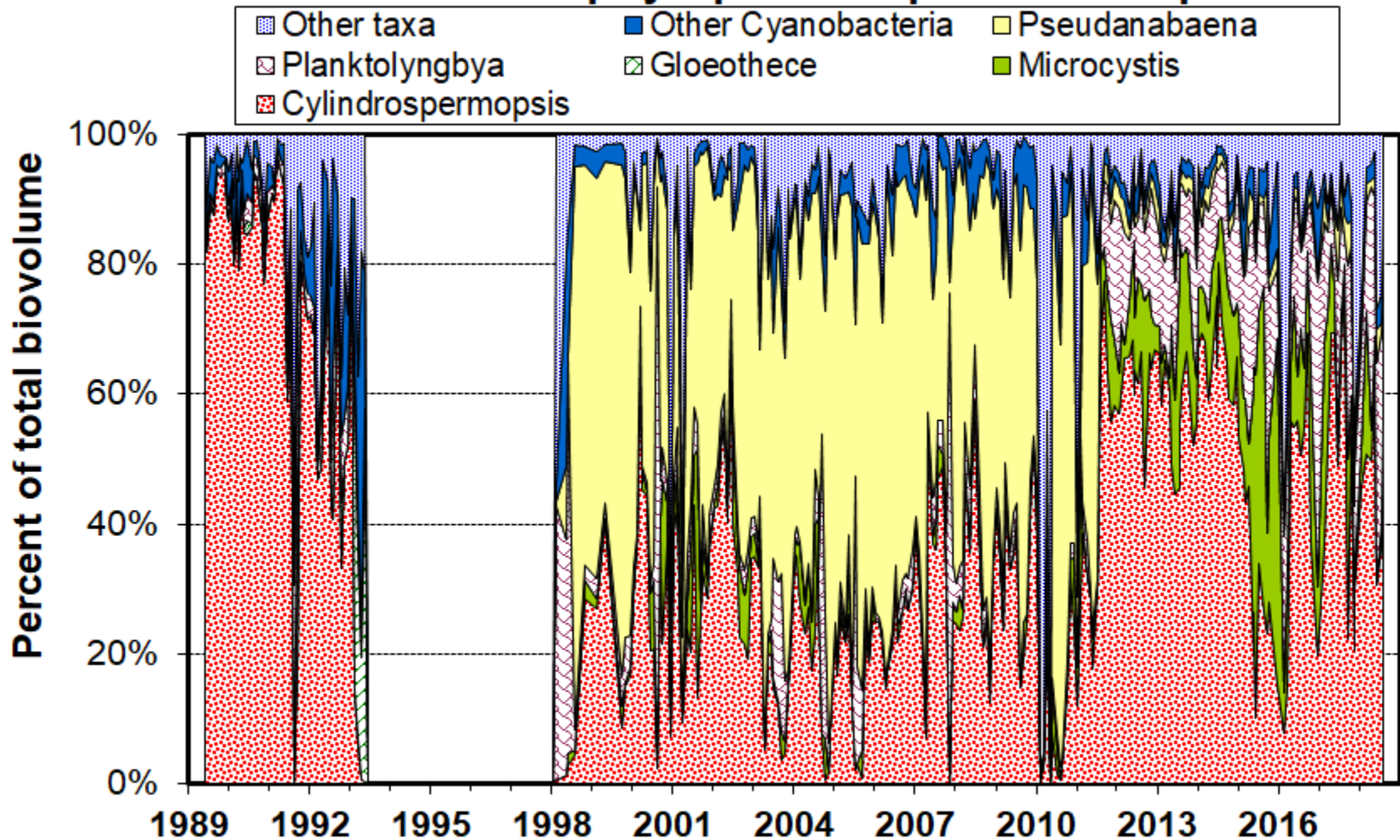
Lake Beauclair estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



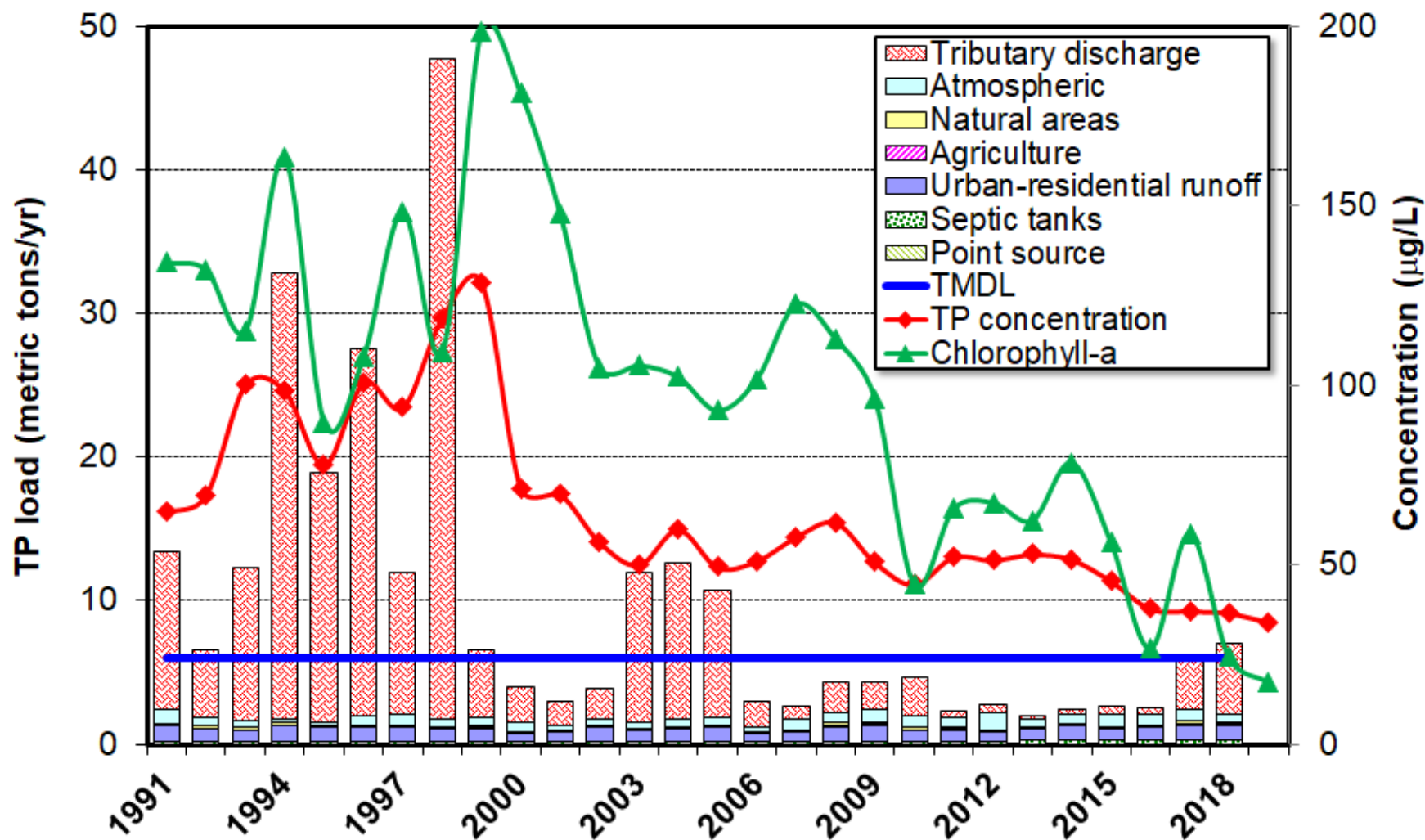
Lake Beauclair phytoplankton biovolume



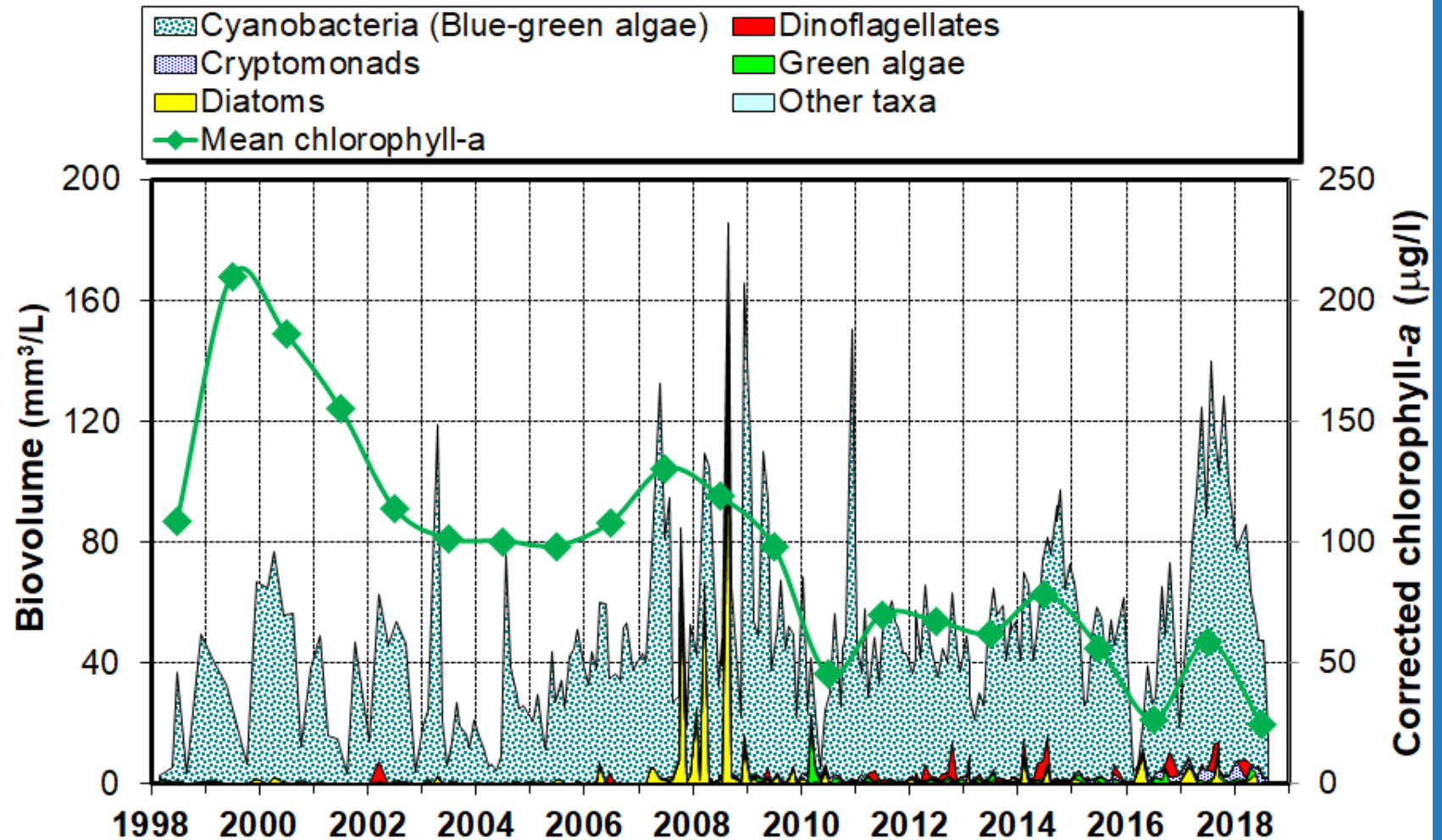
Lake Beauclair phytoplankton percent composition



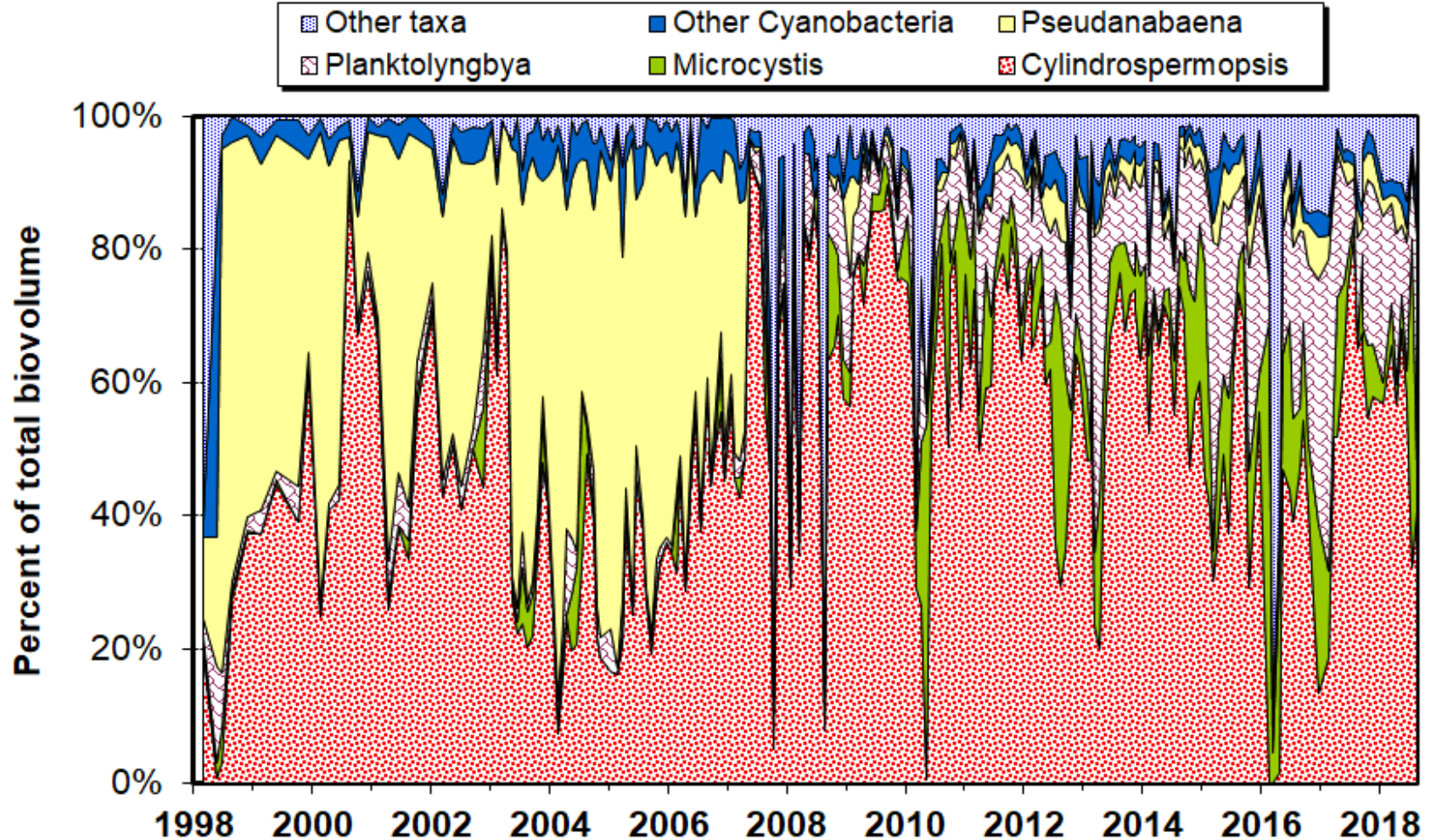
Lake Dora estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



