Blake Lake Nutrient Budget and Reconstruction

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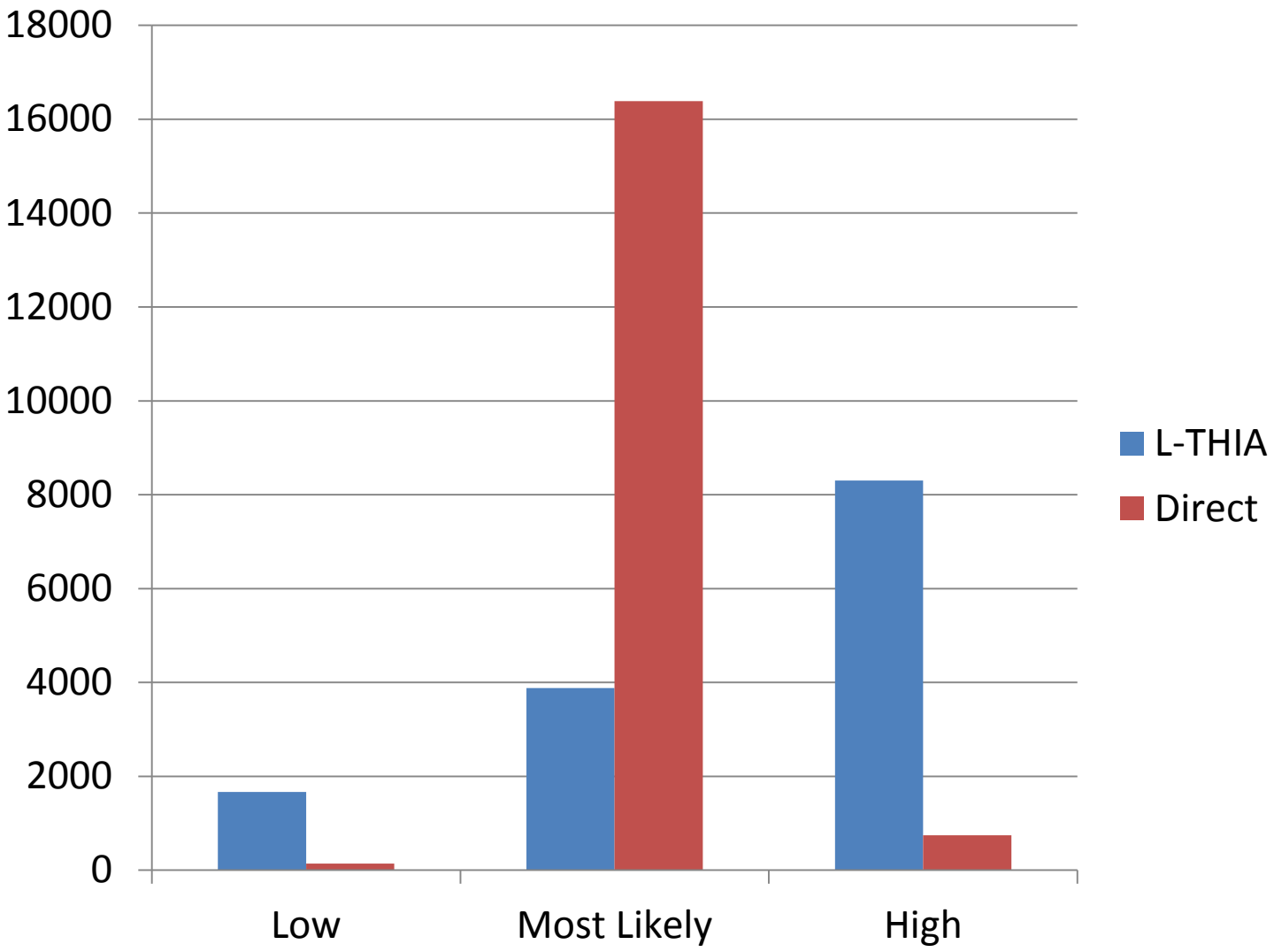
