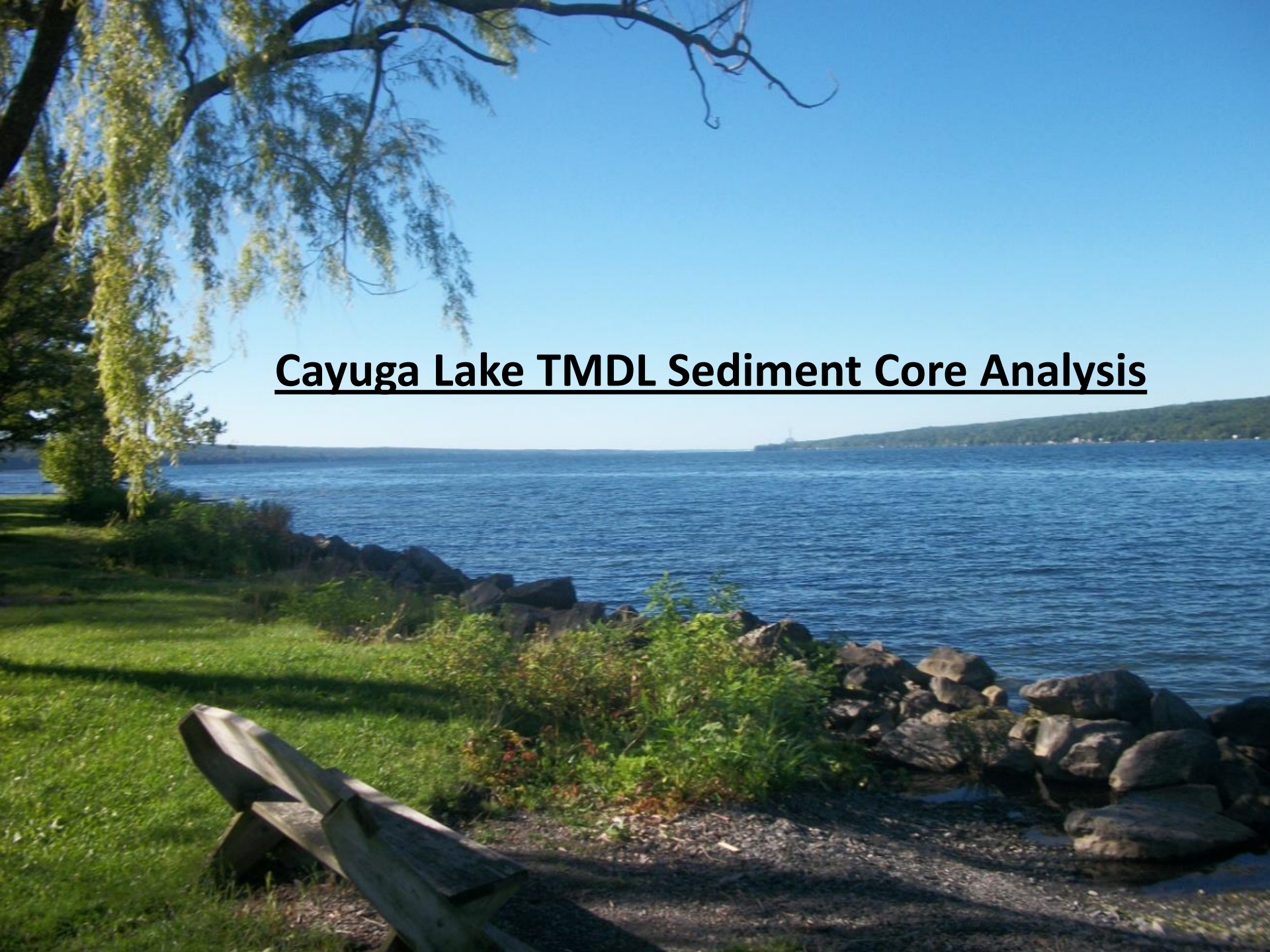


Cayuga Lake TMDL Sediment Core Analysis

Goals:

- to document the history of TP levels in Cayuga Lake, as background to TMDL assessment of TP on the southern shelf

- To independently corroborate modeling results, based on comparison between mechanistic hindcast and paleolimnologic inference TP modeling

Project Participants

- **USEPA**
  - **Abt Associates**
    - **Anchor QEA**
    - **St. Croix Watershed Research Station (MN)**
    - **Hutchinson Environmental Sciences**
    - **Washington University of Saint Louis**
    - **Life Science Labs**
- **NYSDEC**
  - **Rensselaer Polytechnic Institute**
- **Hobart and William Smith Colleges**