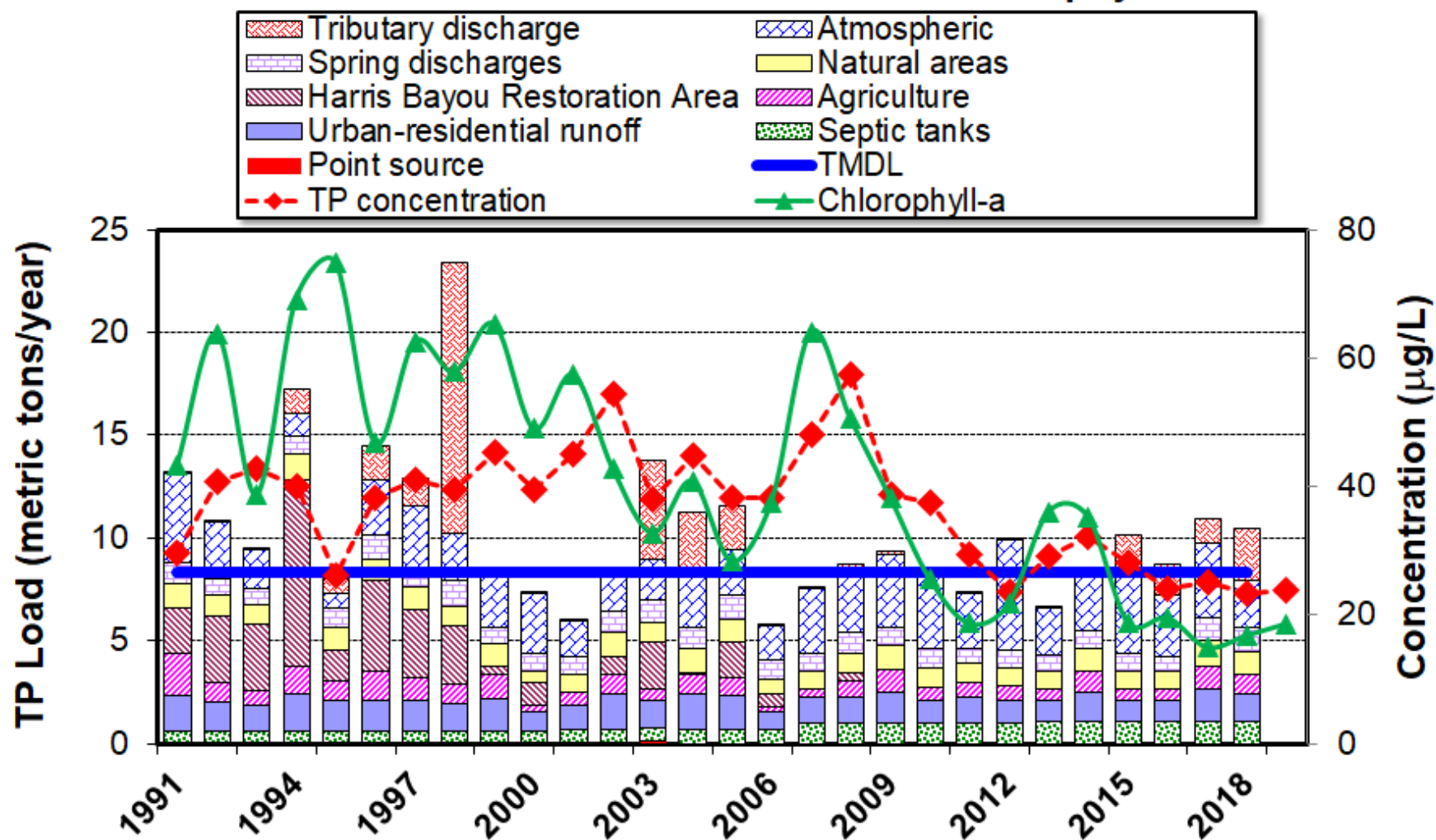
Lake Dora phytoplankton biovolume



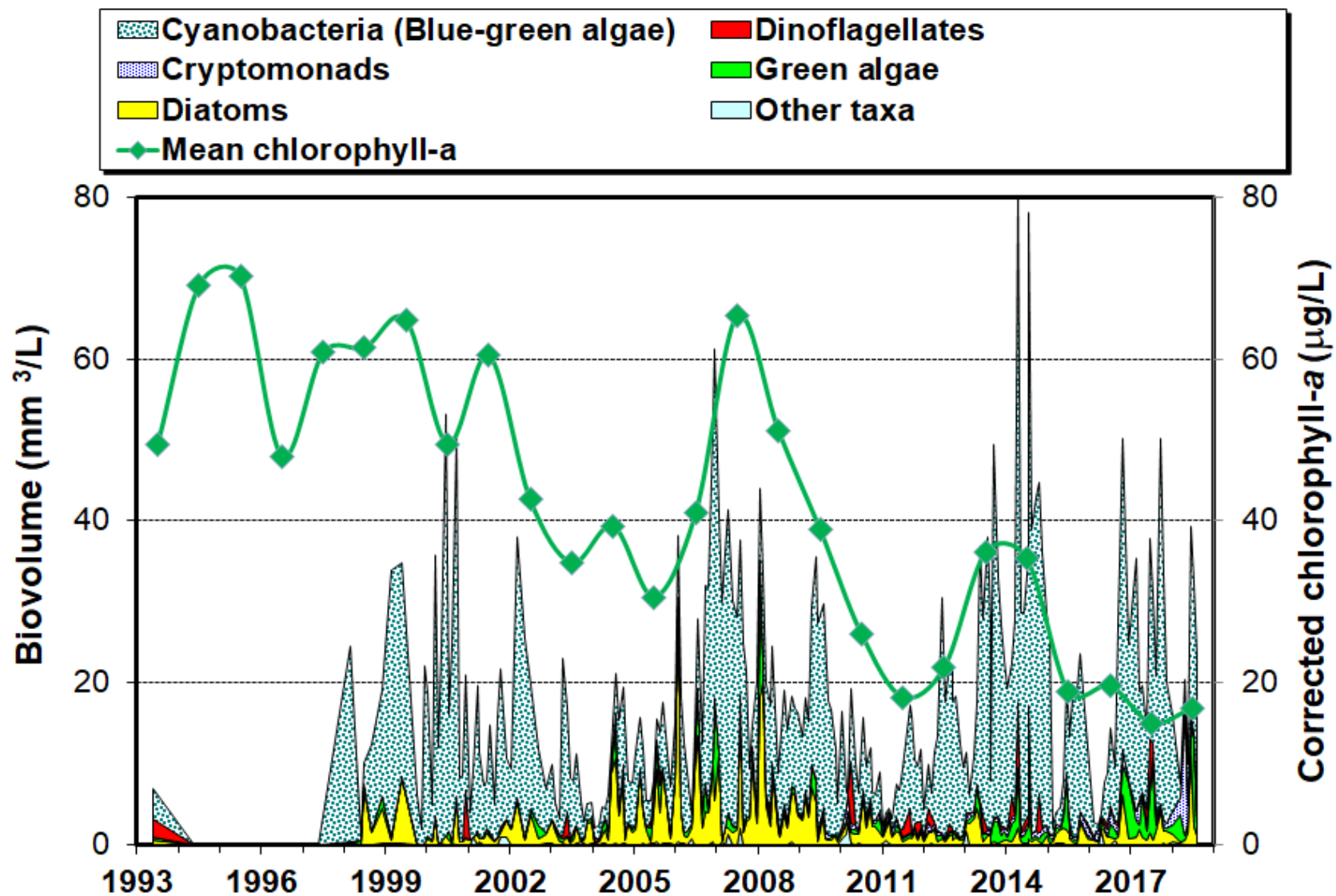
Lake Dora phytoplankton percent composition



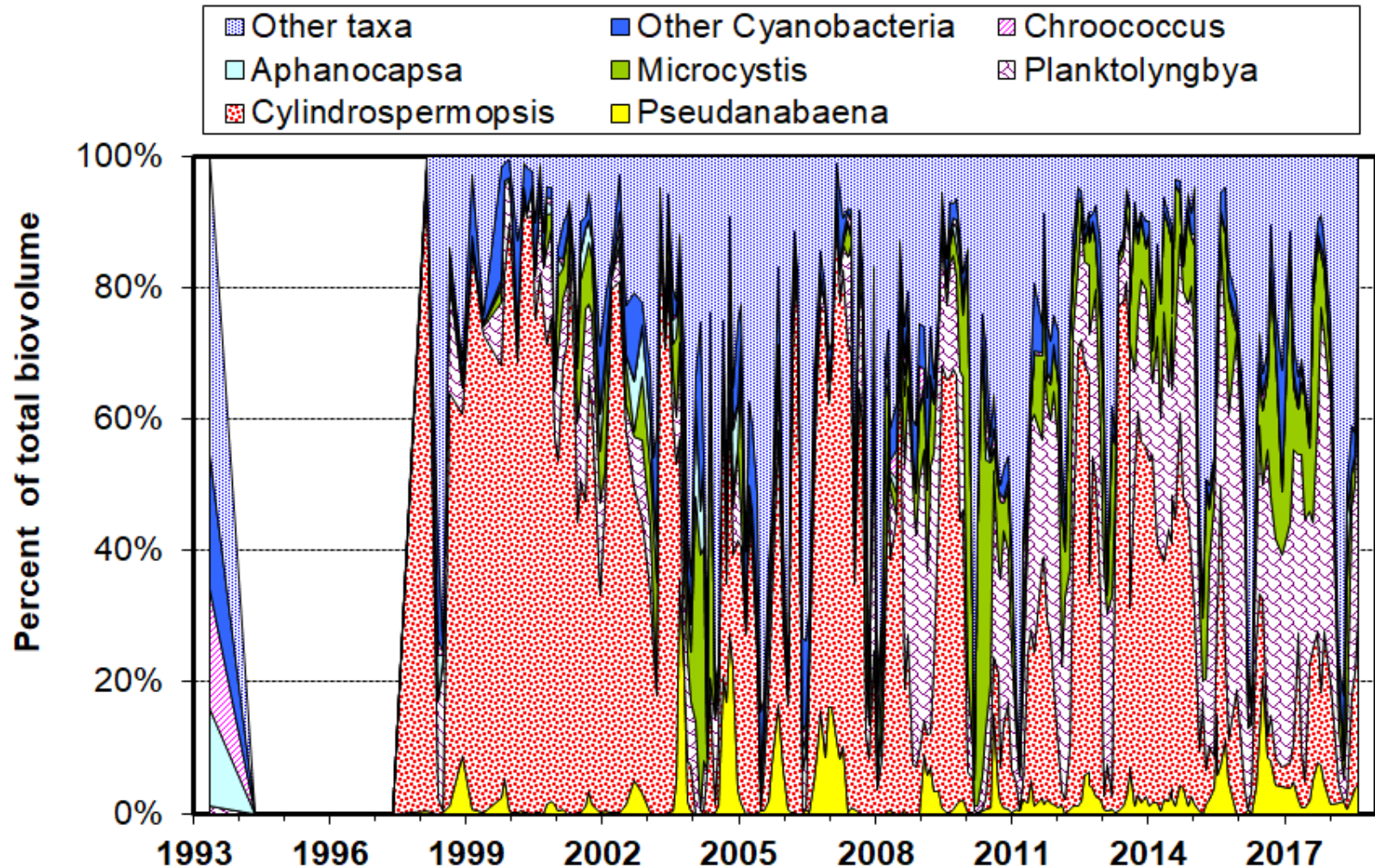
Lake Harris estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