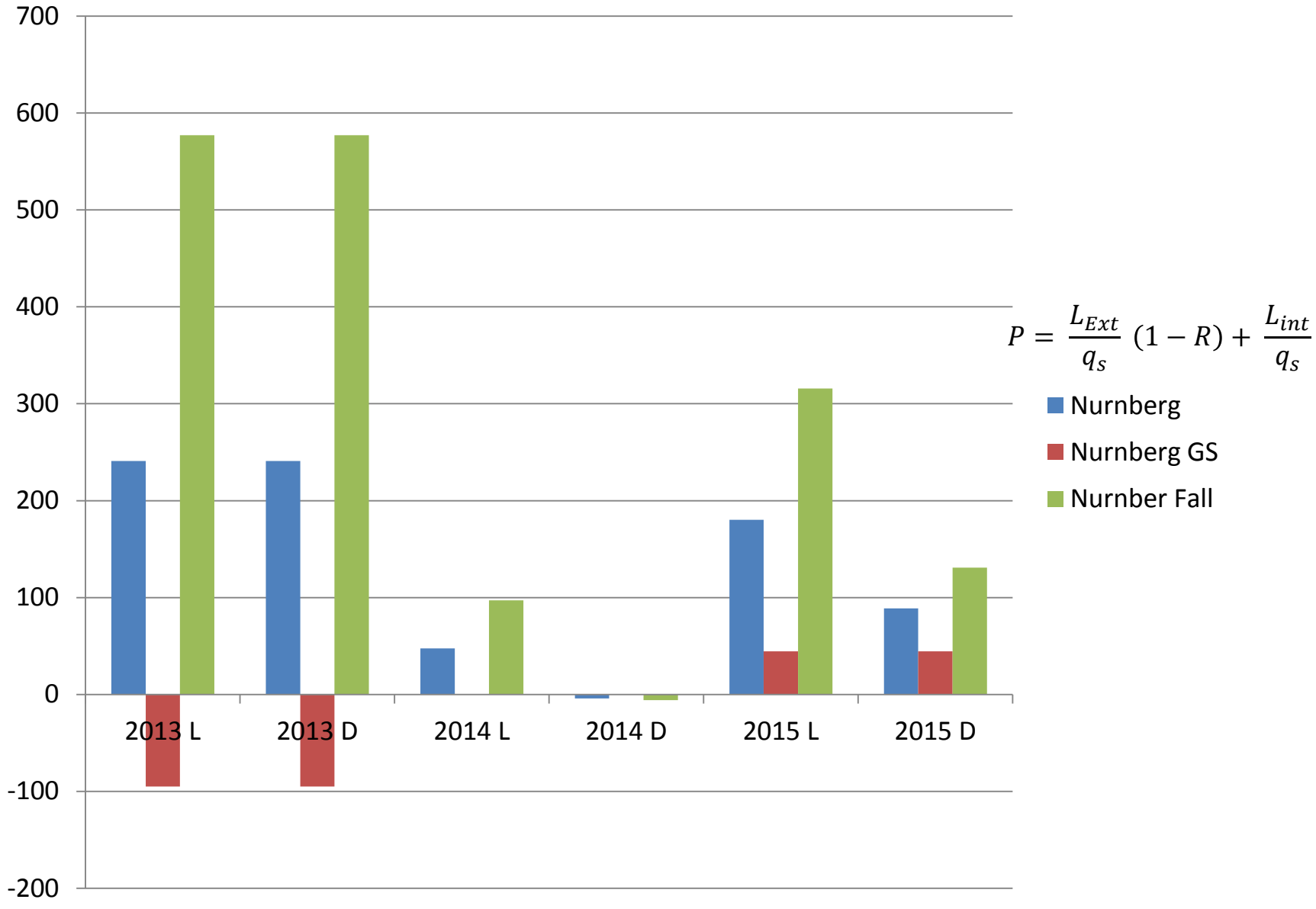
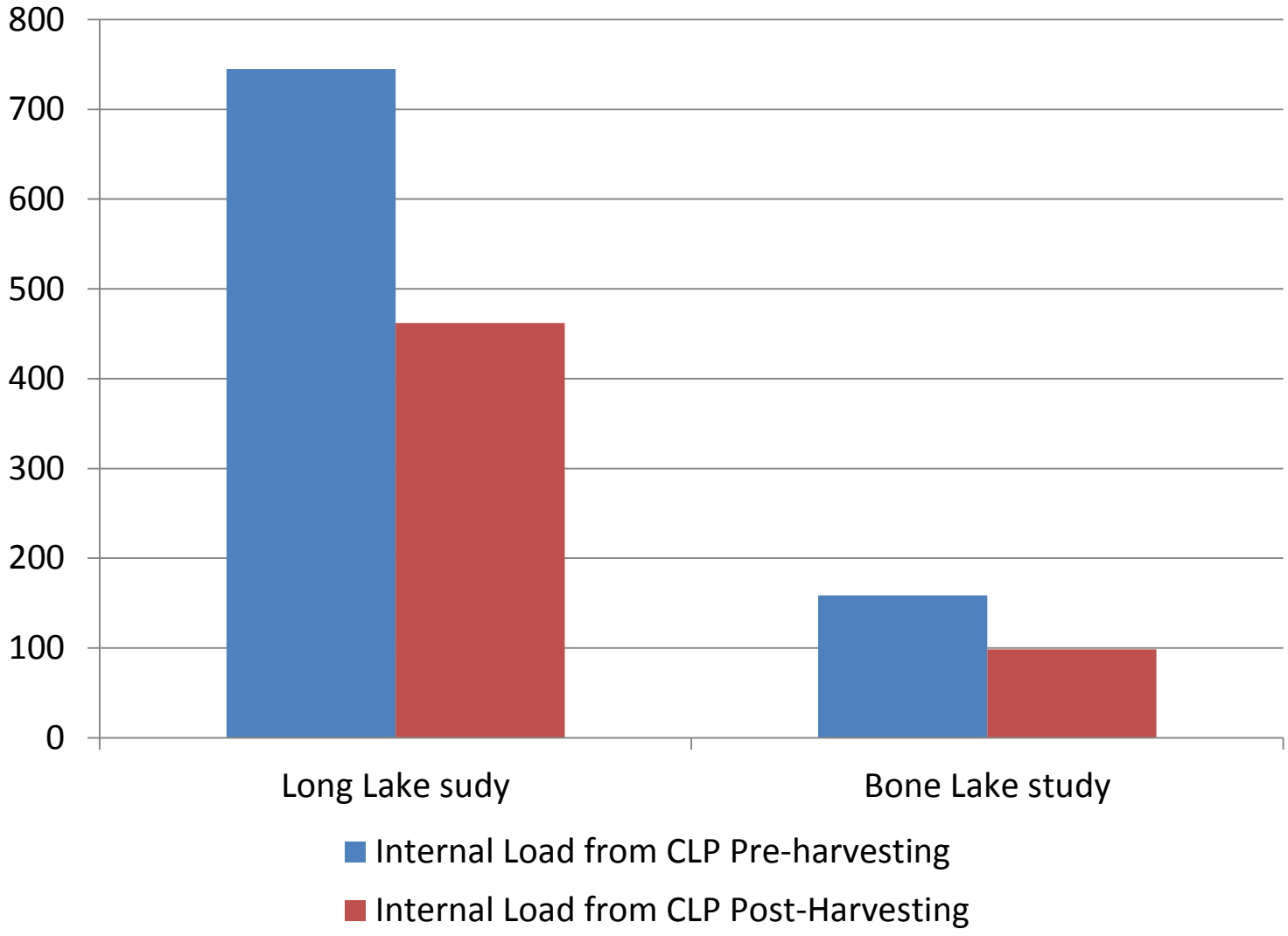
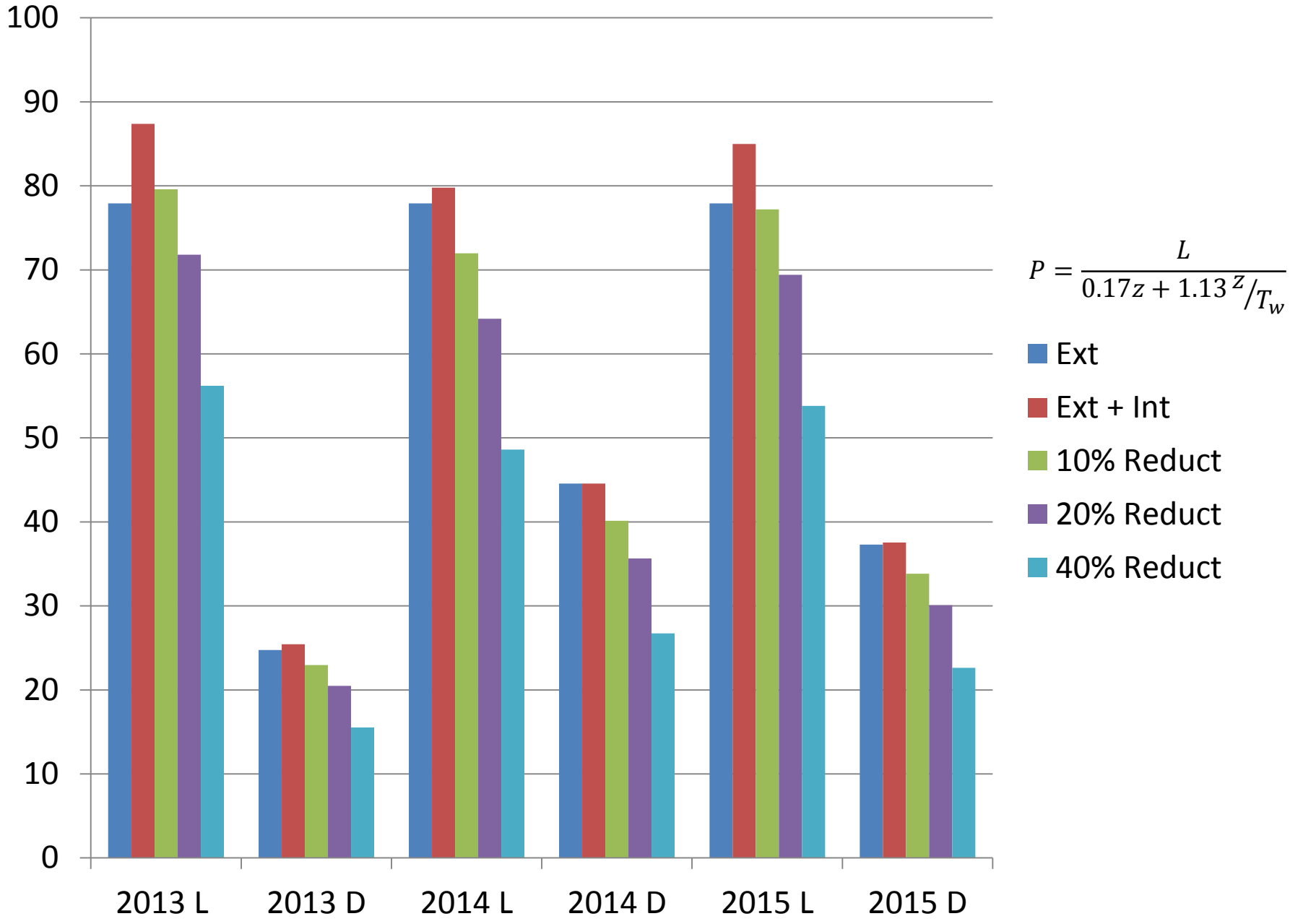
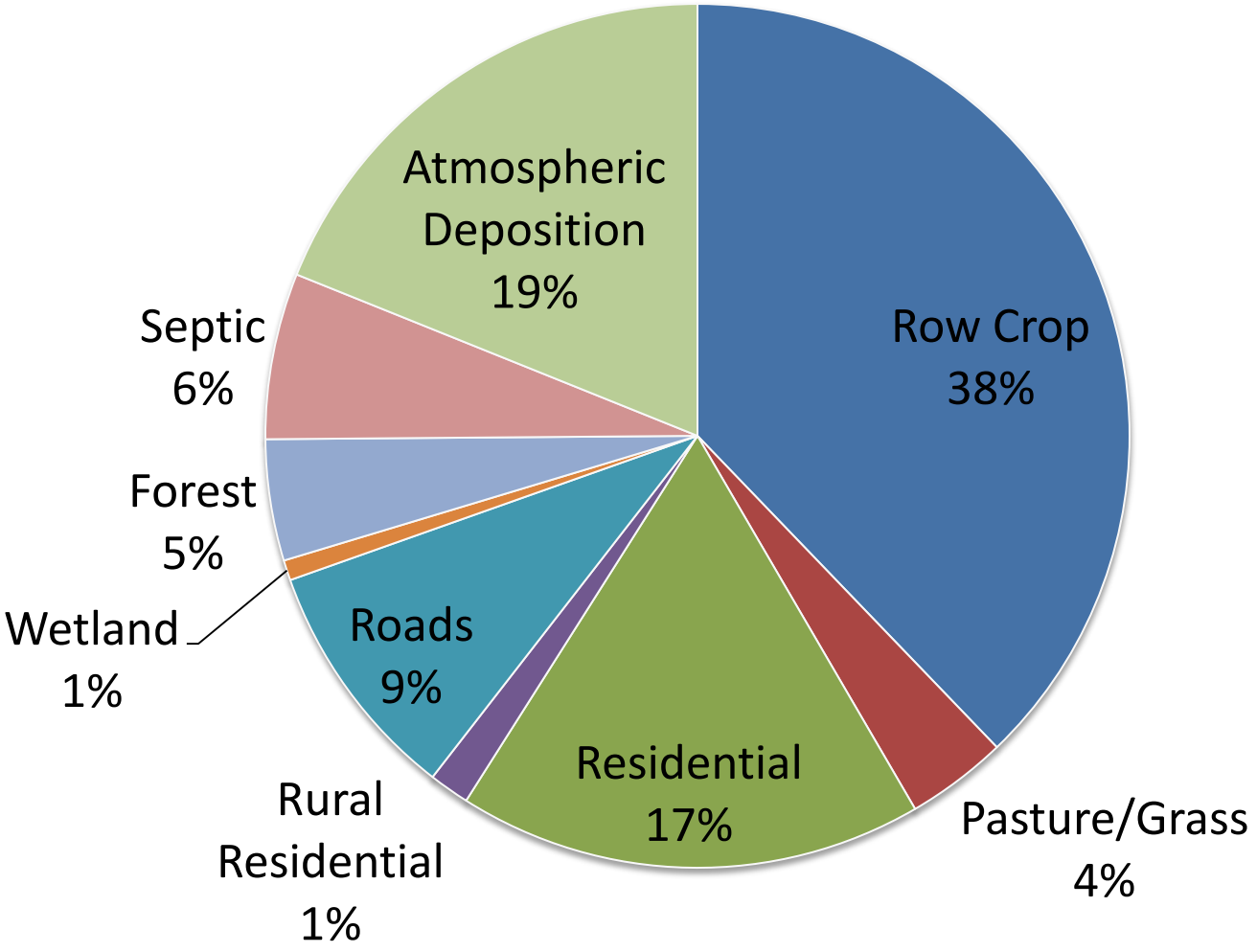