Project Tasks

1) Sediment Coring – completed 5/13/2014

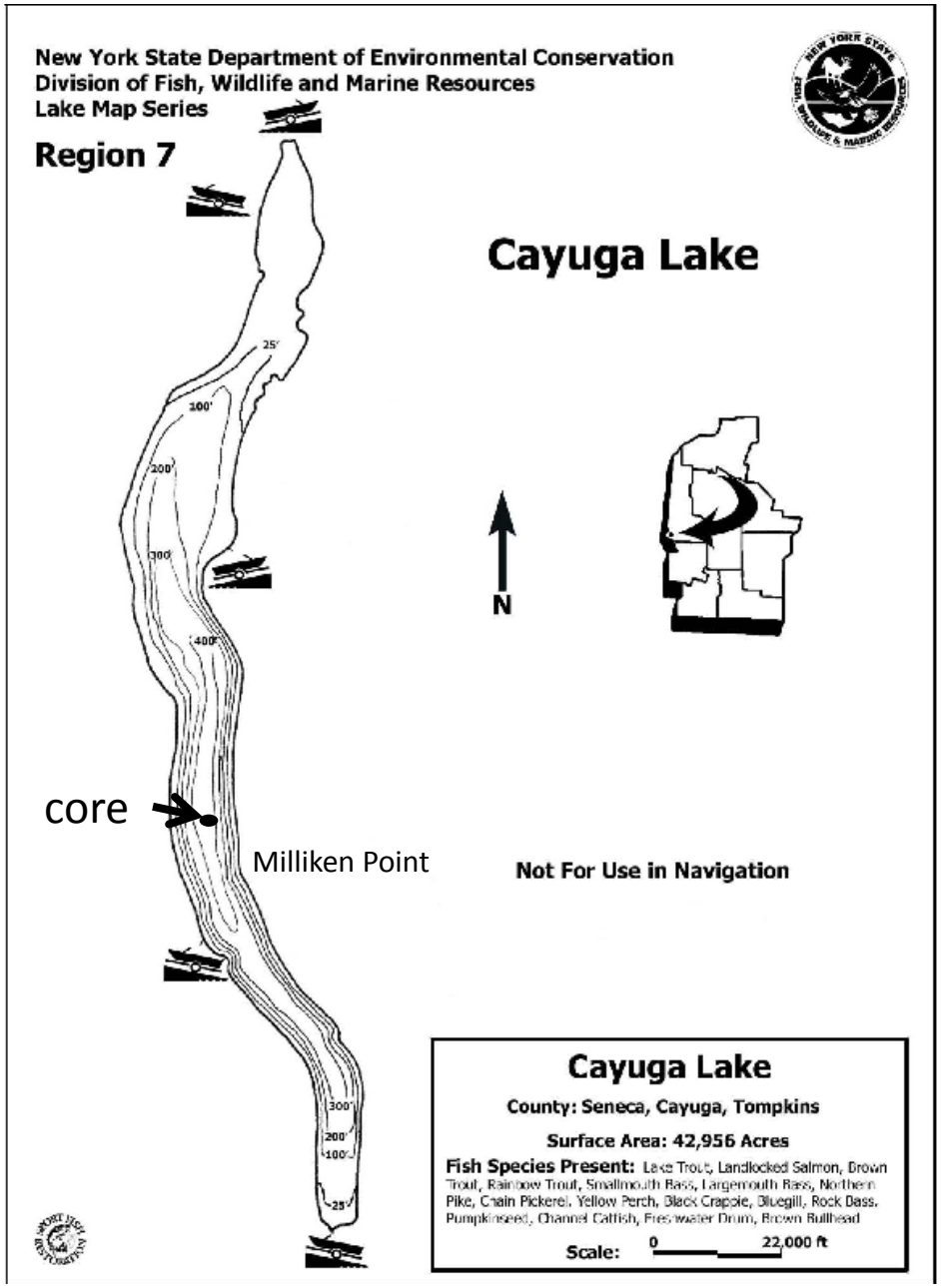
2) Core sample analyses – complete, Abt report complete

3) Diatom TP inference modeling – complete

4) Data correlation – in progress

5) Historical water quality interpretation – part of final report

6) Final paleolimnology Report – spring 2016


New York State Department of Environmental Conservation
Division of Fish, Wildlife and Marine Resources
Lake Map Series
Region 7
Cayuga Lake
25'
100'
200'
300'
400'
N
core
Milliken Point
Not For Use in Navigation
300'
200'
100'
25'
Cayuga Lake
County: Seneca, Cayuga, Tompkins
Surface Area: 42,956 Acres
Fish Species Present: Lake Trout, Landlocked Salmon, Brown Trout, Rainbow Trout, Smallmouth Bass, Largemouth Bass, Northern Pike, Chain Pickerel, Yellow Perch, Black Crappie, Bluegill, Rock Bass, Pumpkinseed, Channel Catfish, Freshwater Drum, Brown Bullhead
Scale: 0 22,000 ft