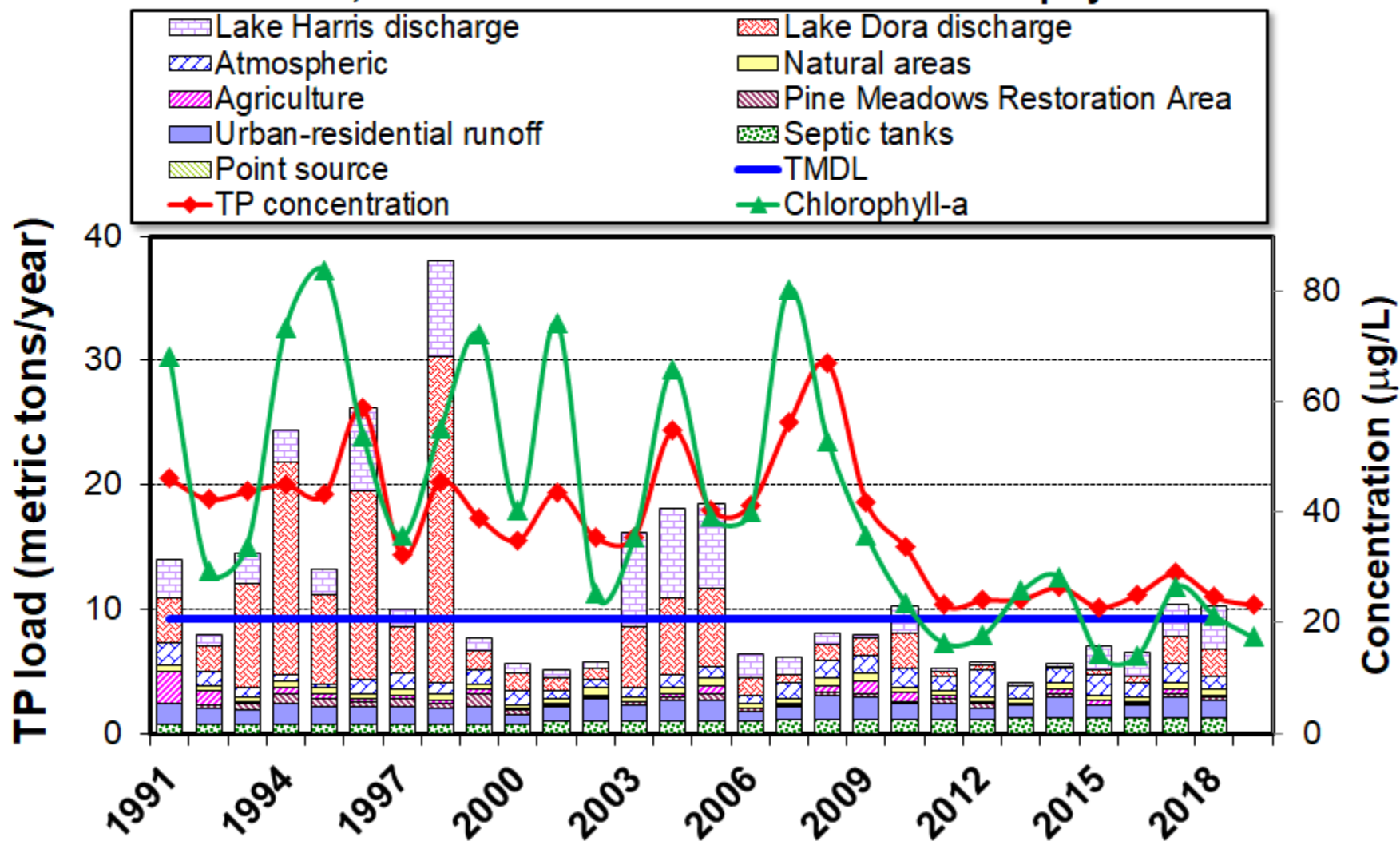
Lake Harris phytoplankton biovolume



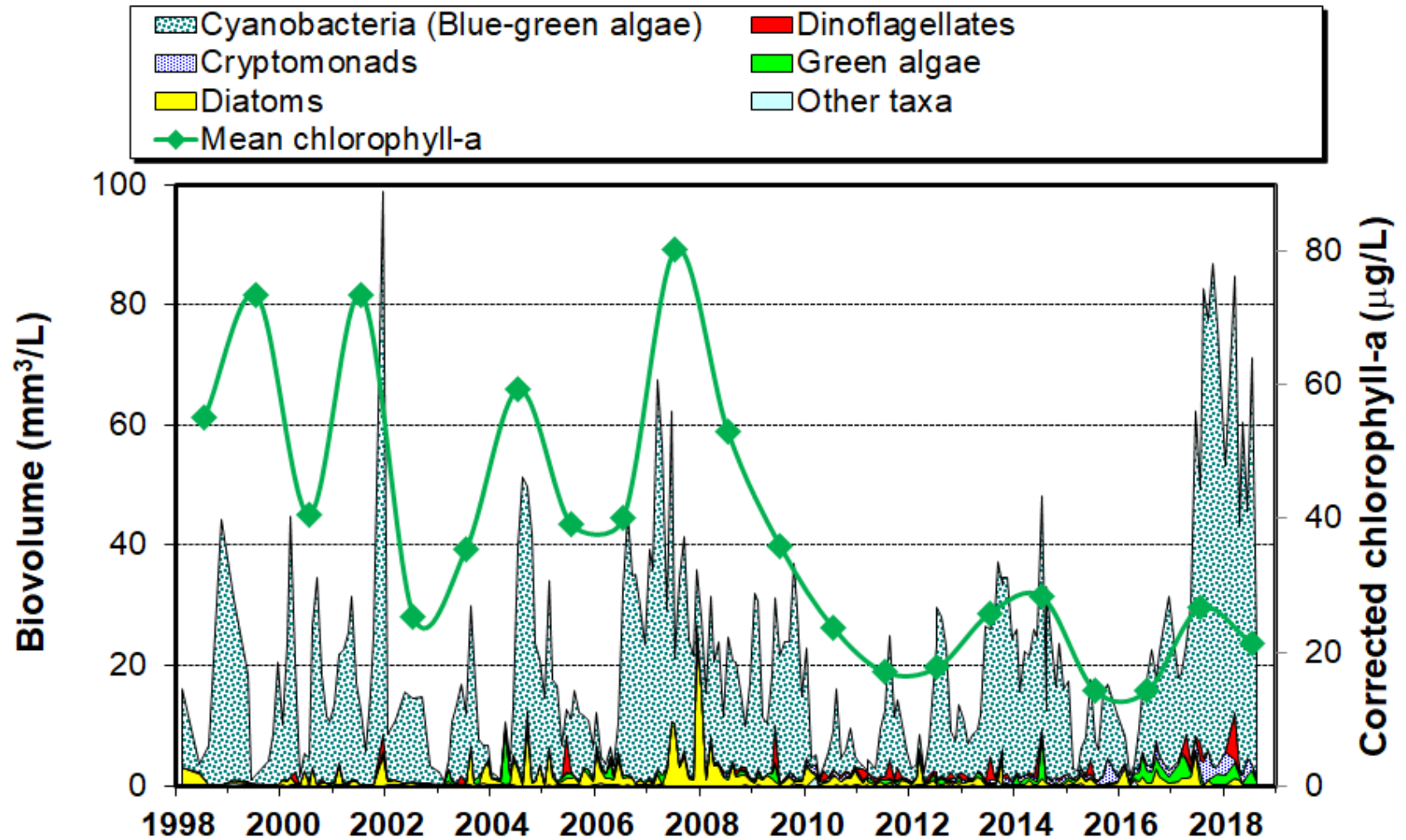
Lake Harris phytoplankton percent composition



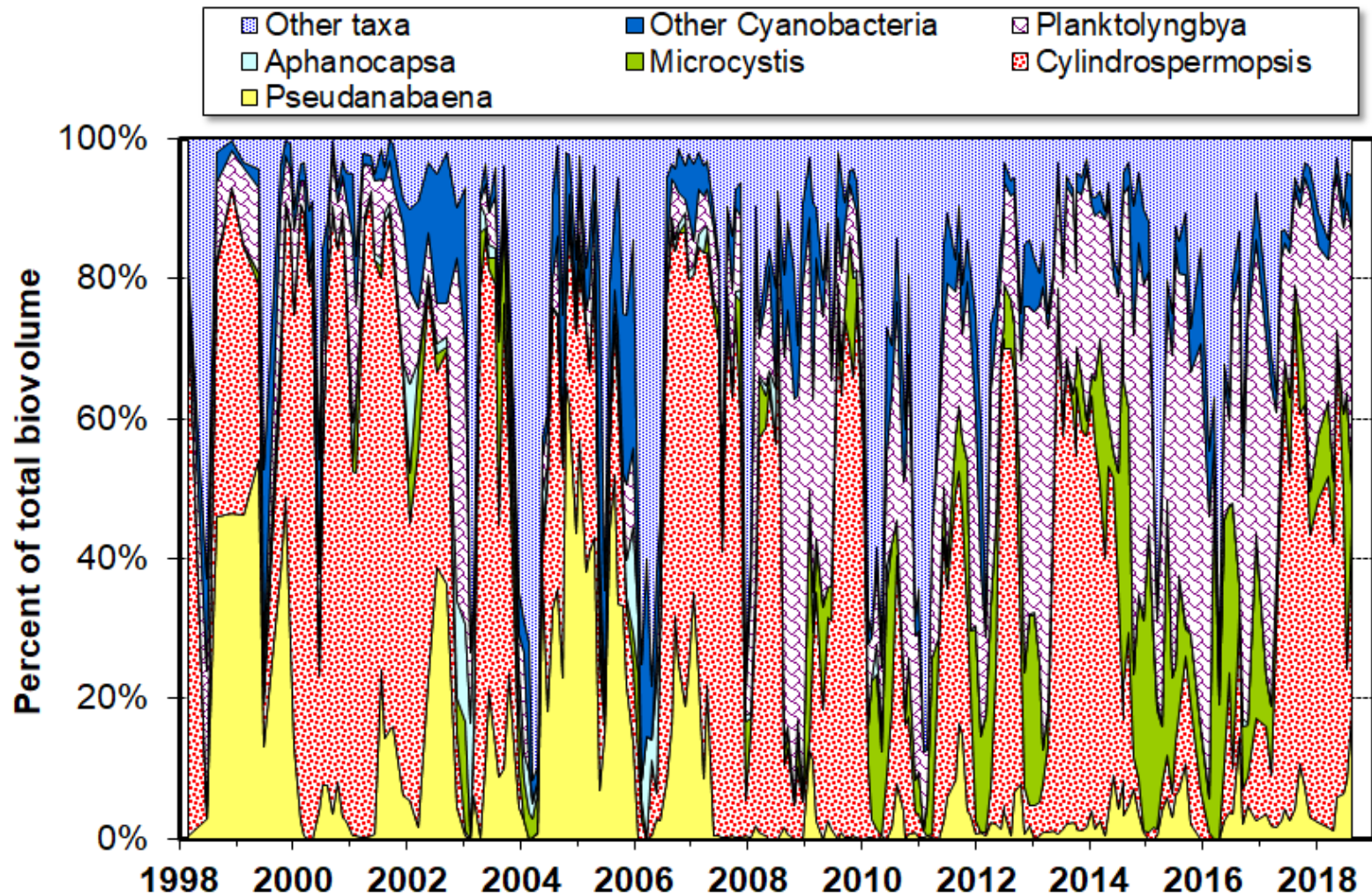
Lake Eustis estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