18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Low
Most Likely
High
L-THIA
Direct


700
600
500
400
300
200
100
0
-100
-200
2013 L
2013 D
2014 L
2014 D
2015 L
2015 D
$P = \frac{L_{Ext}}{q_s}(1-R) + \frac{L_{int}}{q_s}$
Nurnberg
Nurnberg GS
Nurnber Fall

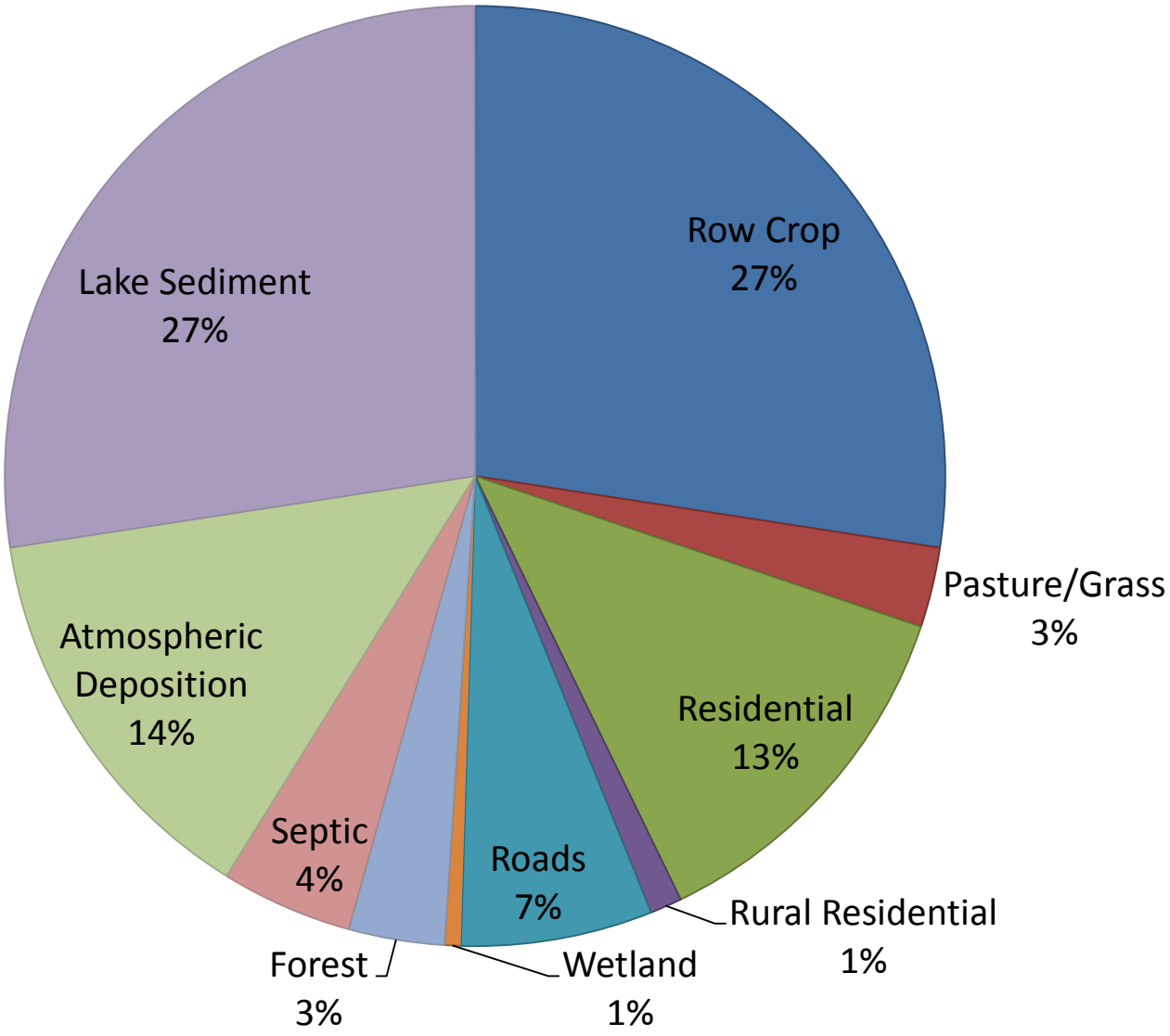

800
700
600
500
400
300
200
100
0
Long Lake sudy
Bone Lake study
Internal Load from CLP Pre-harvesting
Internal Load from CLP Post-Harvesting


100
90
80
70
60
50
40
30
20
10
0
2013 L
2013 D
2014 L
2014 D
2015 L
2015 D
$P = \frac{L}{0.17z + 1.13^{z}/T_w}$
Ext
Ext + Int
10% Reduct
20% Reduct
40% Reduct

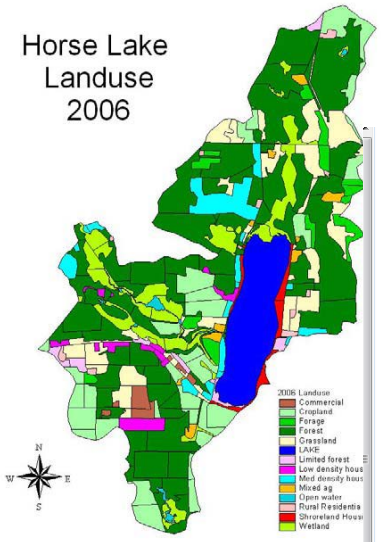
Big Blake Lake Nutrient Budget P Load kg/yr



Big Blake Lake Nutrient Budget P Load kg/yr



Watershed Modeling



Date: 4/5/2006 Scenario: 4
Lake Id: Lotus Lake
Watershed Id: 2

Hydrologic and Morphometric Data

Tributary Drainage Area: 2569.9 acre
Total Unit Runoff: 8.00 in.
Annual Runoff Volume: 1713.3 acre-ft
Lake Surface Area <As>: 248.0 acre
Lake Volume <V>: 1116.0 acre-ft
Lake Mean Depth <z>: 4.5 ft
Precipitation - Evaporation: 3.3 in.
Hydraulic Loading: 1781.5 acre-ft/year
Areal Water Load <qs>: 7.2 ft/year
Lake Flushing Rate <p>: 1.60 1/year
Water Residence Time: 0.63 year
Observed spring overturn total phosphorus (SPO): 109.0 mg/m^3
Observed growing season mean phosphorus (GSM): 131.0 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	480.5	0.50	1.00	3.00	52.4	97	194	583
Mixed AG	23.2	0.30	0.80	1.40	2.0	3	8	13
Pasture/Grass	297.6	0.10	0.30	0.50	9.7	12	36	60
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	58.1	0.30	0.50	0.80	3.2	7	12	19
Rural Res (>1 Ac)	403.1	0.05	0.10	0.25	4.4	8	16	41
Wetlands	248.3	0.10	0.10	0.10	2.7	10	10	10
Forest	954.2	0.05	0.09	0.18	9.4	19	35	70
Lake Surface	248.0	0.10	0.30	1.00	8.1	10	30	100

POINT SOURCE DATA

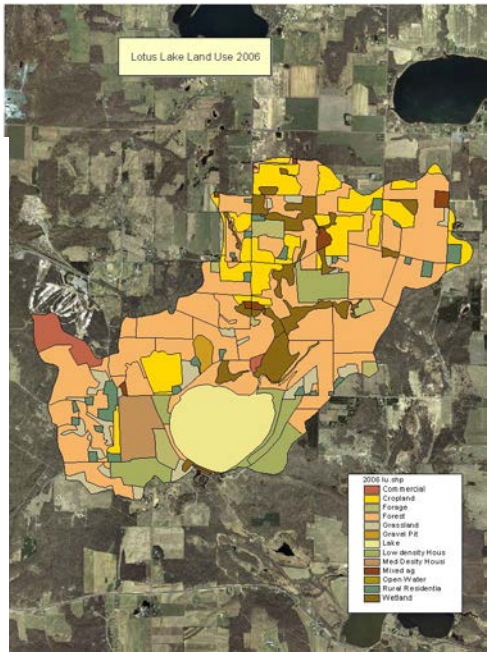
Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %