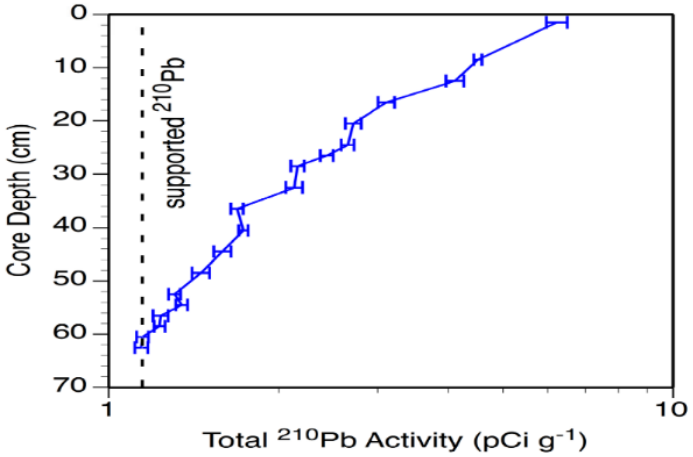
Cayuga Lake
Sediment Core

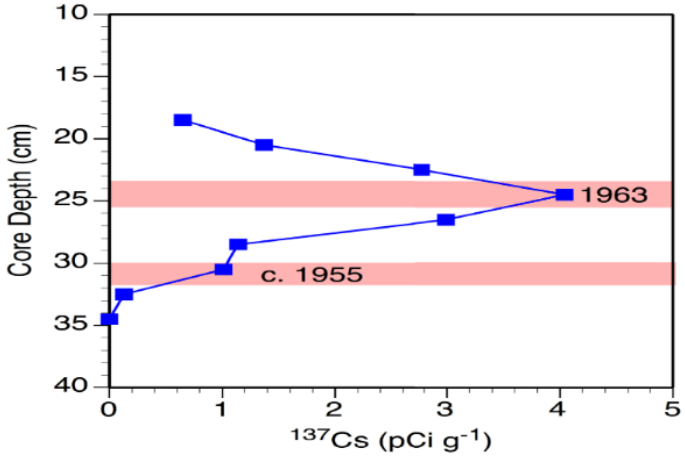
base

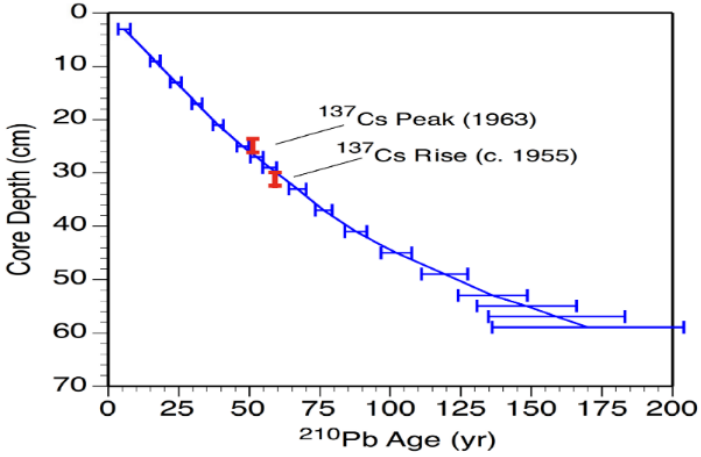
top

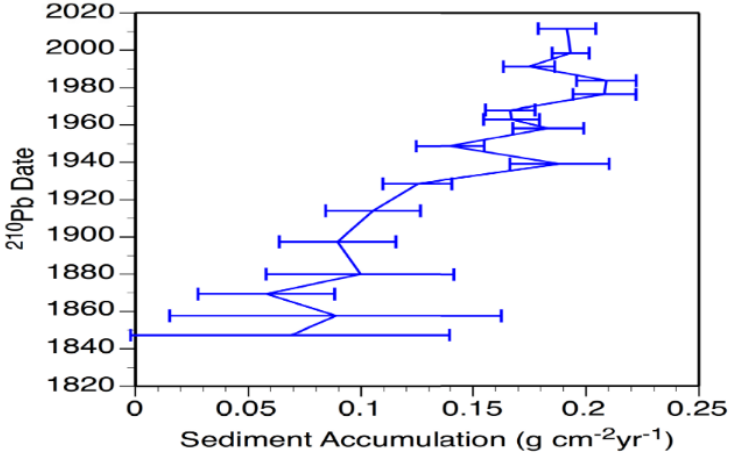
black layer