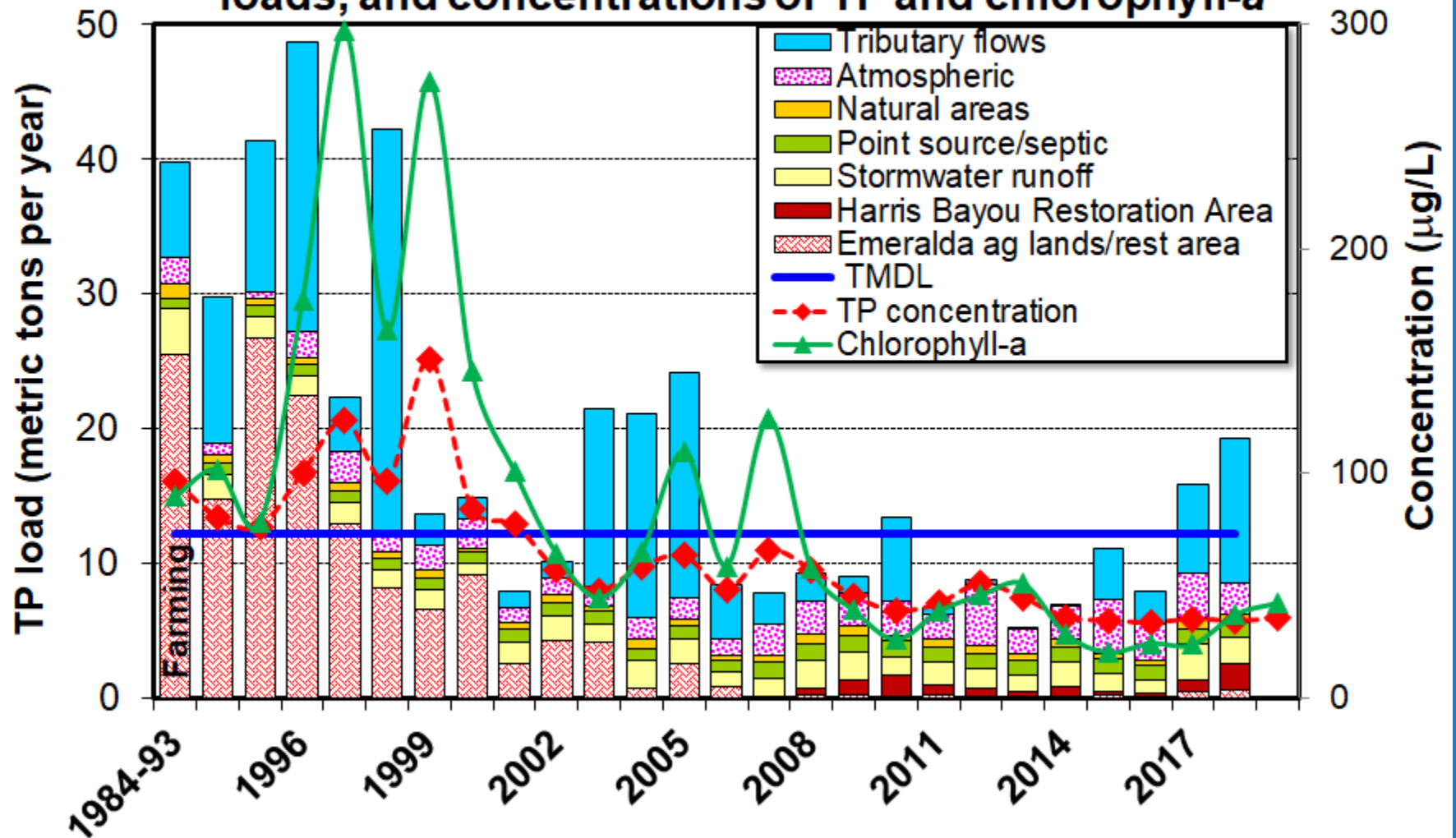
Lake Eustis phytoplankton biovolume



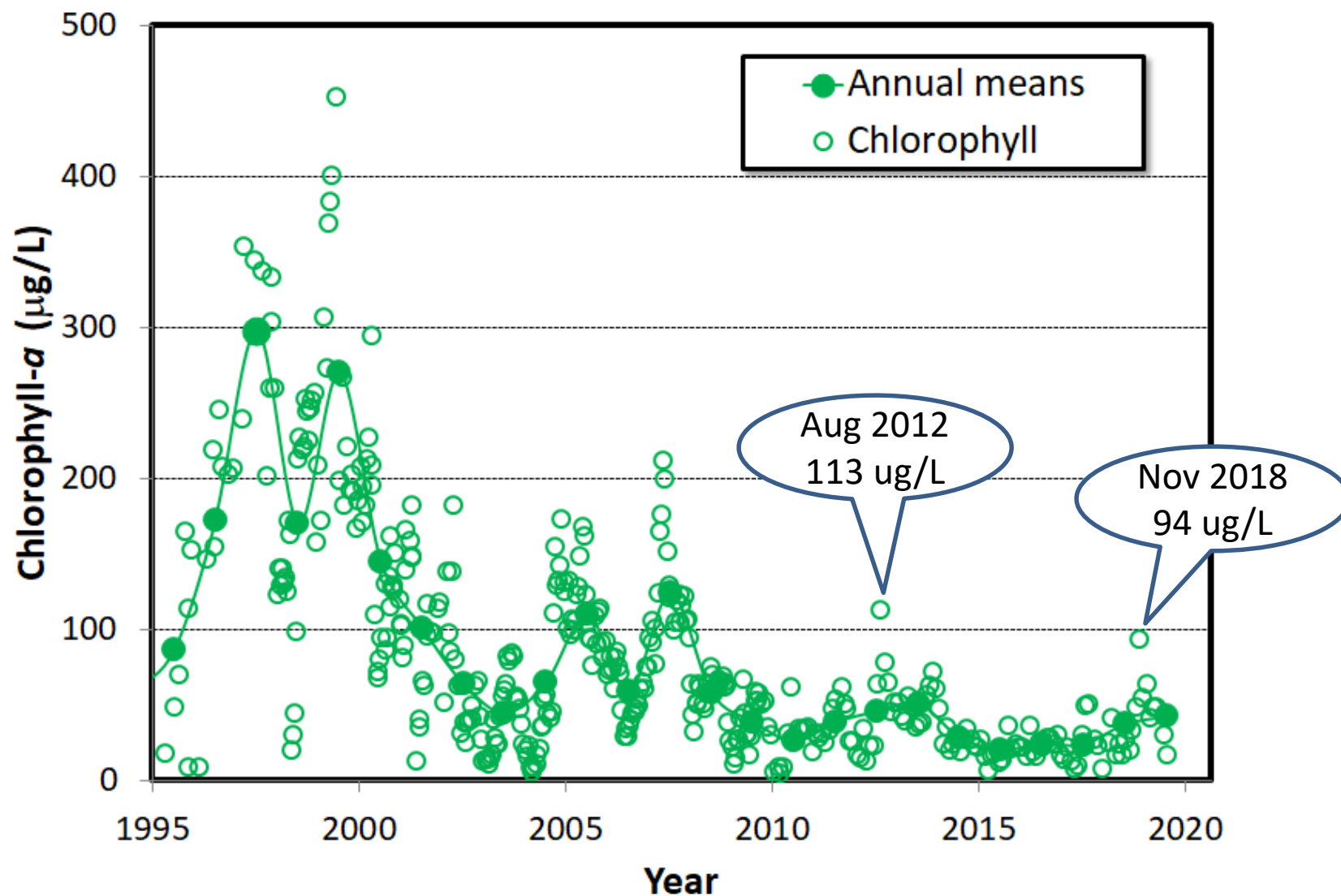
Lake Eustis phytoplankton percent composition



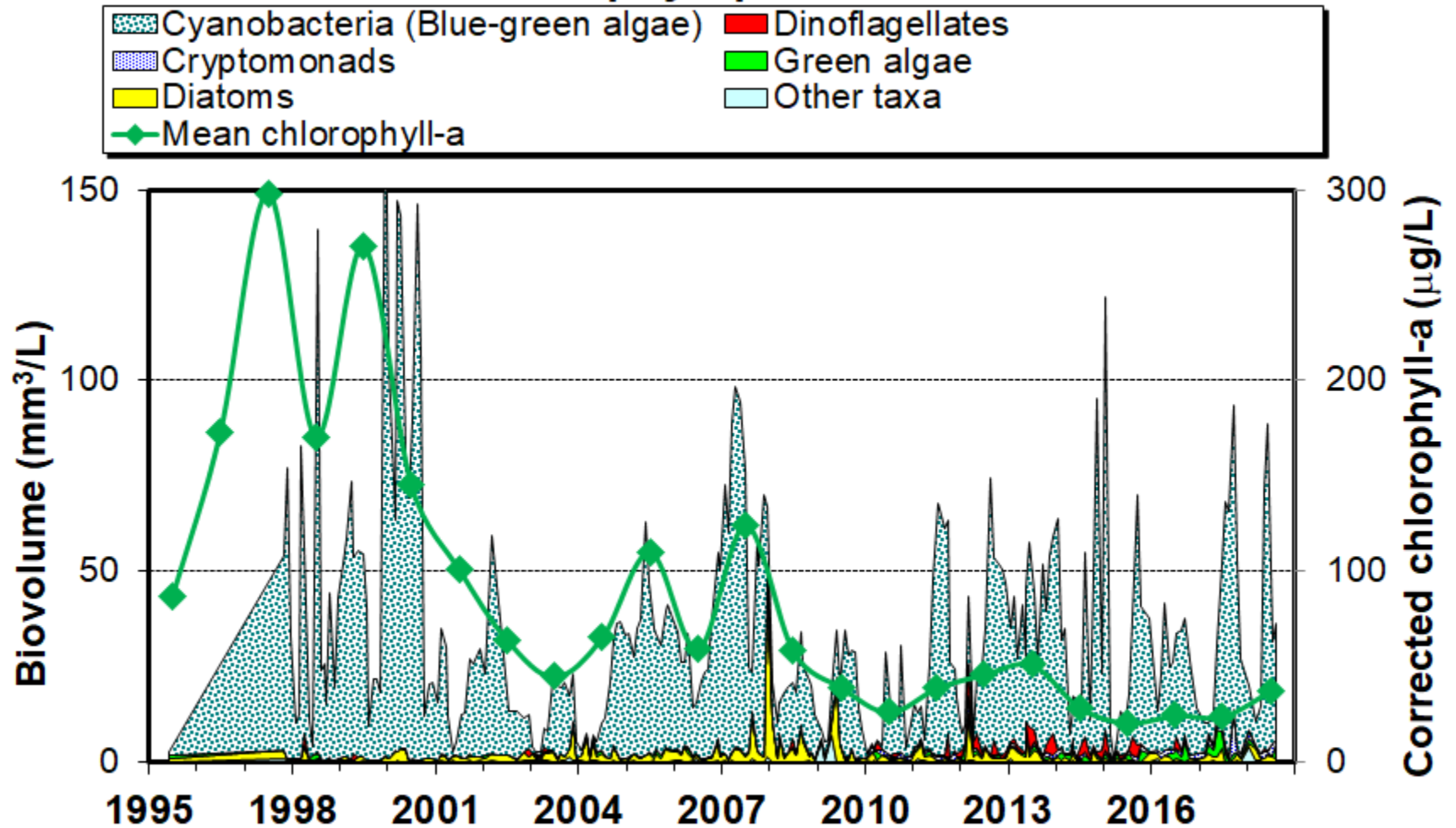
Lake Griffin estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



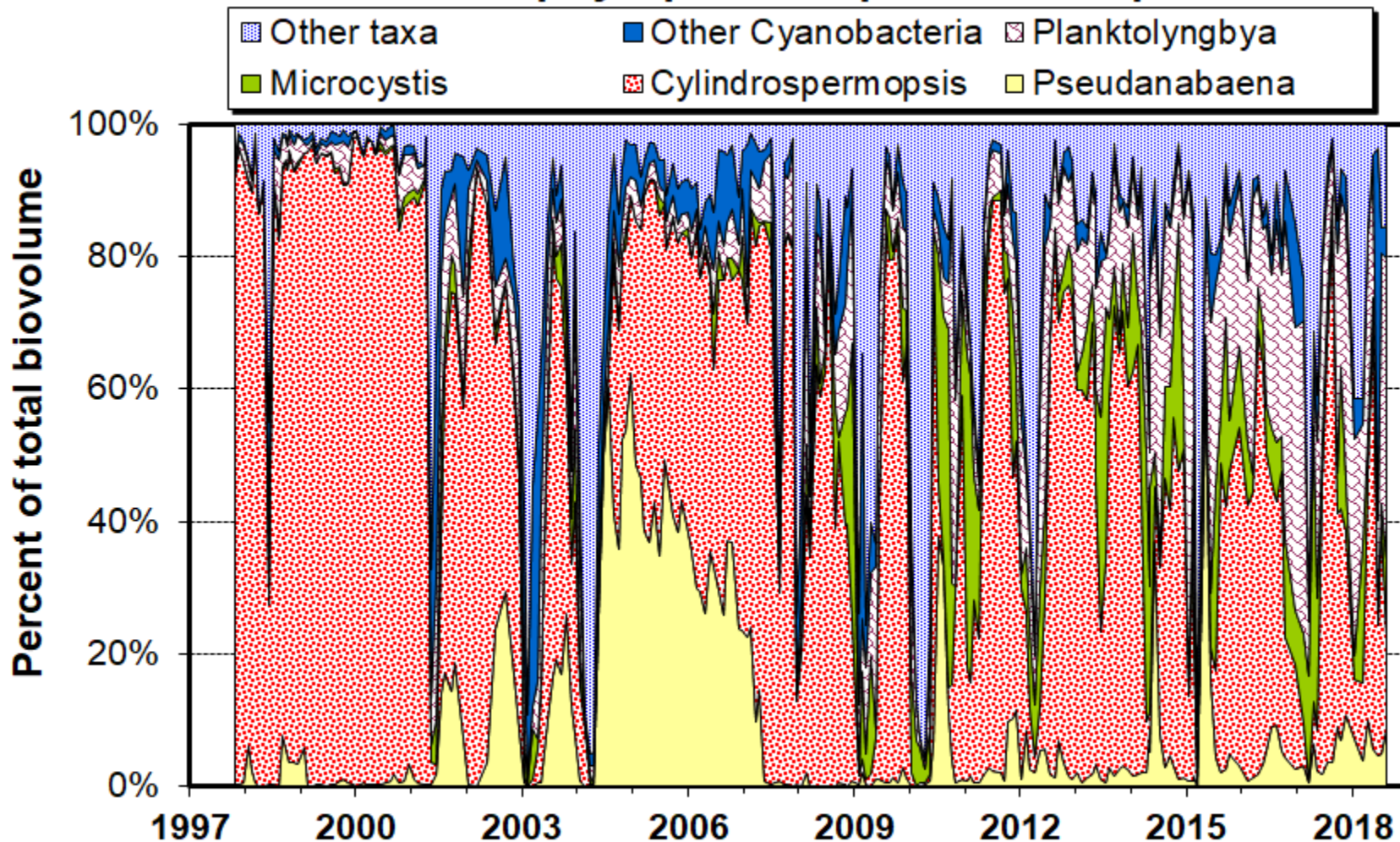
Lake Griffin chlorophyll-*a* concentrations