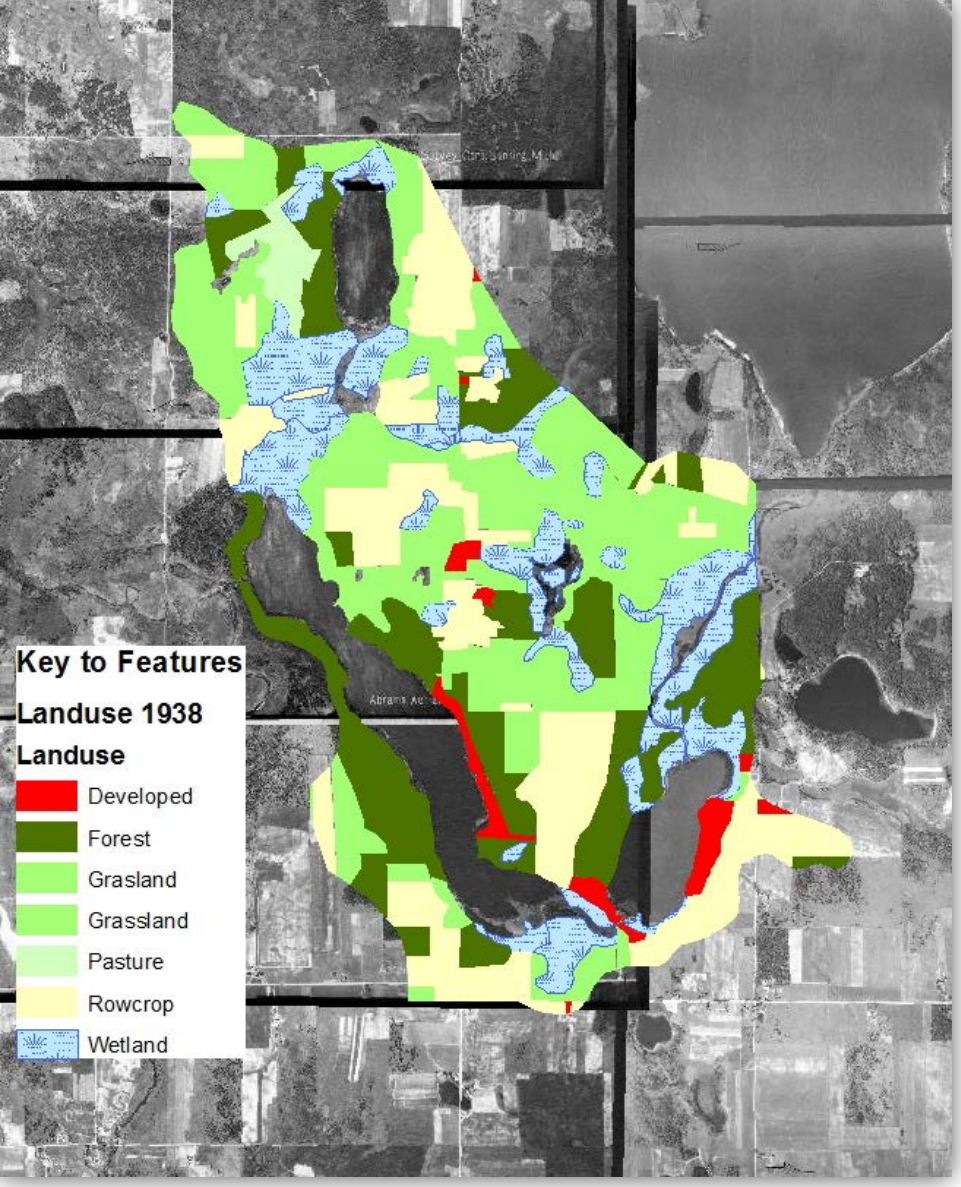
SEPTIC TANK DATA

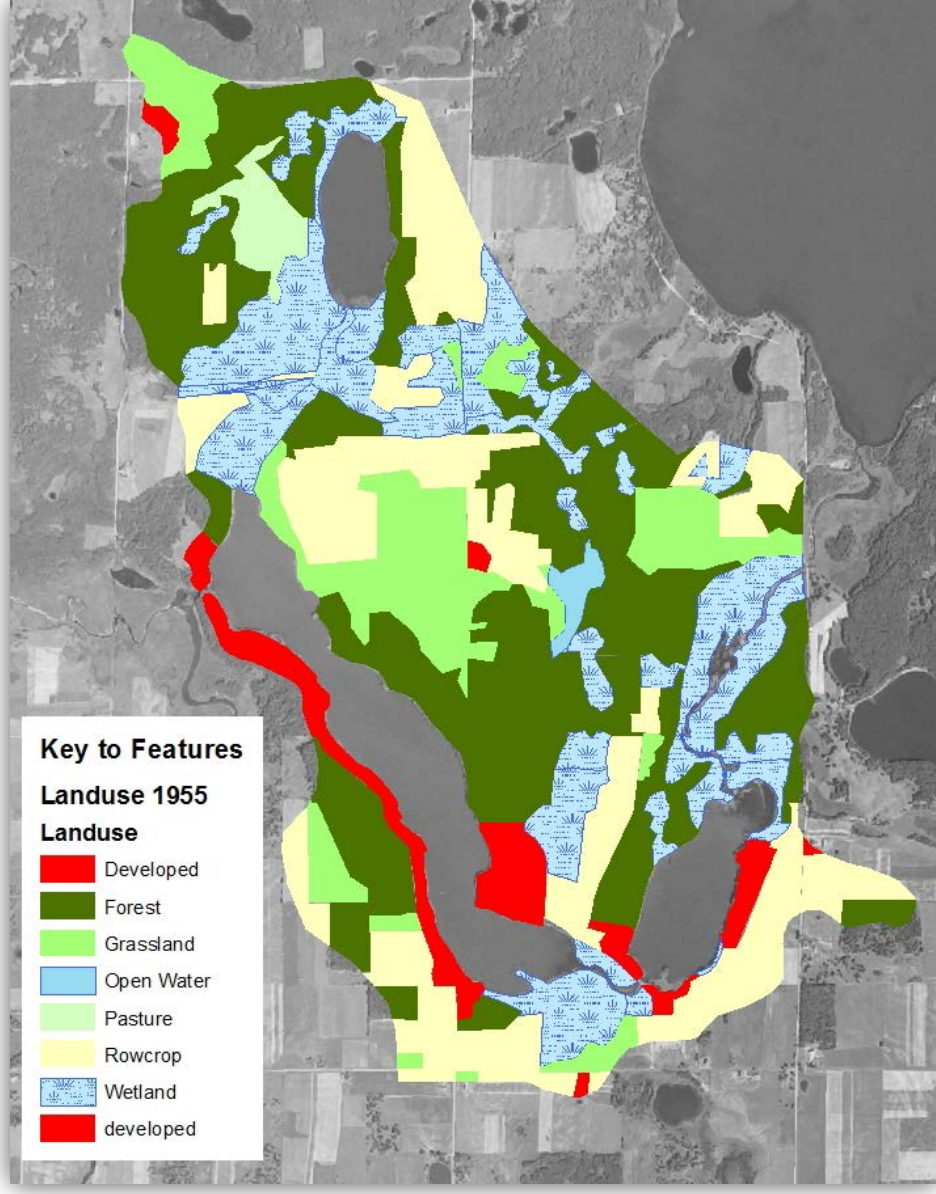
Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.30	0.50	0.80	
# capita-years	172.8				
% Phosphorus Retained by Soil		98.0	90.0	80.0	
Septic Tank Loading (kg/year)		1.04	8.64	27.65	2.3