1990-2000

Cayuga Lake
New York
CL-SED 2014

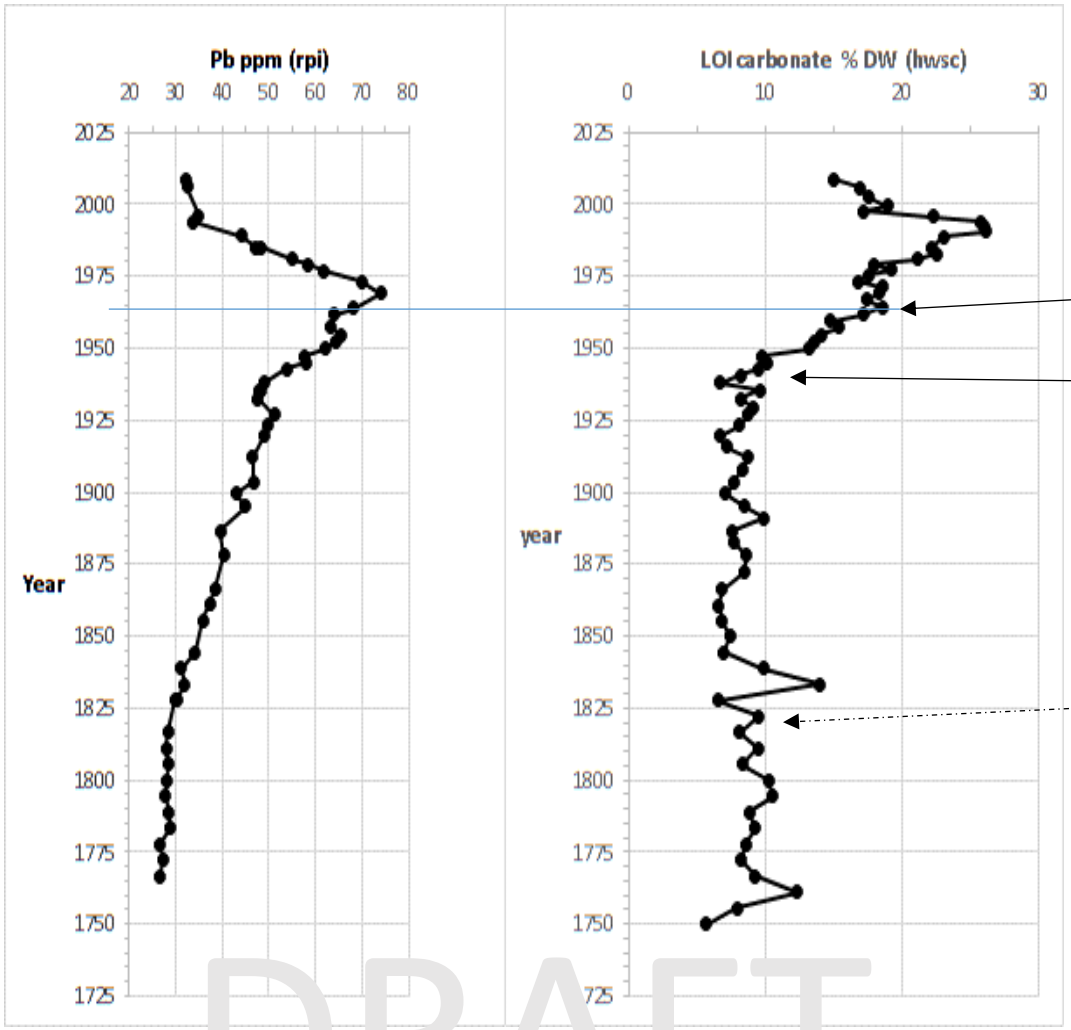








Mullins, H. T. 1998, Environmental change controls of lacustrine carbonate, Cayuga Lake, New York. *Geology26;443-446.*