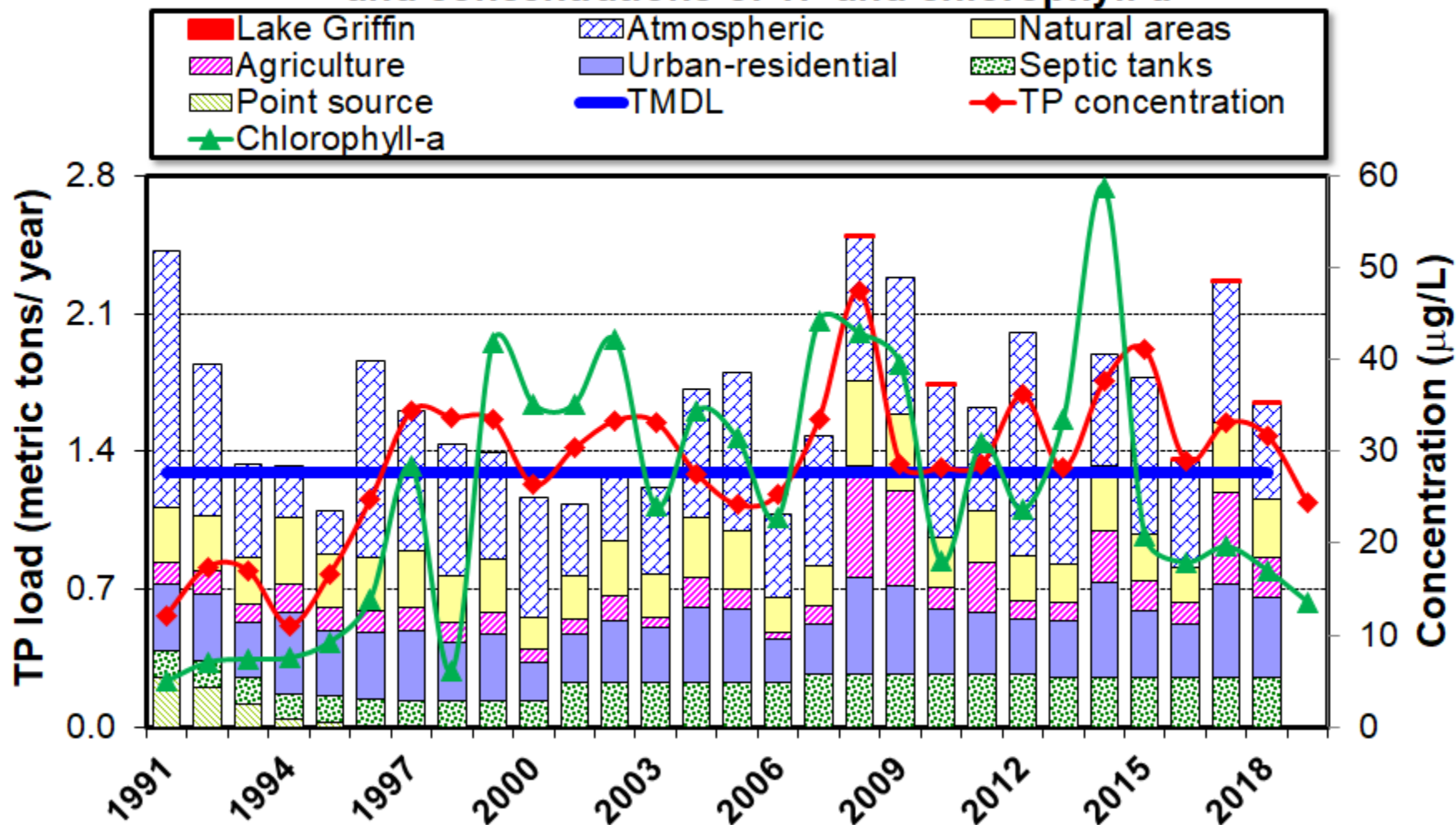
Lake Griffin phytoplankton biovolume



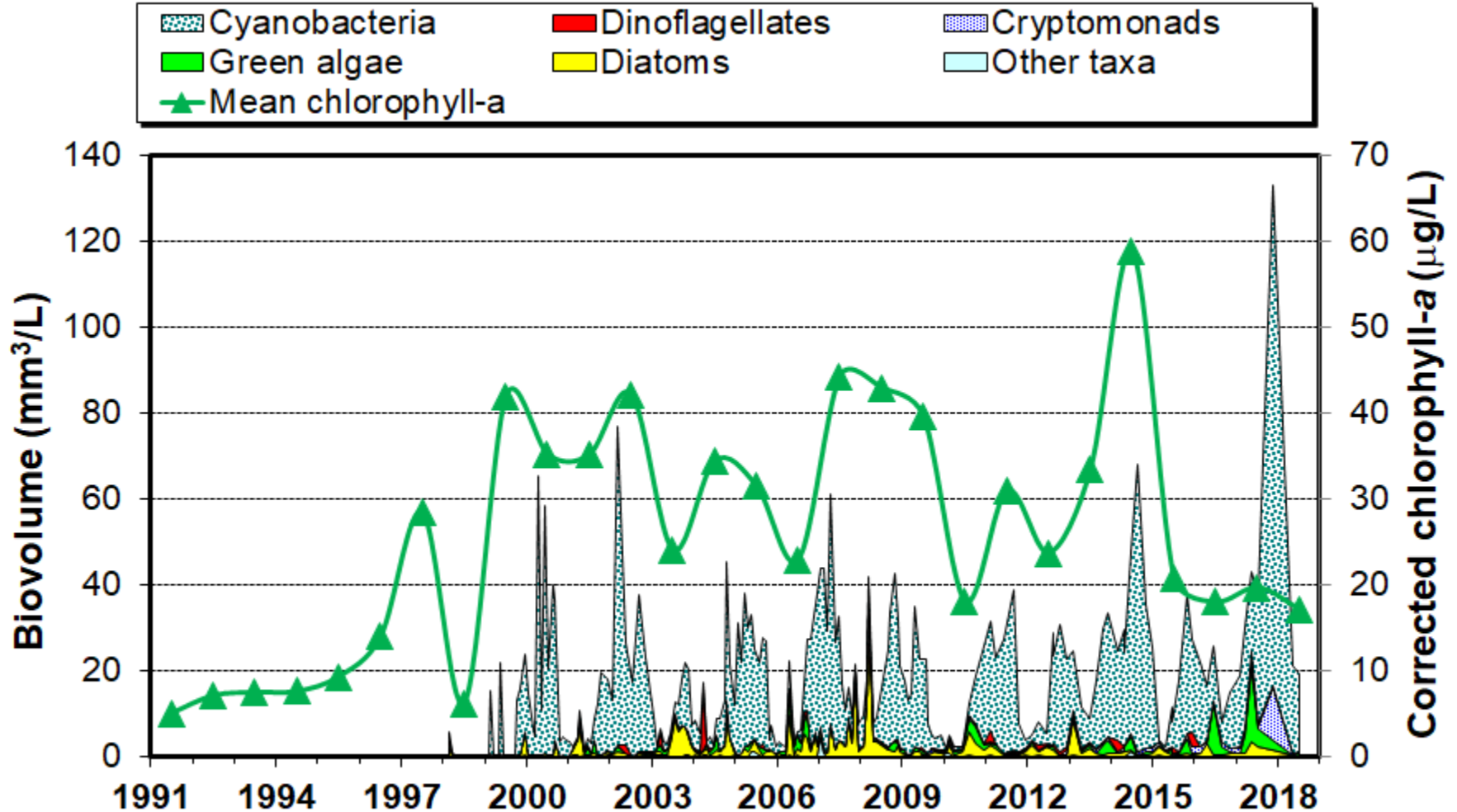
Lake Griffin phytoplankton percent composition



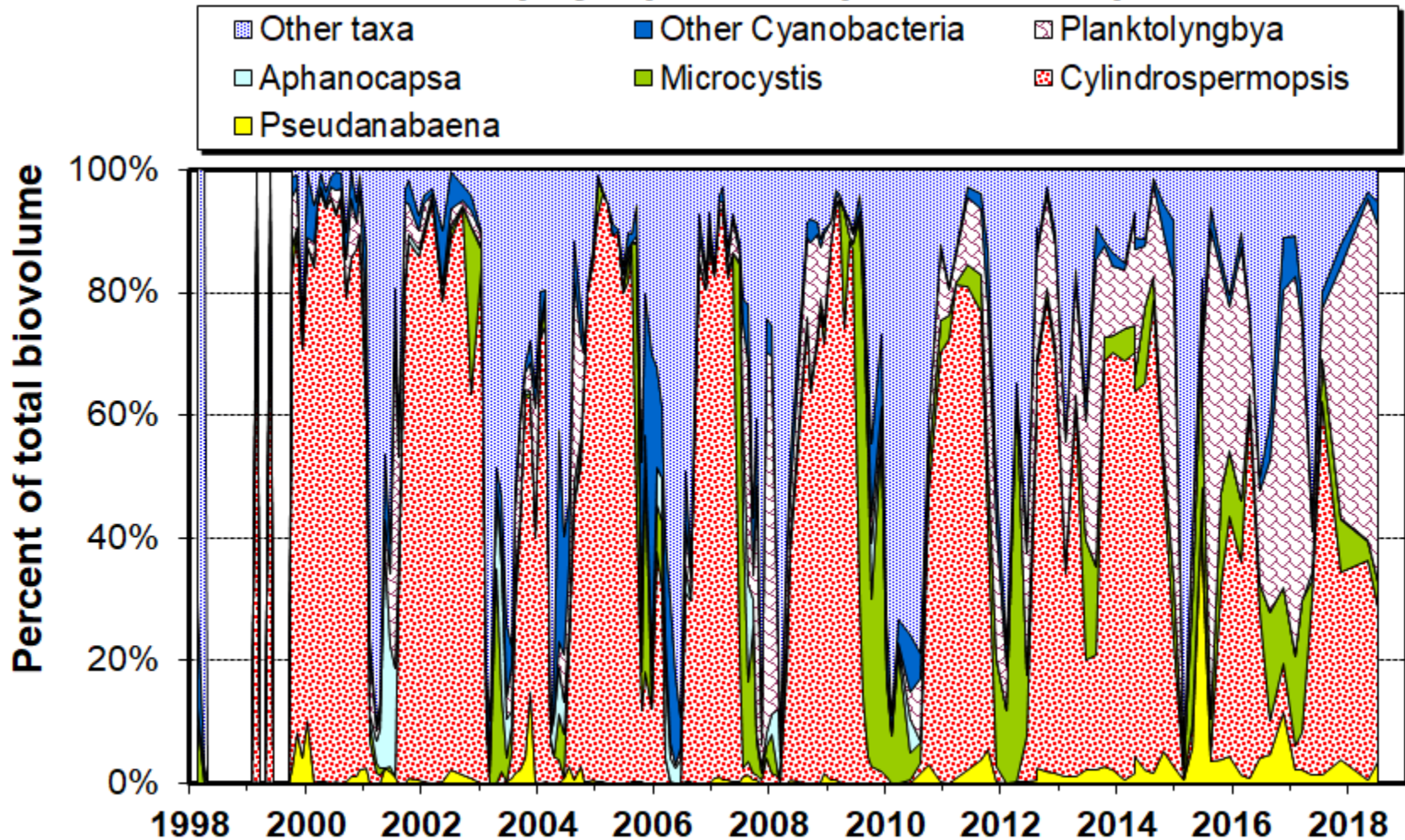
Lake Yale estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