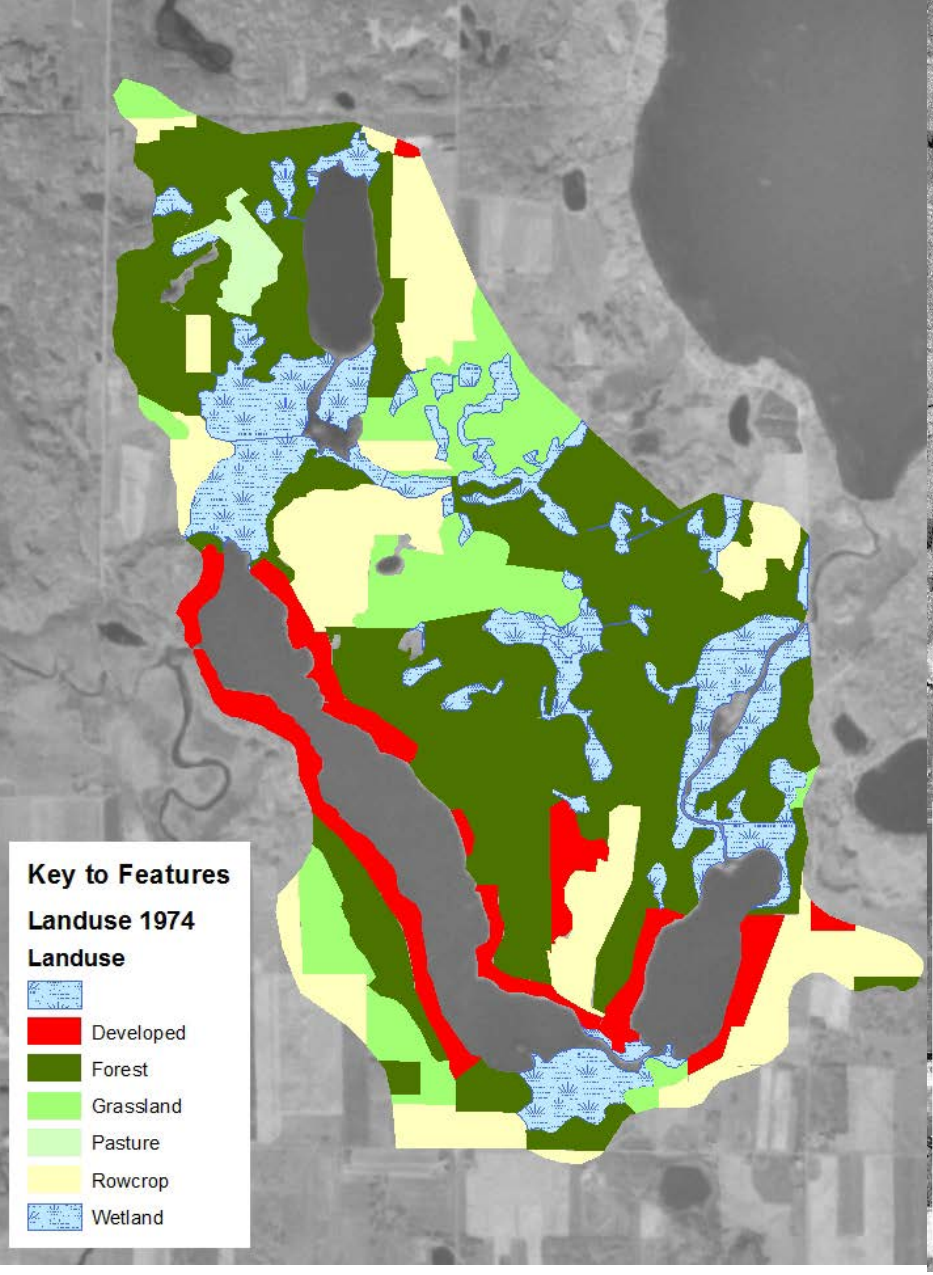
TOTALS DATA

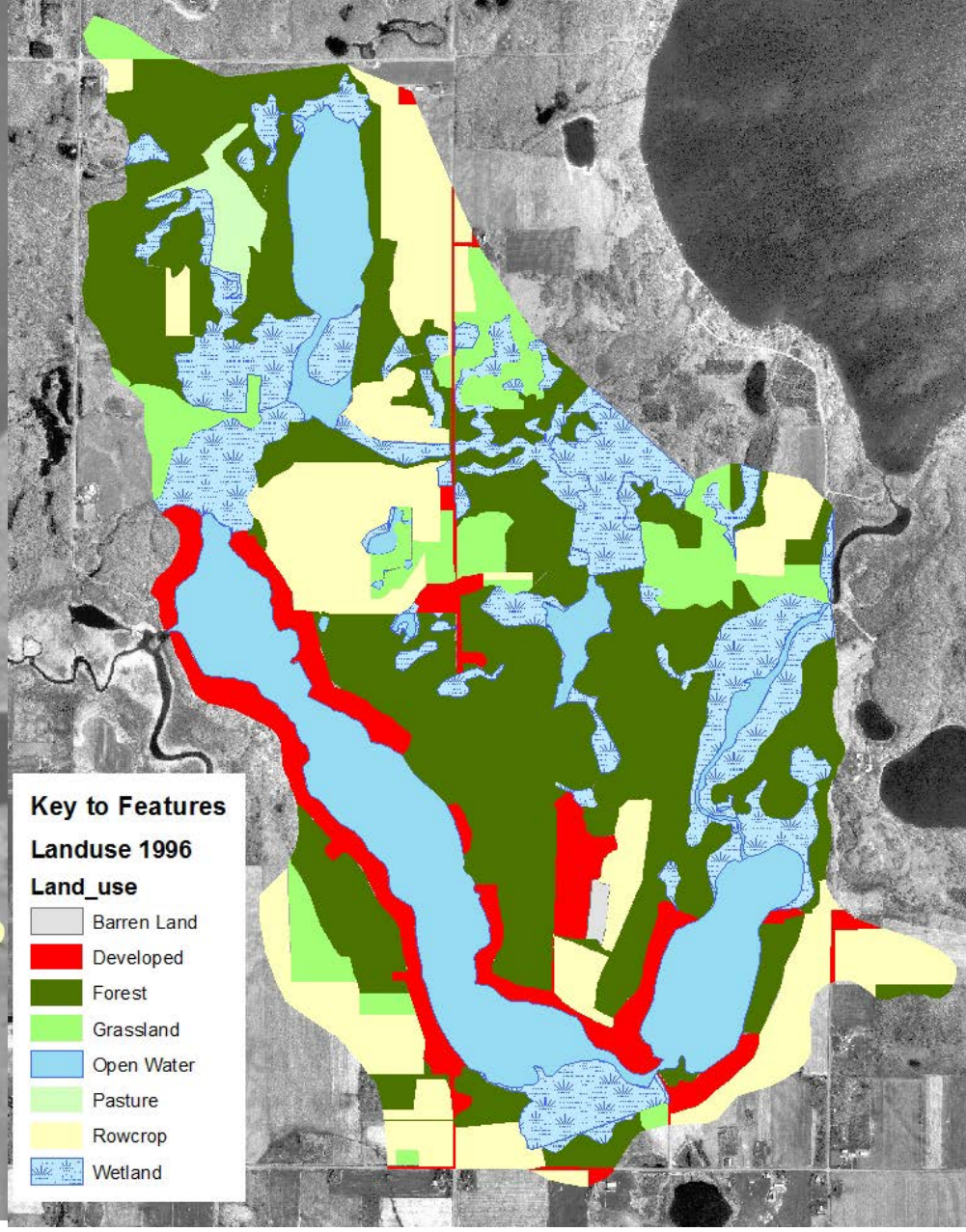
Description	Low	Most Likely	High	Loading %
Total Loading (lb)	397.9	817.8	2111.8	100.0
Total Loading (kg)	180.5	371.0	957.9	100.0
Areal Loading (lb/ac-year)	1.60	3.30	8.52	
Areal Loading (mg/m^2-year)	179.82	369.63	954.43	
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	373.5	732.4	1829.5	97.7
Total NPS Loading (kg)	169.4	332.2	829.9	97.7

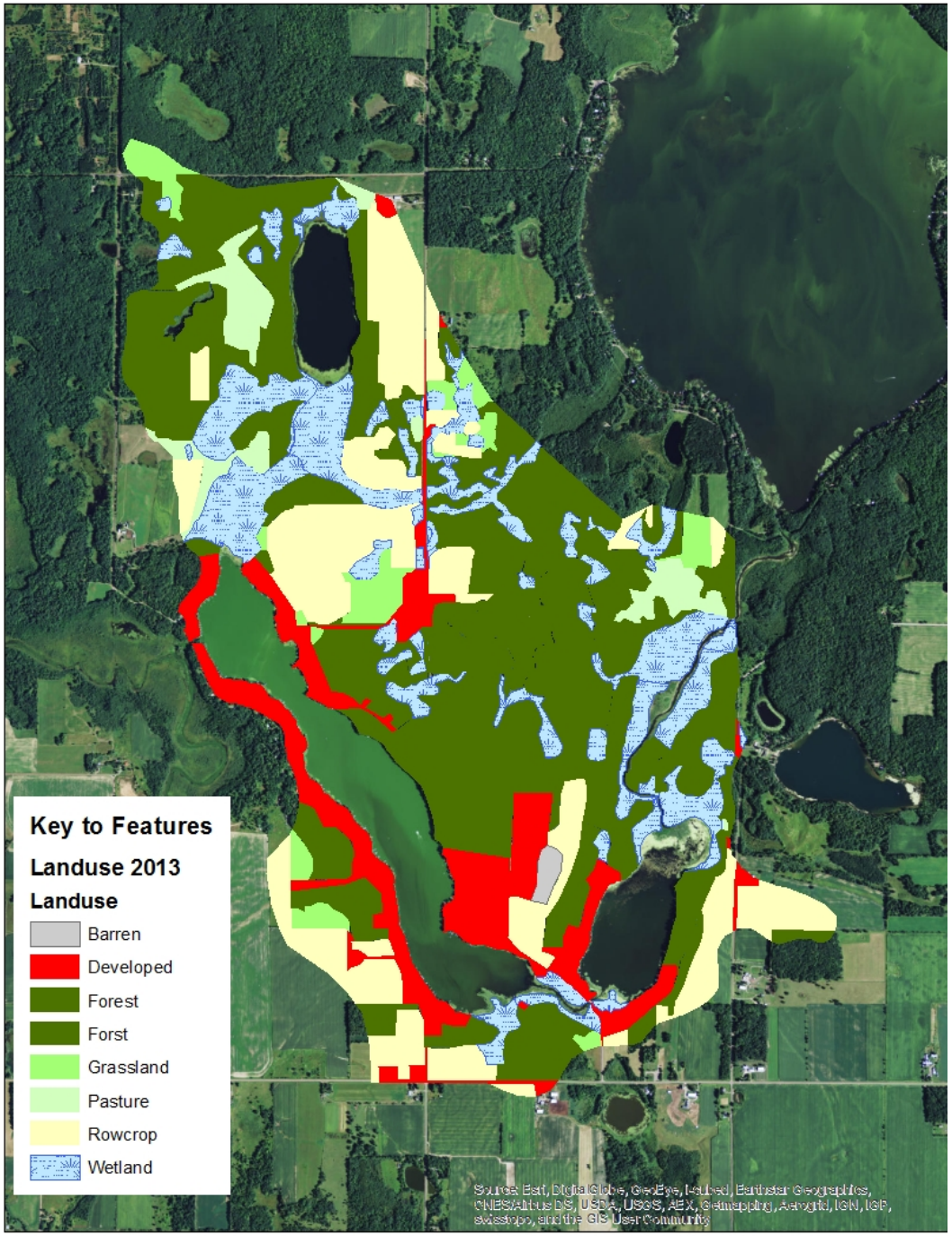


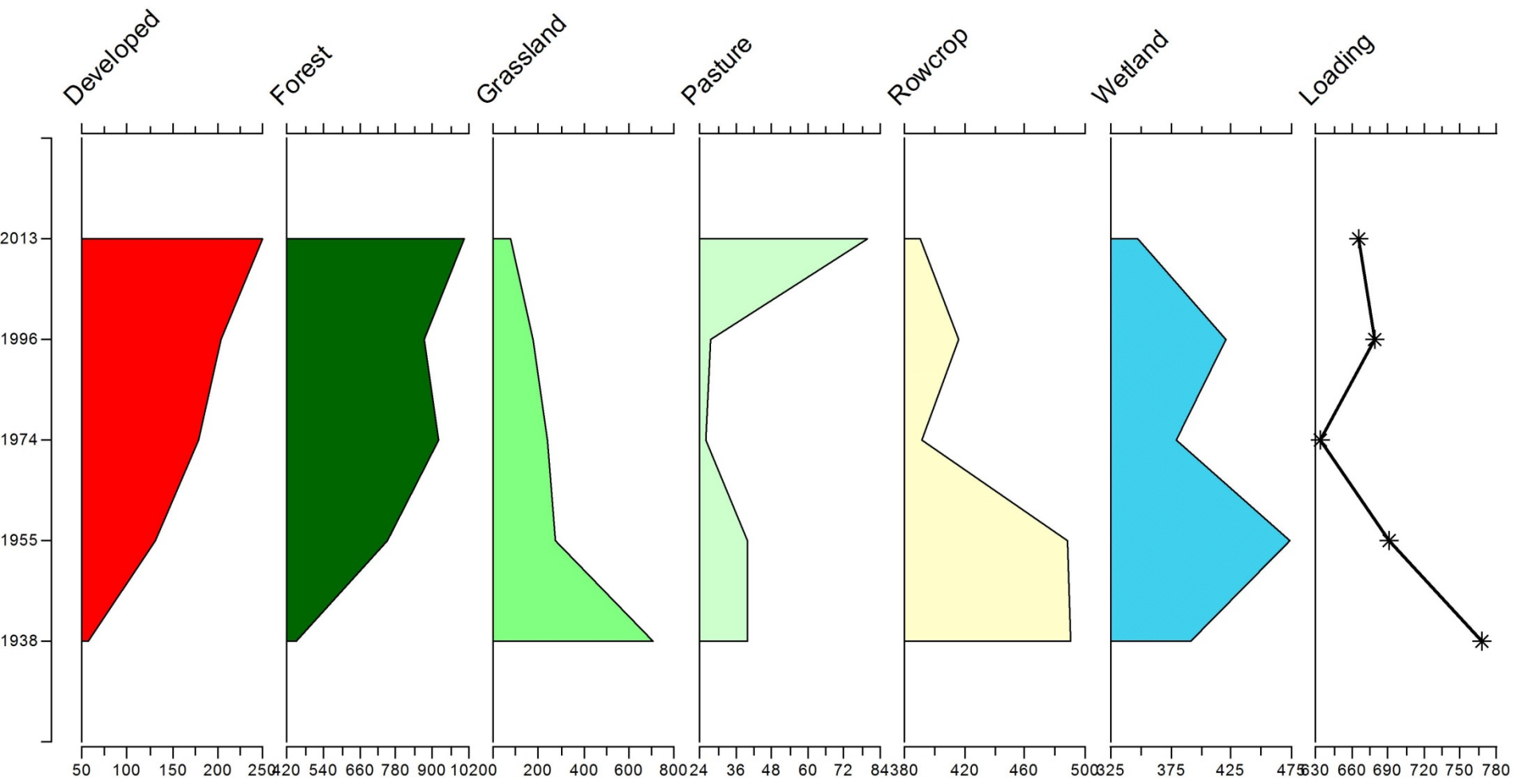

Key to Features
Landuse 1938
Landuse
Developed
Forest
Grasland
Grassland
Pasture
Rowcrop
Wetland