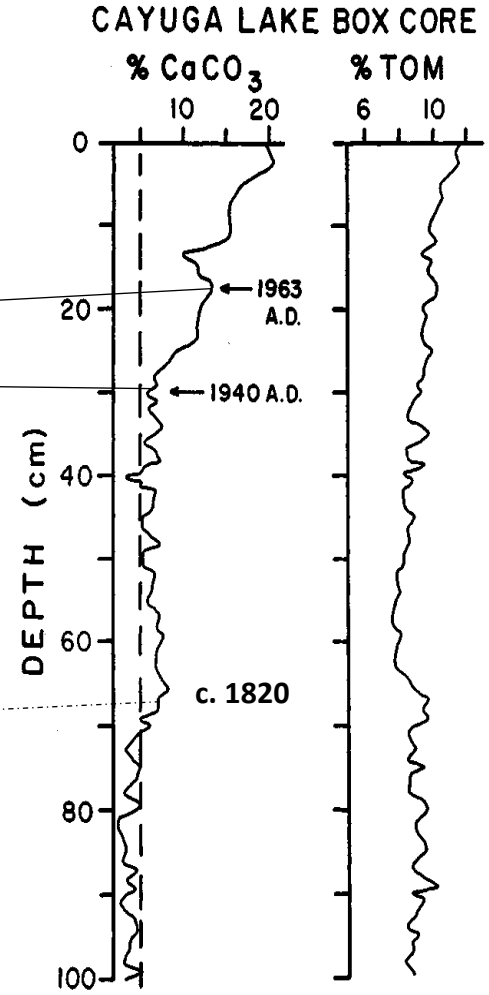
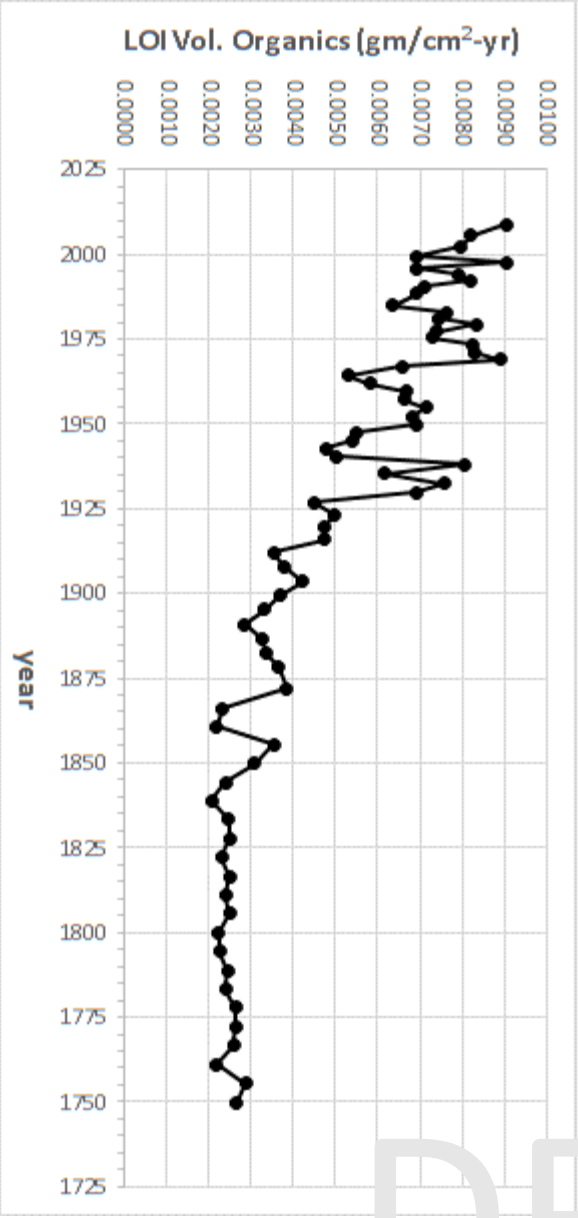