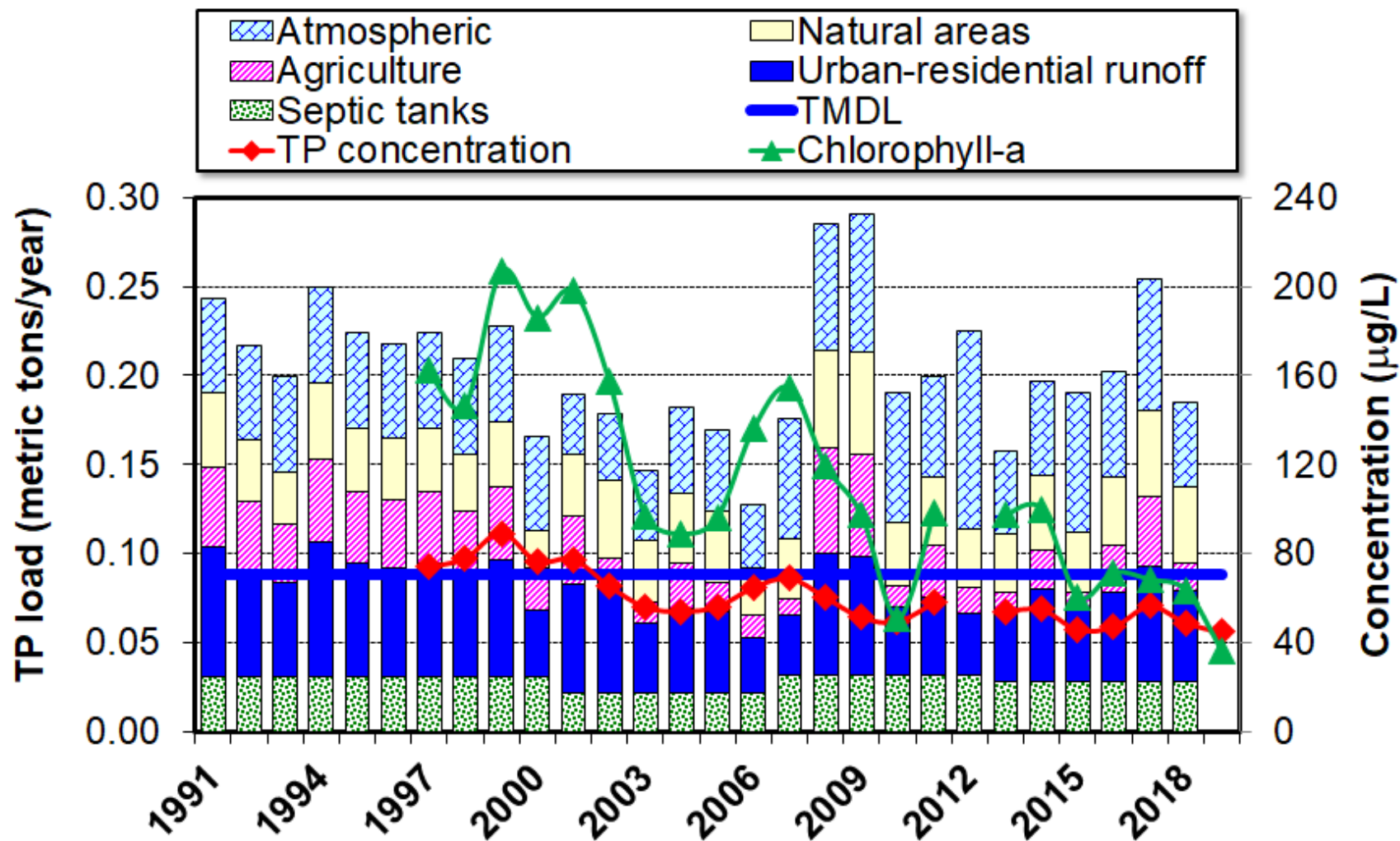
Lake Yale phytoplankton biovolume



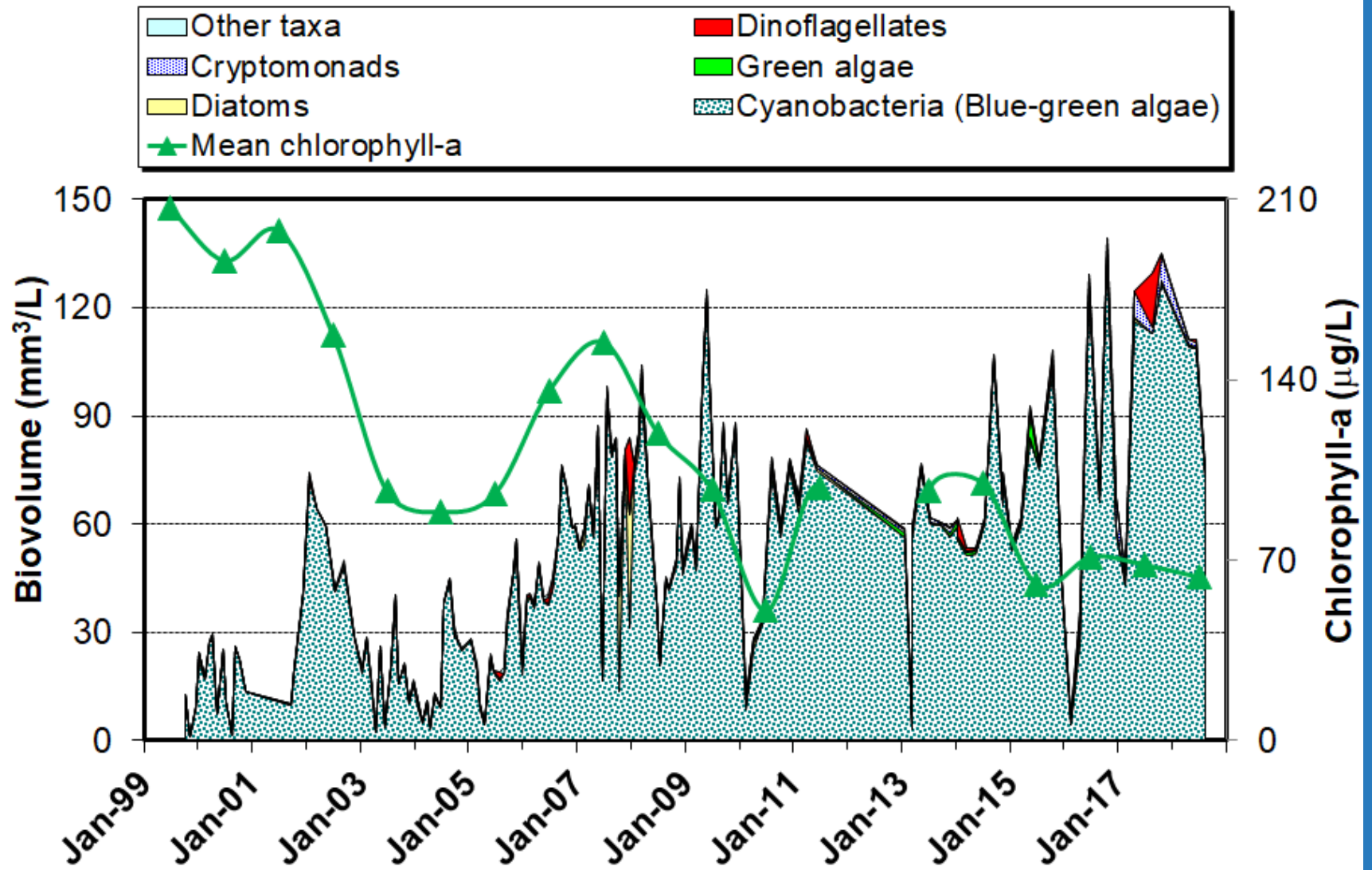
Lake Yale phytoplankton percent composition



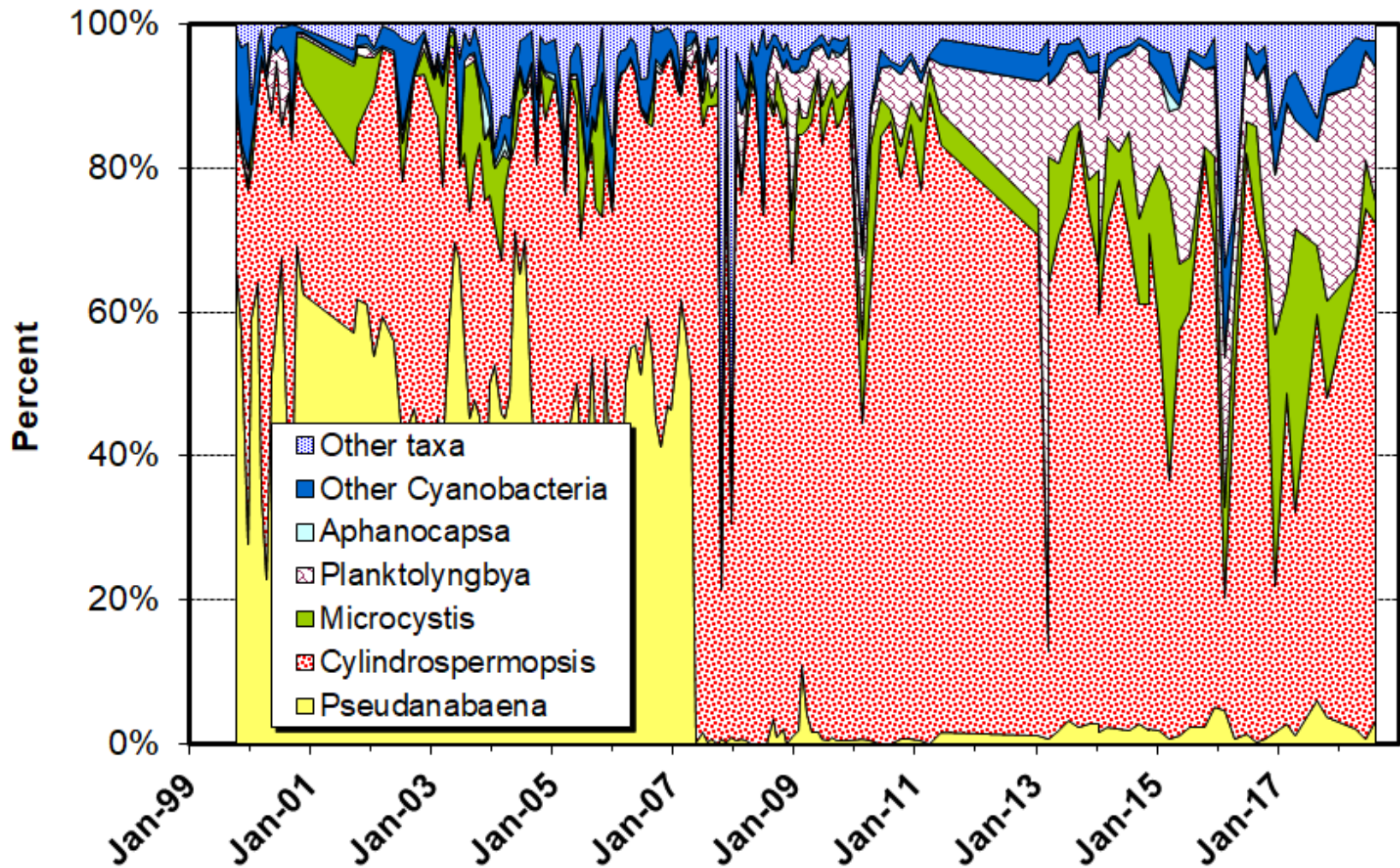
Lake Carlton estimated annual external total phosphorus loads, and concentrations of TP and chlorophyll-a



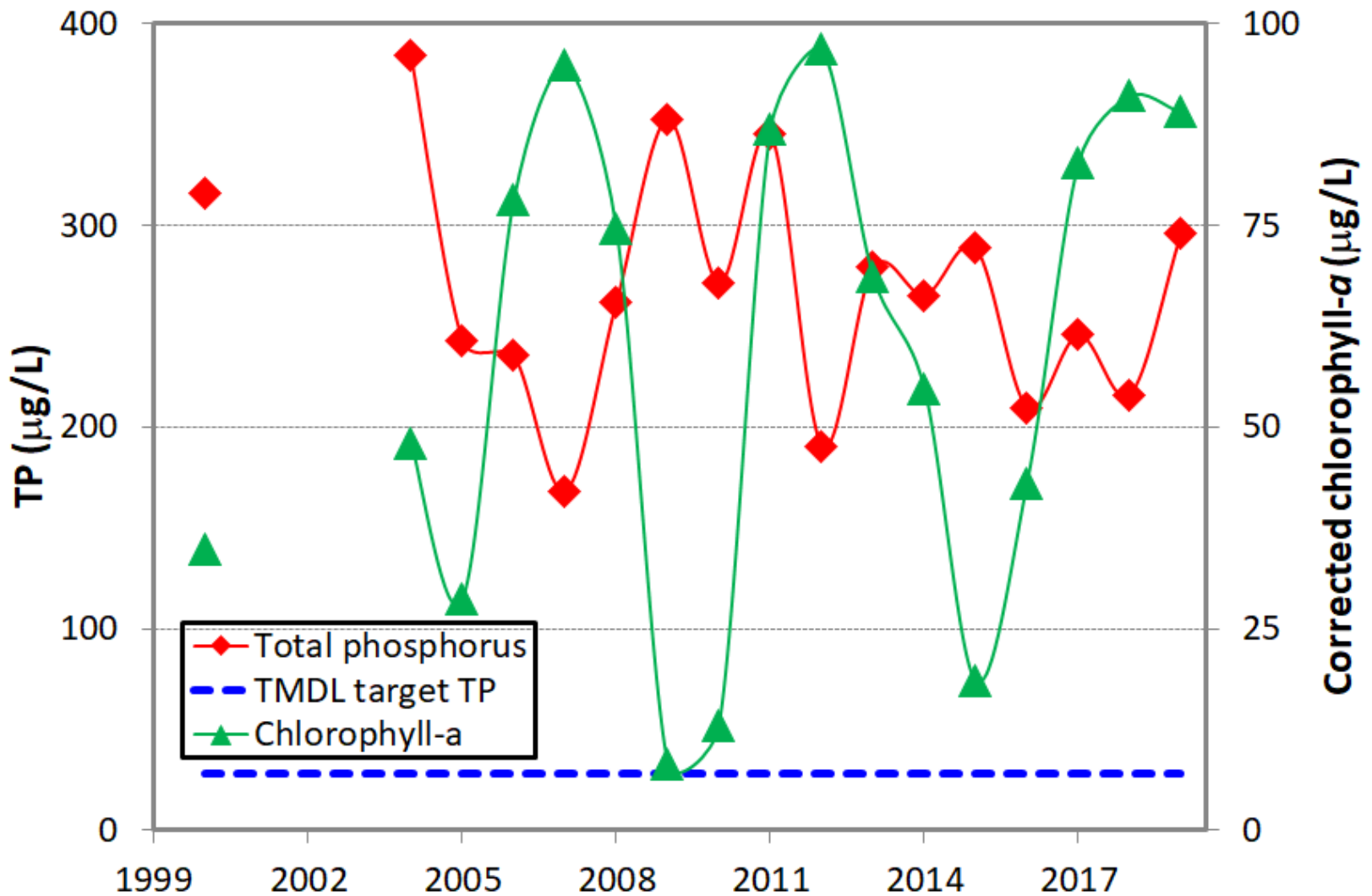
Lake Carlton phytoplankton biovolume



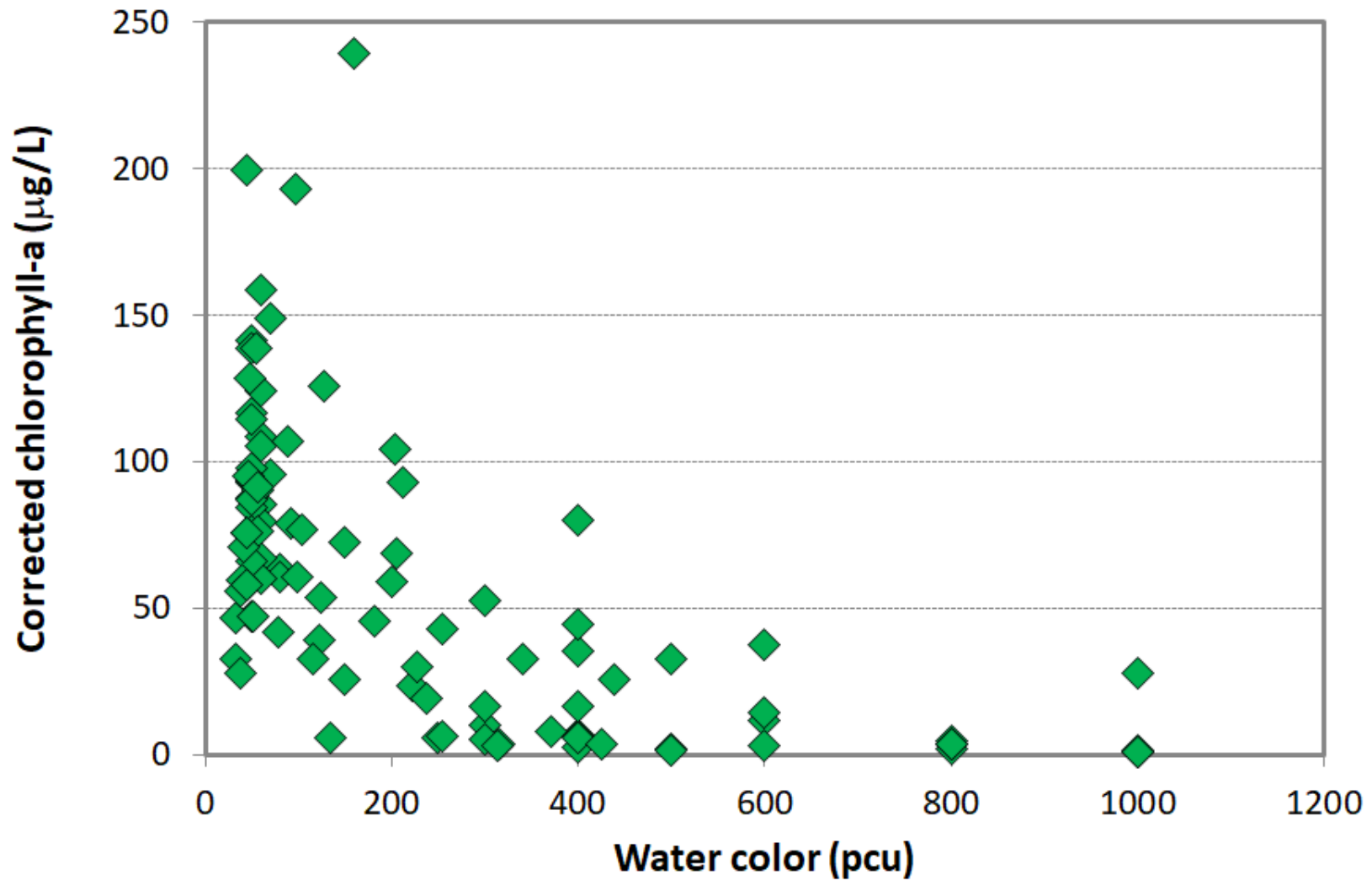
Lake Carlton phytoplankton percent composition