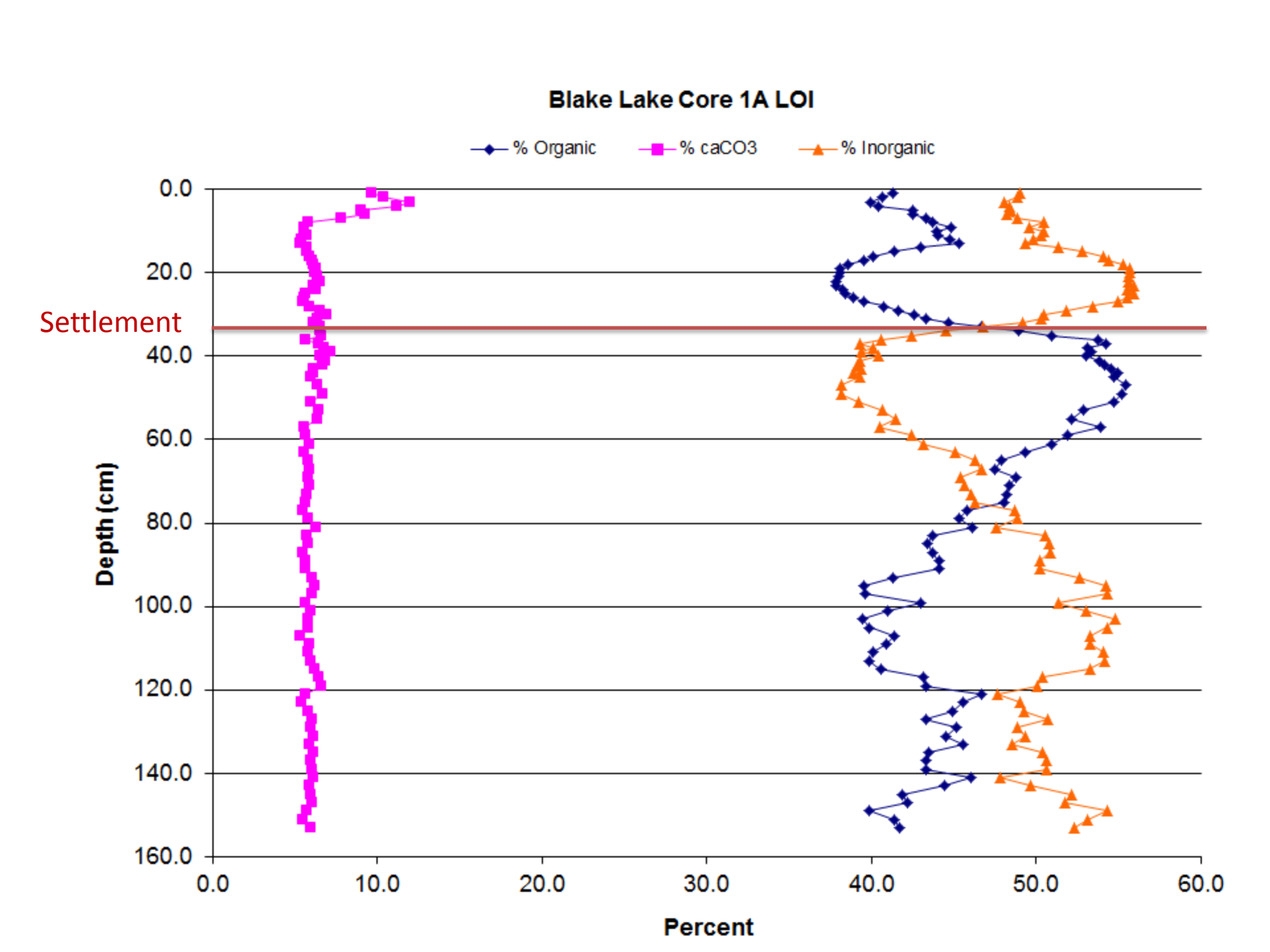

Key to Features
Landuse 1955
Landuse
Developed
Forest
Grassland
Open Water
Pasture
Rowcrop
Wetland
developed

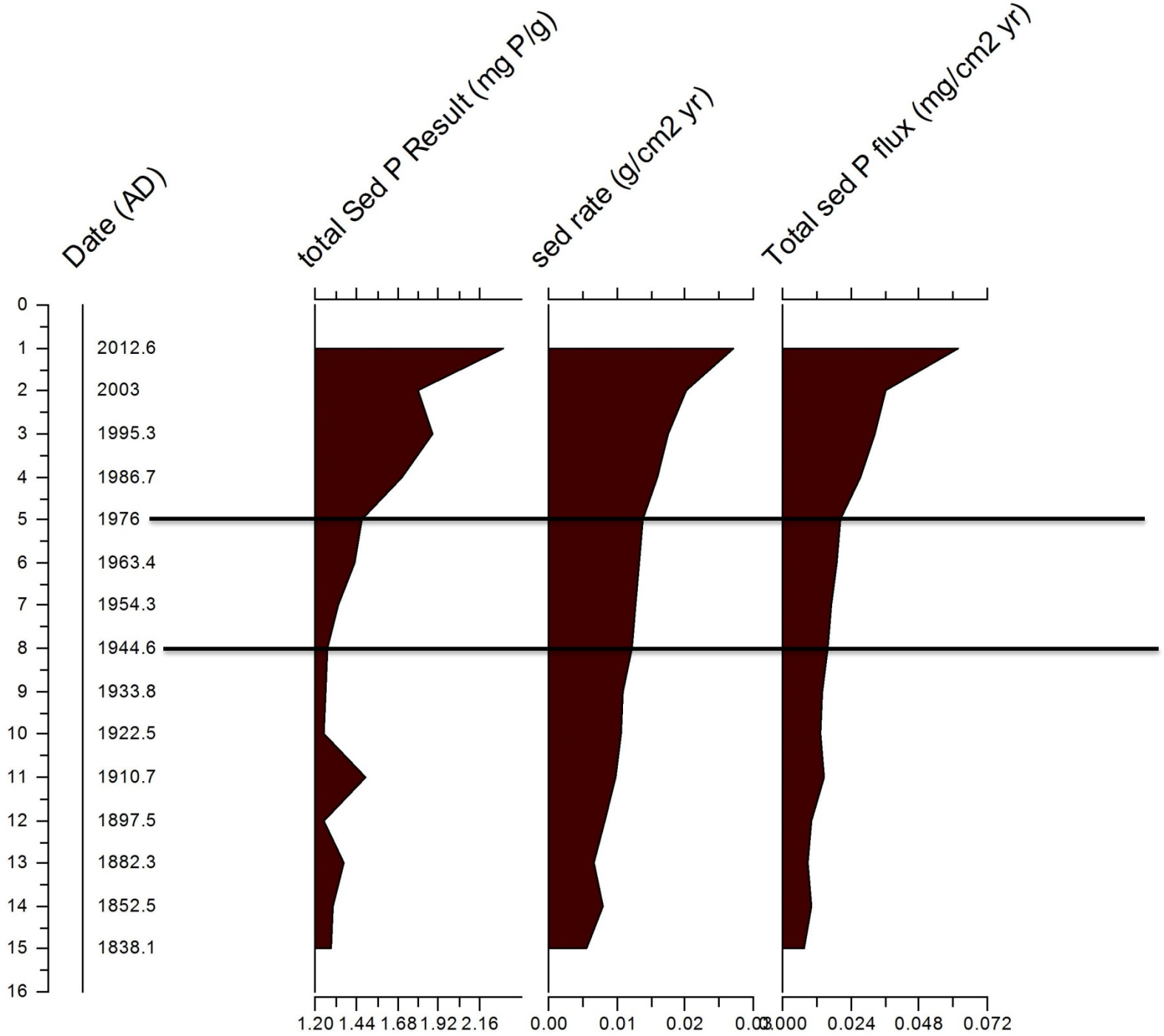

Key to Features
Landuse 1974
Landuse
Developed
Forest
Grassland
Pasture
Rowcrop
Wetland