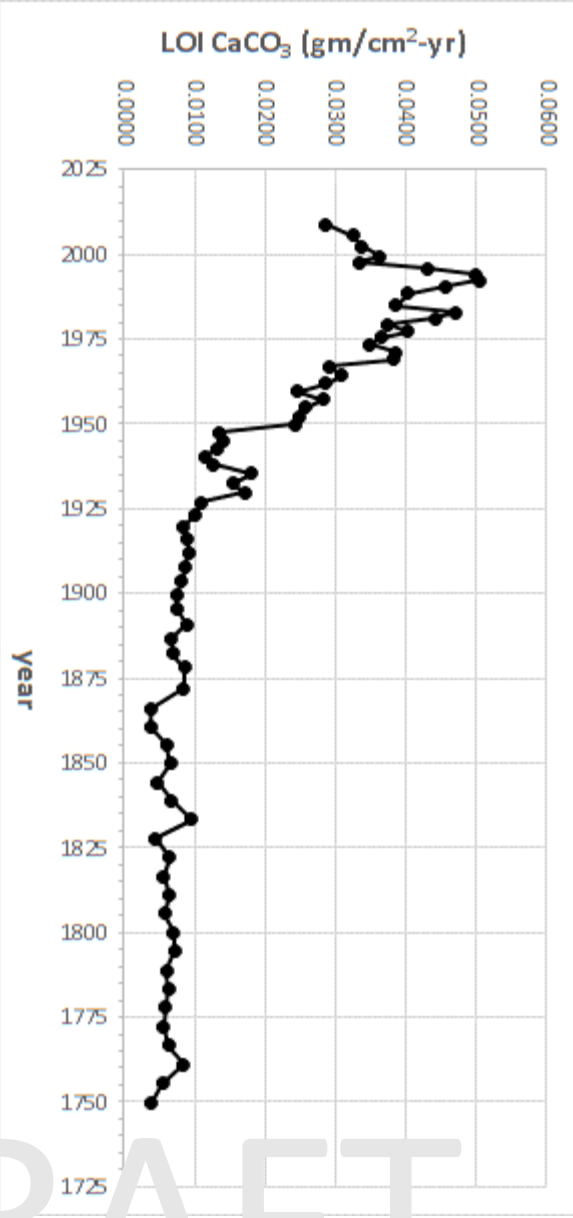
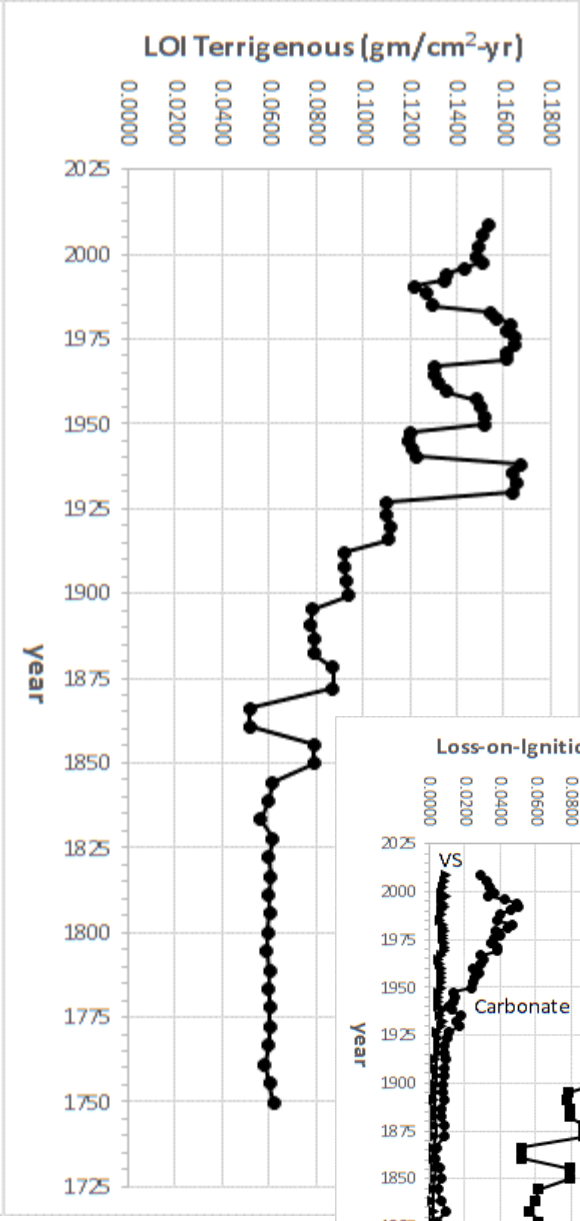