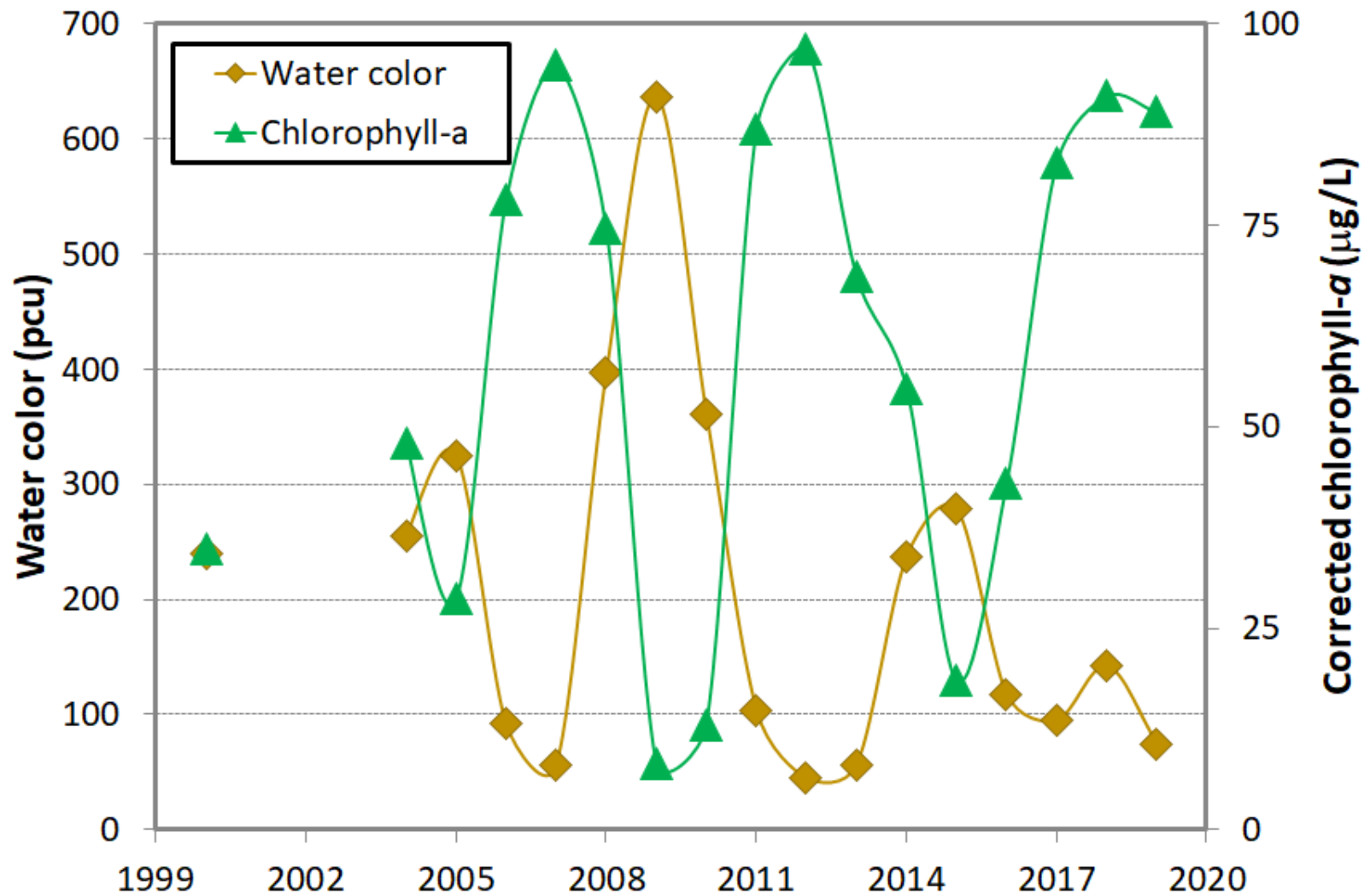
Trout Lake mean annual total phosphorus and chlorophyll-*a* concentrations



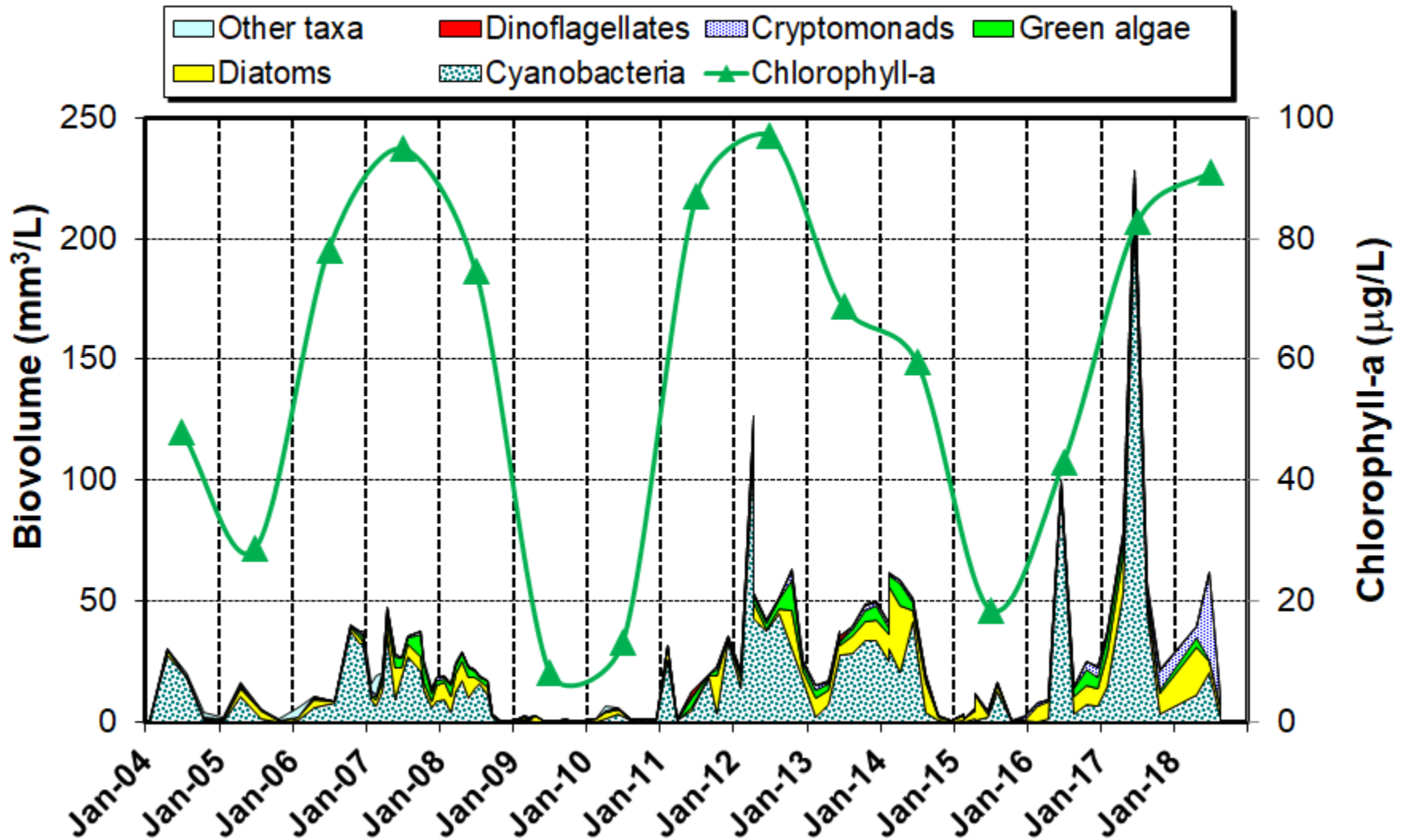
Trout Lake water color vs. chlorophyll-*a* concentrations



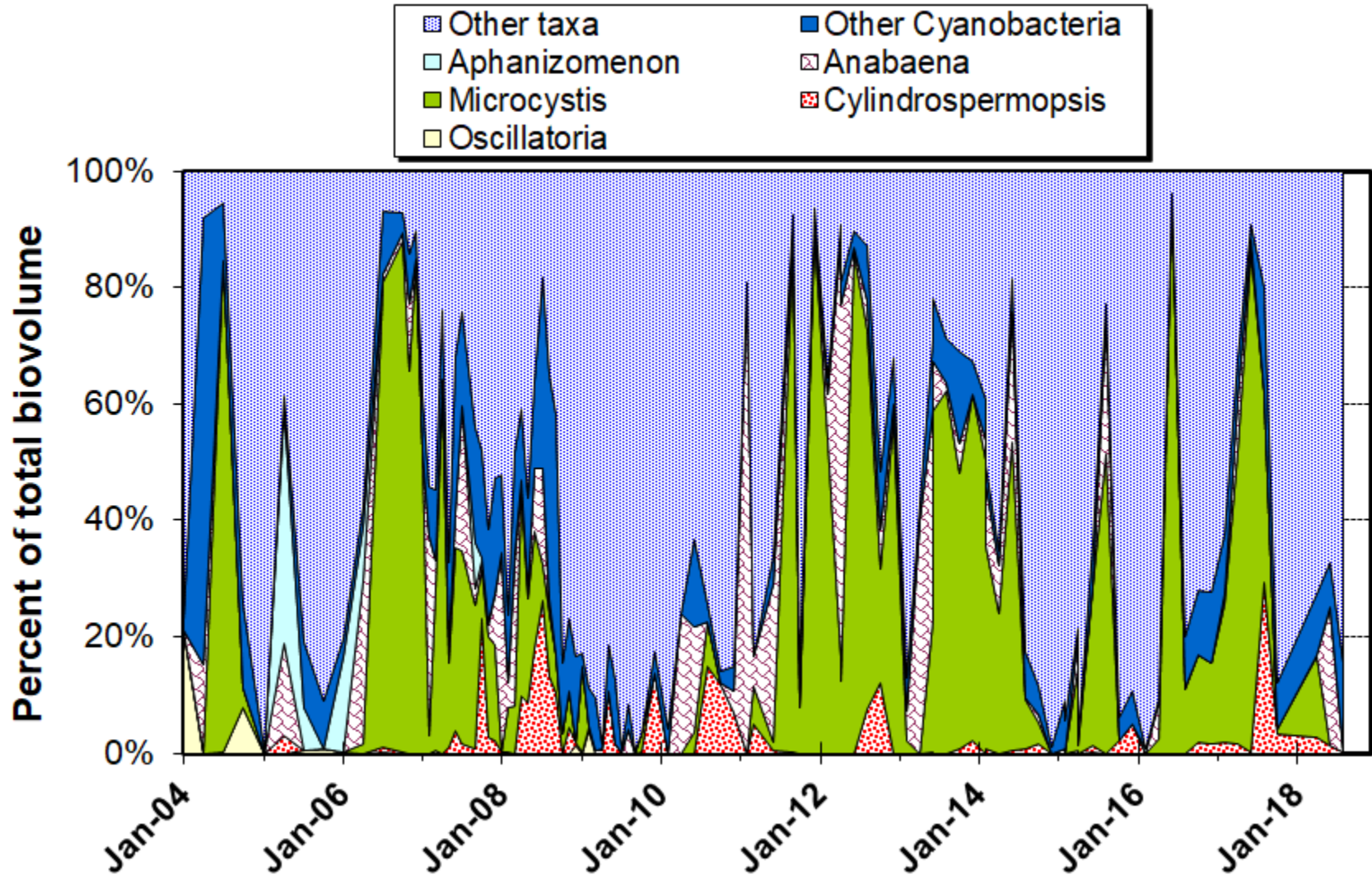
Trout Lake mean annual water color and chlorophyll-*a* concentrations