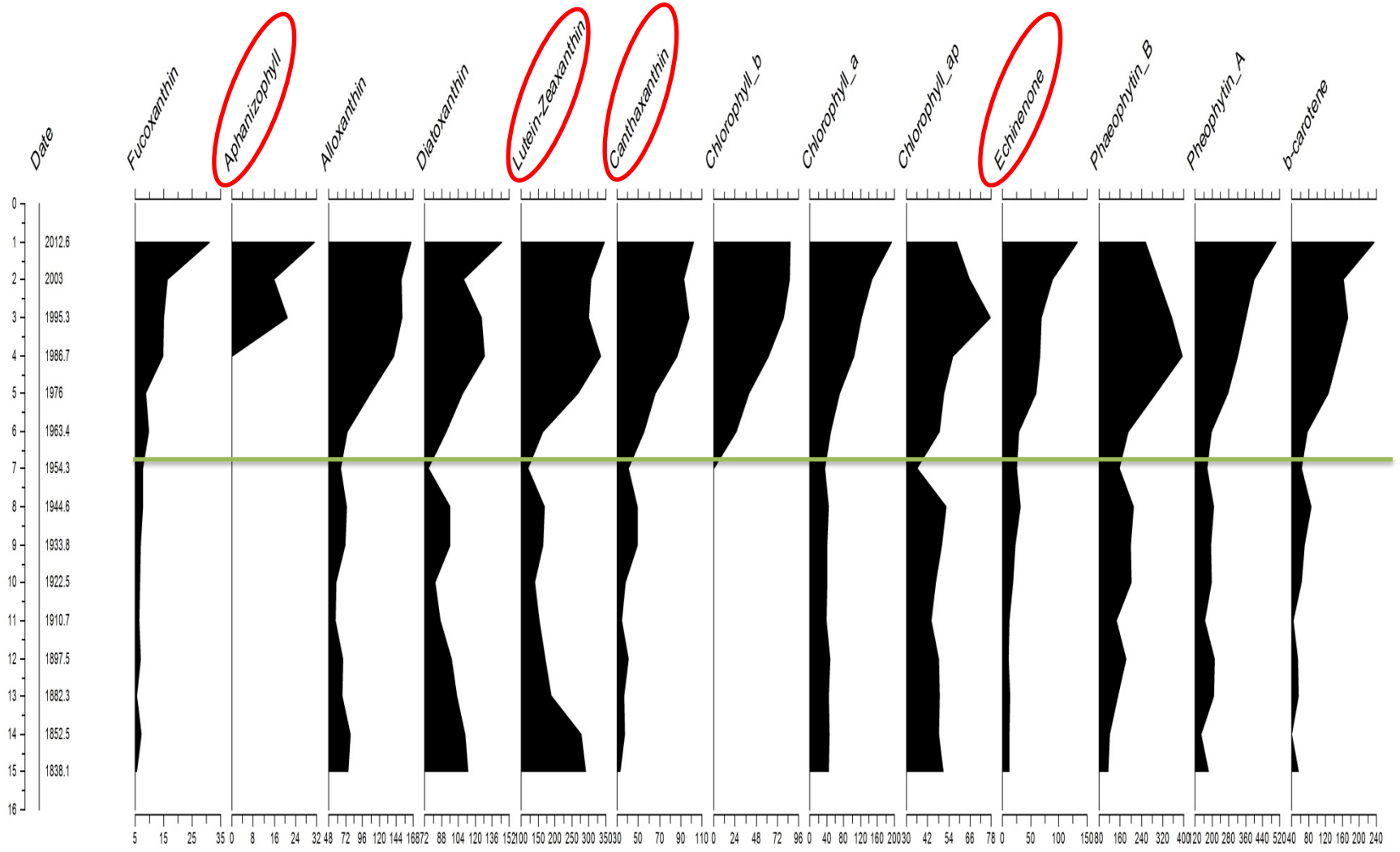

Key to Features
Landuse 1996
Land_use
Barren Land
Developed
Forest
Grassland
Open Water
Pasture
Rowcrop
Wetland

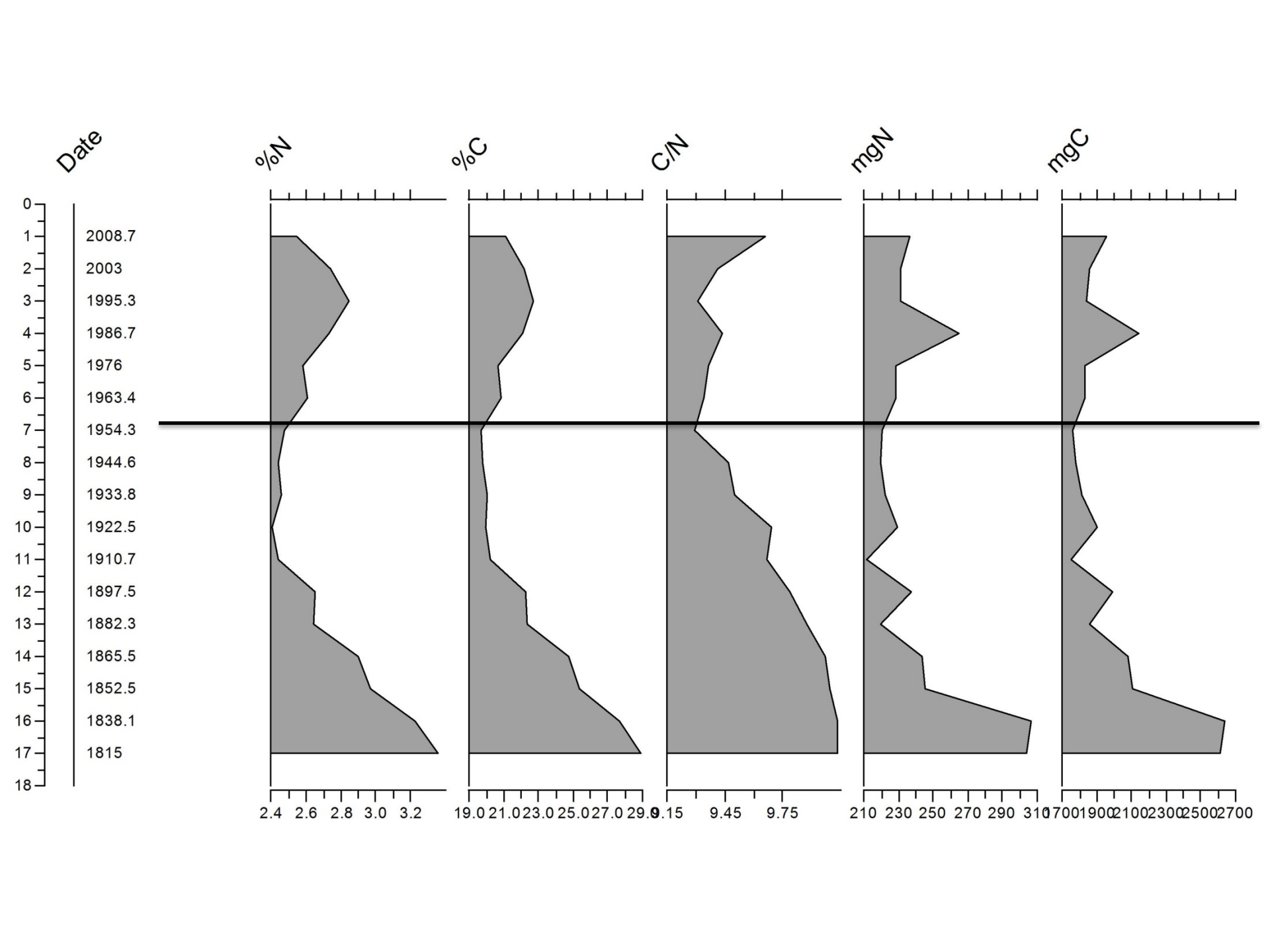

Key to Features
Landuse 2013
Landuse
Barren
Developed
Forest
Forst
Grassland
Pasture
Rowcrop
Wetland
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


Developed
Forest
Grassland
Pasture
Rowcrop
Wetland
Loading
2013
1996
1974
1955
1938
50 100 150 200 250
420 540 660 780 900 1020
200 400 600 800
24 36 48 60 72 84
380 420 460 500
325 375 425 475
630 660 690 720 750 780


Blake Lake Core 1A LOI
% Organic
% caCO3
% Inorganic
Settlement
Depth (cm)
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
Percent

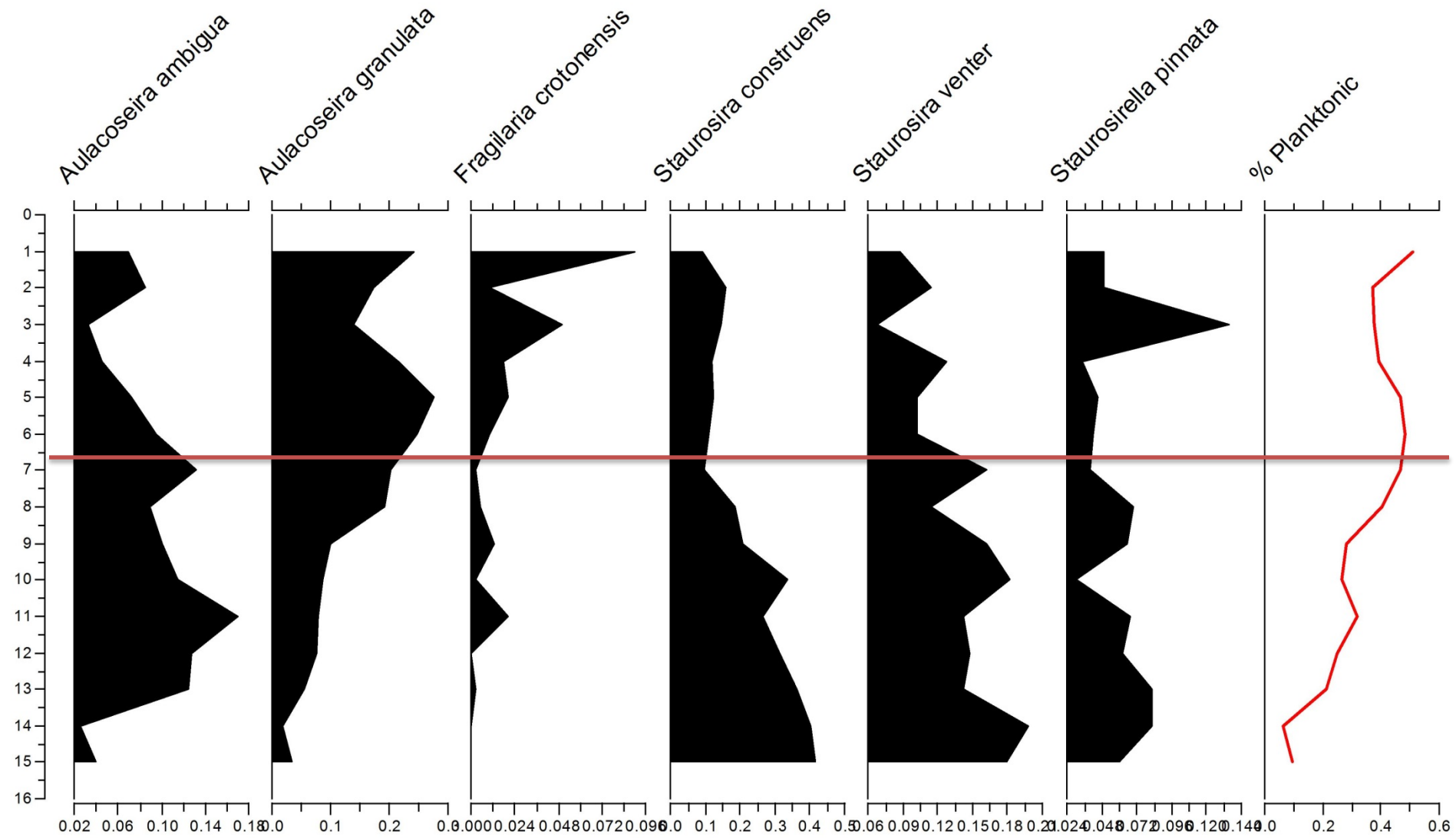

Date (AD)
total Sed P Result (mg P/g)
sed rate (g/cm2 yr)
Total sed P flux (mg/cm2 yr)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
2012.6
2003
1995.3
1986.7
1976
1963.4
1954.3
1944.6
1933.8
1922.5
1910.7
1897.5
1882.3
1852.5
1838.1
1.20 1.44 1.68 1.92 2.16
0.00 0.01 0.02
0.000 0.024 0.048 0.072