Figure 3. Dry weight percent calcium carbonate and total organic matter (TOM) content versus depth for box core CL-1 (see Fig. 1). Date of A.D. 1963 is based on direct ^{137}Cs and ^{210}Pb data, whereas date of A.D. 1940 is based on linear extrapolation from A.D. 1963.


LOI Vol. Organics (gm/cm2-yr)
0.0000
0.0010
0.0020
0.0030
0.0040
0.0050
0.0060
0.0070
0.0080
0.0090
0.0100
2025
2000
1975
1950
1925
1900
1875
1850
1825
1800
1775
1750
1725
year


LOI CaCO3 (gm/cm2-yr)
0.0000
0.0100
0.0200
0.0300
0.0400
0.0500
0.0600
2025
2000
1975
1950
1925
1900
1875
1850
1825
1800
1775
1750
1725
year


LOI Terrigenous (gm/cm2-yr)
0.0000
0.0200
0.0400
0.0600
0.0800
0.1000
0.1200
0.1400
0.1600
0.1800
2025
2000
1975
1950
1925
1900
1875
1850
1825
1800
1775
1750
1725
year

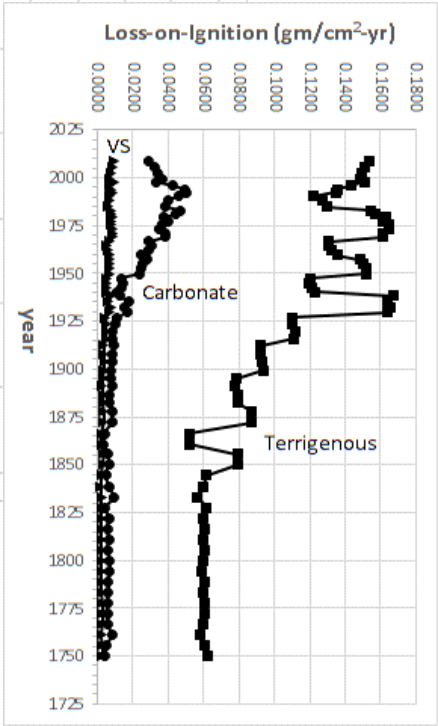
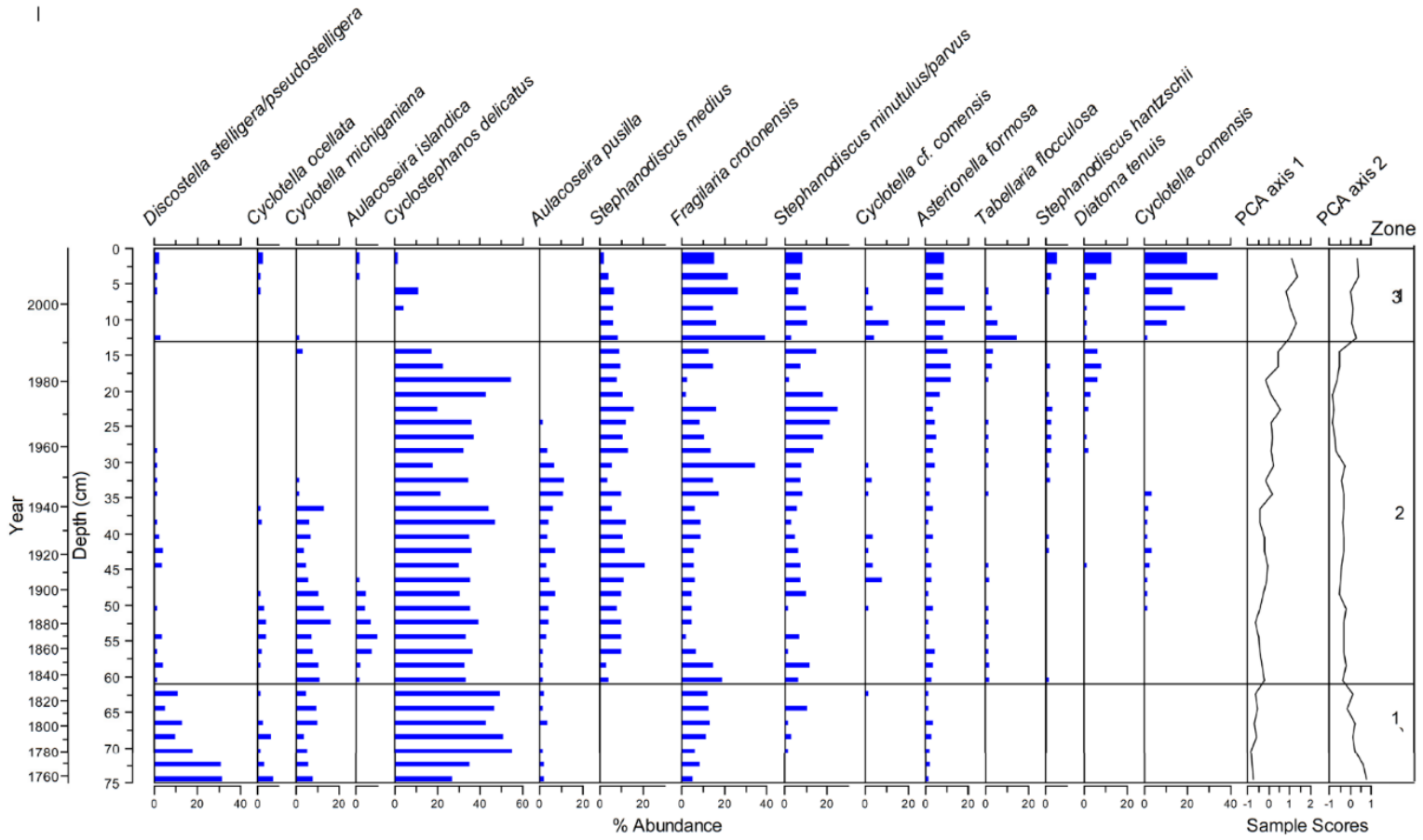
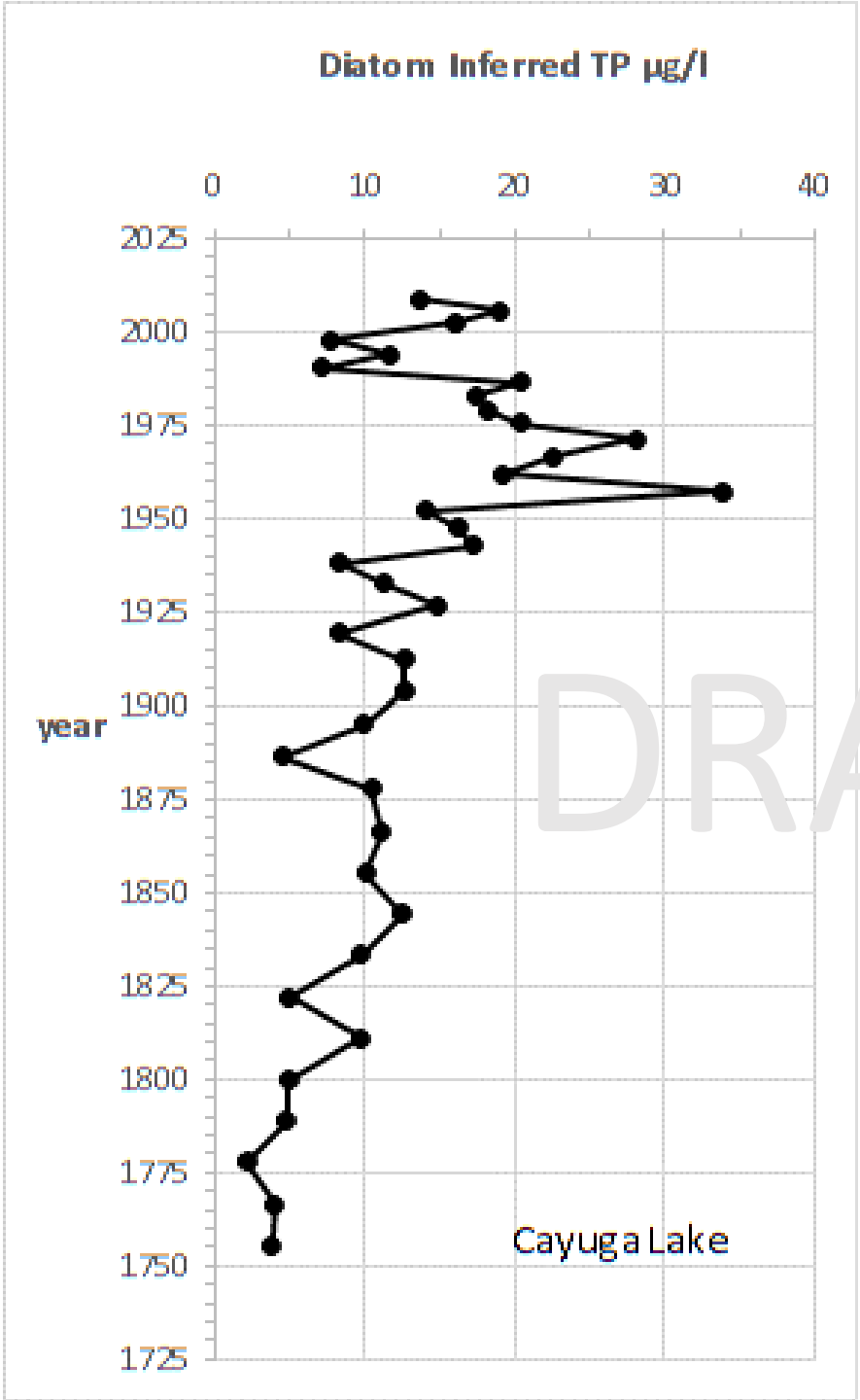

Loss-on-Ignition (gm/cm2-yr)
0.0000
0.0200
0.0400
0.0600
0.0800
0.1000
0.1200
0.1400
0.1600
0.1800
2025
2000
1975
1950
1925
1900
1875
1850
1825
1800
1775
1750
1725
year
VS
Carbonate
Terrigenous

Figure 2. Profiles of dominant diatom taxa (n=15, maximum abundance >5) for the Cayuga Lake core with PCA sample scores and zonation by CONISS.




Diatom Inferred TP µg/l
0
10
20
30
40
2025
2000
1975
1950
1925
1900
1875
1850
1825
1800
1775
1750
1725
year
Cayuga Lake

Preliminary Conclusions

- Adequate core recovery and age control to carry out project objectives
- Oligotrophic lake until 1840s, mesotrophic into 1950s, borderline eutrophic from late 1950s into late 1980s, mesotrophic to recent
- Inferred TP comparison to measured TP data and model hindcast pending…….
- Some carbonate deposition associated with increased lake productivity
- Terrigenous material and volatile solids rise until 1960s, then continue with episodic variability
- Carbonate decline starts and the most recent rise in terrigenous material occurs in late 1990s