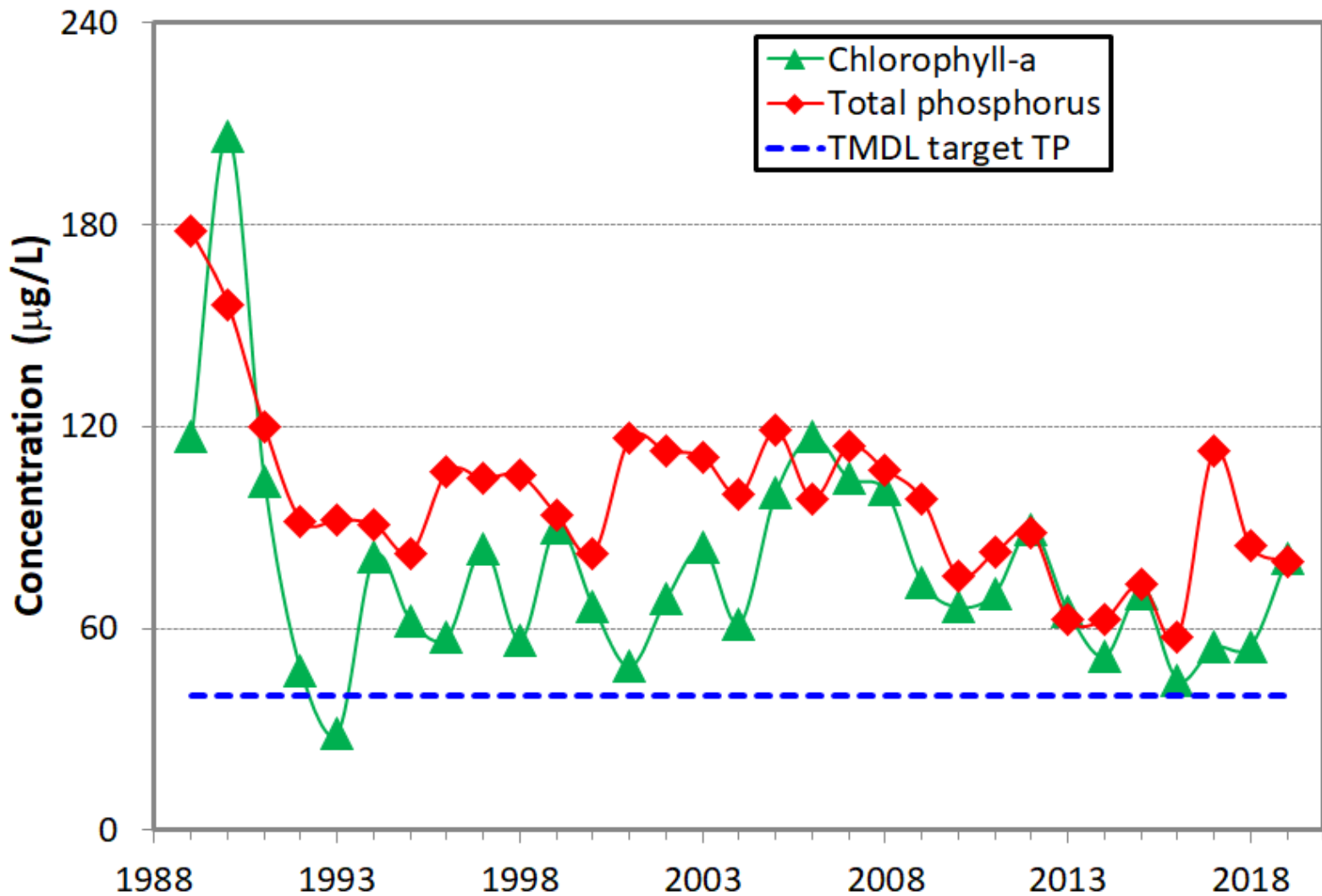
Trout Lake phytoplankton biovolume



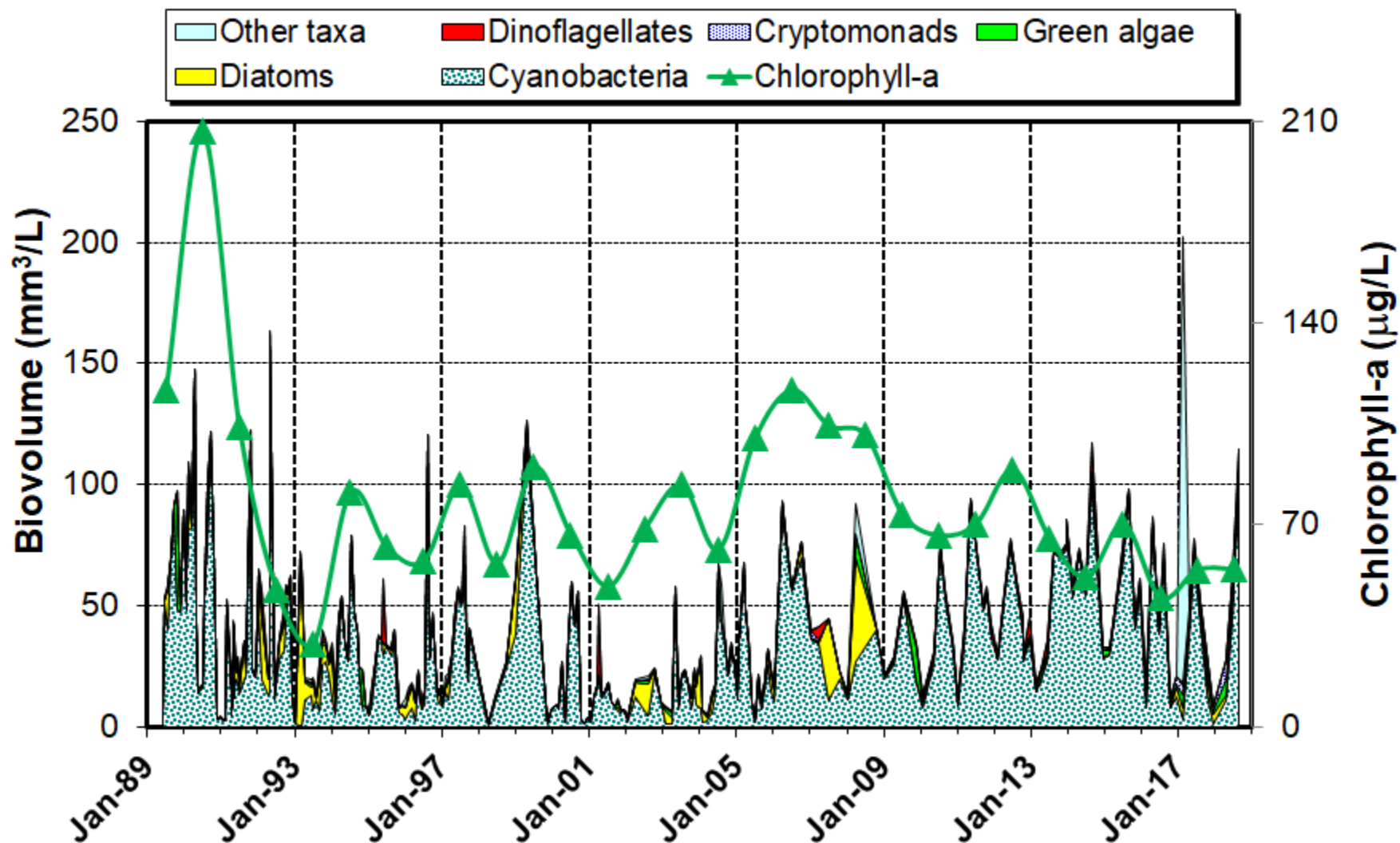
Trout Lake phytoplankton percent composition



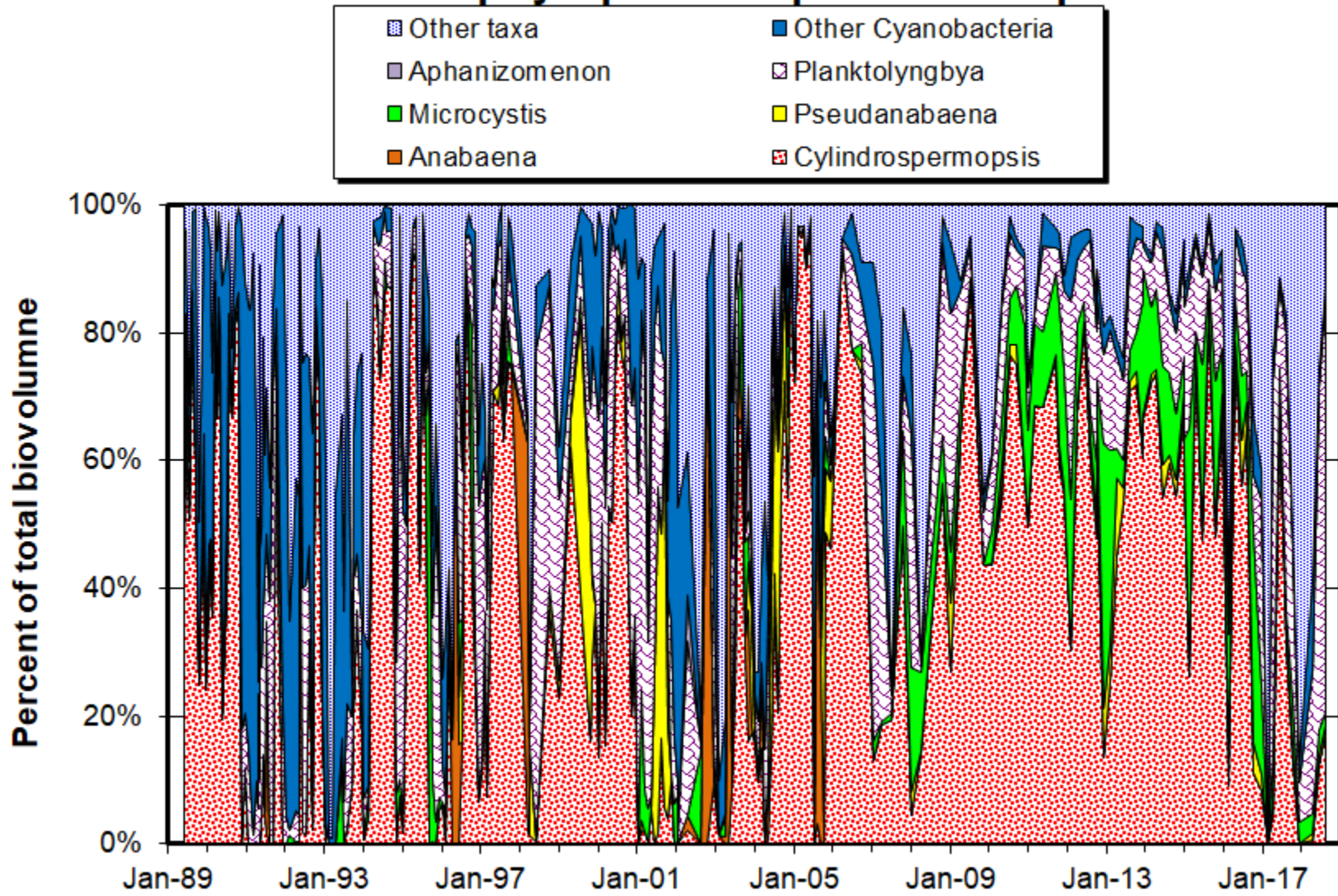
Lake Denham mean annual total phosphorus and chlorophyll-*a* concentrations



Lake Denham phytoplankton biovolume



Lake Denham phytoplankton percent composition



Summary (1)

- Generally best water quality in lakes Eustis, Harris, Yale, and until very recently, Griffin
- TP load decreases and substantial water quality improvements in lakes Apopka, Beauclair, Dora, and Griffin
 - Due primarily to SJRWMD and LCWA projects
 - Reduced discharges from the Lake Apopka North Shore accounted for ~90% of the TP decreases in Lake Apopka
 - Reductions in Lake Apopka discharge concentrations accounted for ~90% of the TP load reductions to lakes Beauclair and Dora
 - Reduced discharges from the Emerald Marsh Conservation Area accounted for ~90% of the TP load reductions to Lake Griffin



Summary (2)

- **Smaller load decreases and water quality improvements in lakes Harris, Eustis, and Carlton**
 - May reflect restoration activities, basin stormwater projects, and reduced loading due to drier conditions
- **Water quality deterioration in Lake Yale**
 - No projects in Yale basin
- **Not much improvement in water quality in Trout Lake or Lake Denham**



Summary (3)

- Phytoplankton tends to be dominated by cyanobacteria, particularly *Cylindrospermopsis*, except for lakes Apopka (*Planktolyngbya*) and Trout (*Microcystis*)



Upper Ocklawaha Basin – a success story

Orlando Sentinel – 8/26/01

SPECIAL REPORT
Toxic algae in our lakes

Menace lurks hidden in lakes

A study reveals how risky it
may be to go into the water

Flunked test.
Florida Game
and Fresh
Water Fish
Commission
biologist John
Benton tests the
water in Lake
Griffin for
visibility



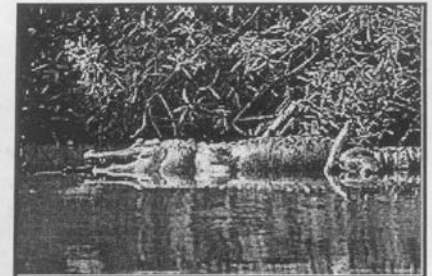
TOM BENITEZ/THE
ORLANDO
SENTINEL

Test confirms bacteria will poison lake

Ramsey Campbell
of The Sentinel Staff

Published in The Orlando Sentinel on July 23, 1999.

Killed by Cy? A
gator lies dead
in Lake Griffin.
Scientists think
the killer may be
a tiny organism
nicknamed 'Cy.'



TOM BENITEZ/THE
ORLANDO
SENTINEL

Do lakes hold a killer algae?

Robert Sargent Jr. and Ramsey Campbell
of The Sentinel Staff

Published in The Orlando Sentinel on July 22, 1999.



St. Johns River
Water Management District

More information

- Coveney, M.F. 2016. Water quality changes in Lake Apopka, Florida, and the St. Johns River Water Management District's restoration program. SJRWMD Technical Memorandum 56.
- Fulton, R.S. III. 2018. Nutrient loading and water quality trends in the Upper Ocklawaha basin lakes through 2016. SJRWMD Technical Memorandum 54-3.