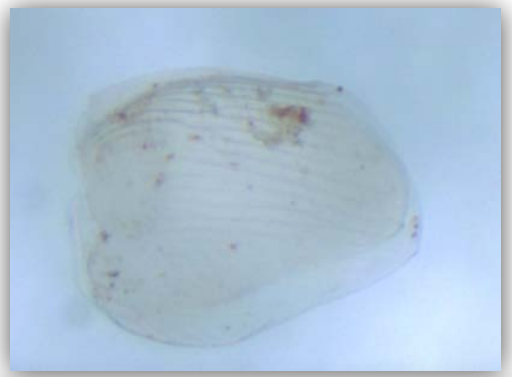

Date
Fucoxanthin
Aphanizophyll
Alloxanthin
Diatoxanthin
Lutein-Zeaxanthin
Canthaxanthin
Chlorophyll_b
Chlorophyll_a
Chlorophyll_ap
Echinenone
Phaeophytin_B
Pheophytin_A
b-carotene
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
2012.6
2003
1995.3
1986.7
1976
1963.4
1954.3
1944.6
1933.8
1922.5
1910.7
1897.5
1882.3
1852.5
1838.1
5 15 25 35
0 8 16 24 32
48 72 96 120 144 168
72 88 104 120 136 152
100 150 200 250 300 350
30 50 70 90 110
0 24 48 72 96
0 40 80 120 160 200
30 42 54 66 78
0 50 100 150
80 160 240 320 400
120 200 280 360 440 520
40 80 120 160 200 240


Date
%N
%C
C/N
mgN
mgC
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
2008.7
2003
1995.3
1986.7
1976
1963.4
1954.3
1944.6
1933.8
1922.5
1910.7
1897.5
1882.3
1865.5
1852.5
1838.1
1815
2.4 2.6 2.8 3.0 3.2
19.0 21.0 23.0 25.0 27.0 29.0
9.15 9.45 9.75
210 230 250 270 290 310
1700 1900 2100 2300 2500 2700

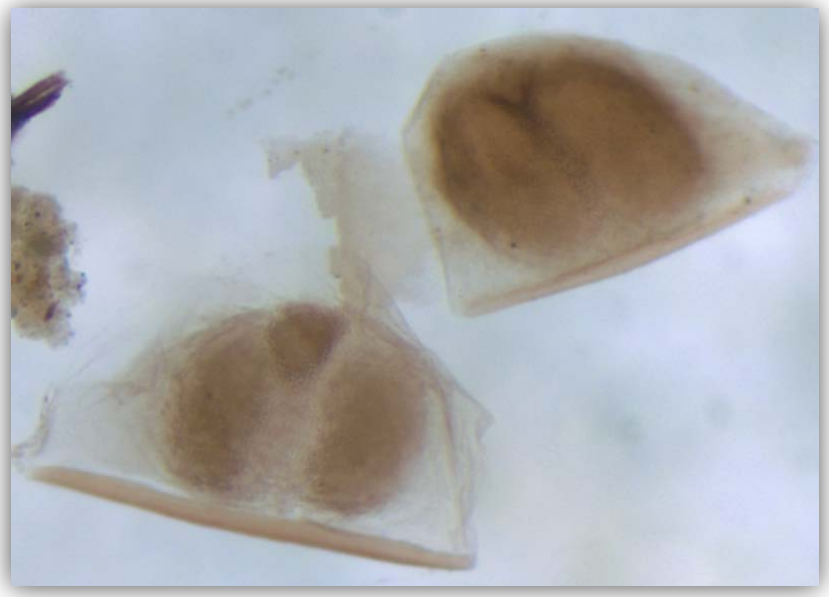
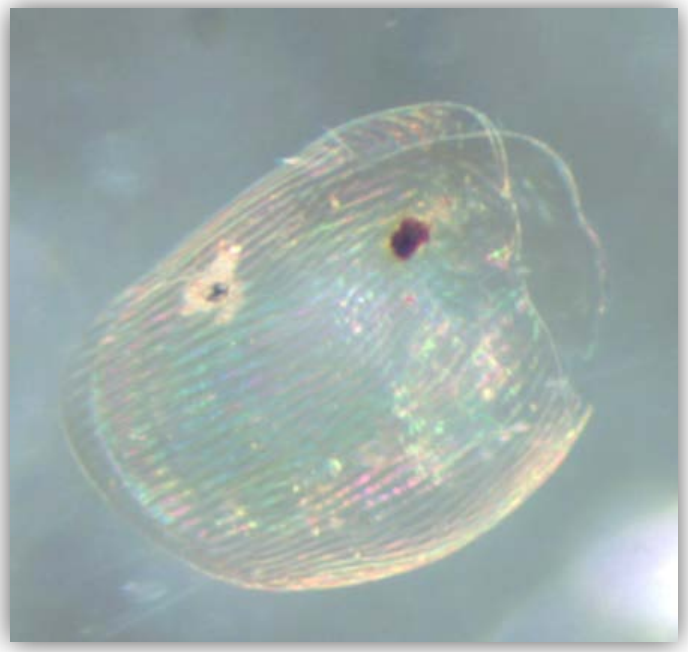

Blake Lake 1852

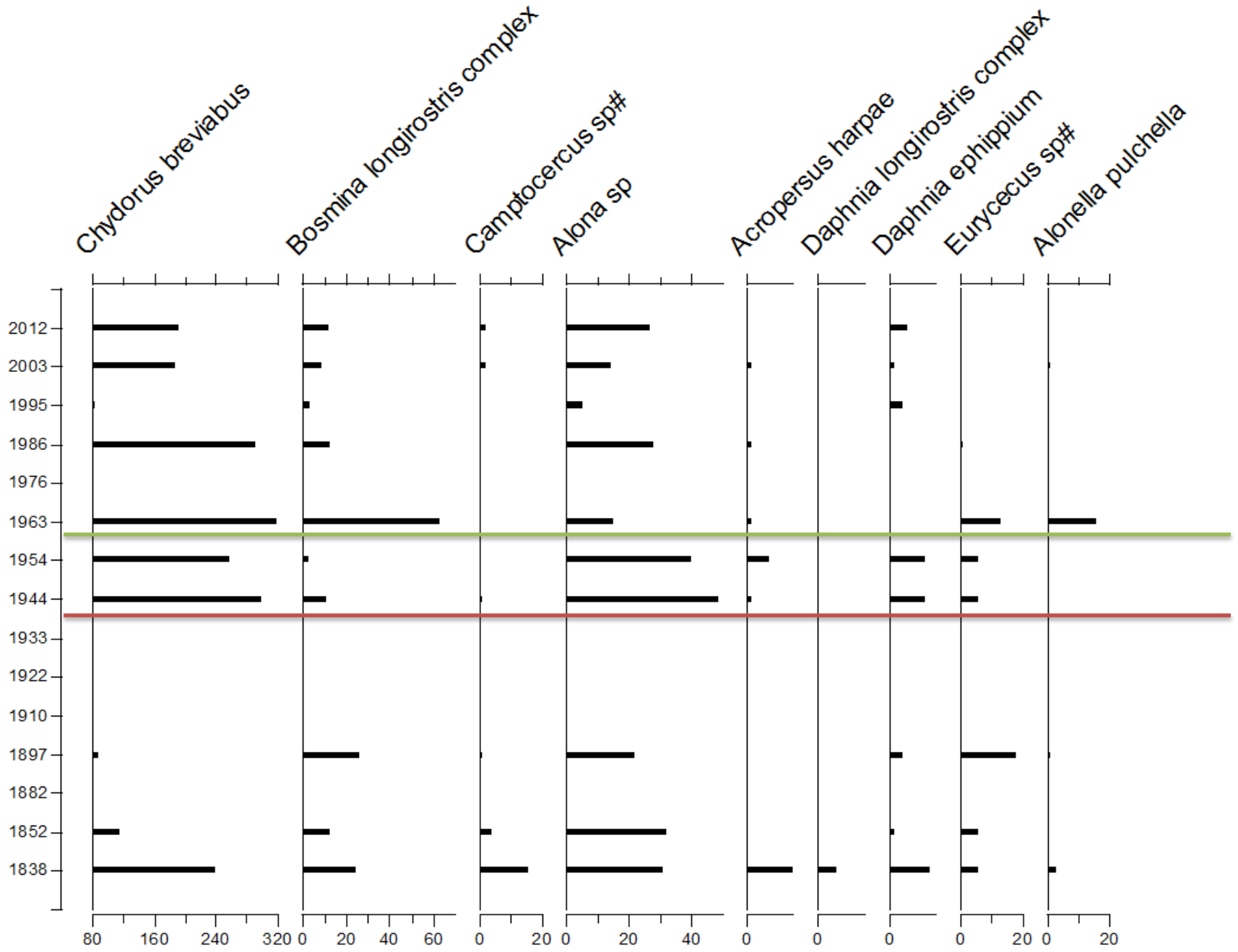

Blake Lake 2012

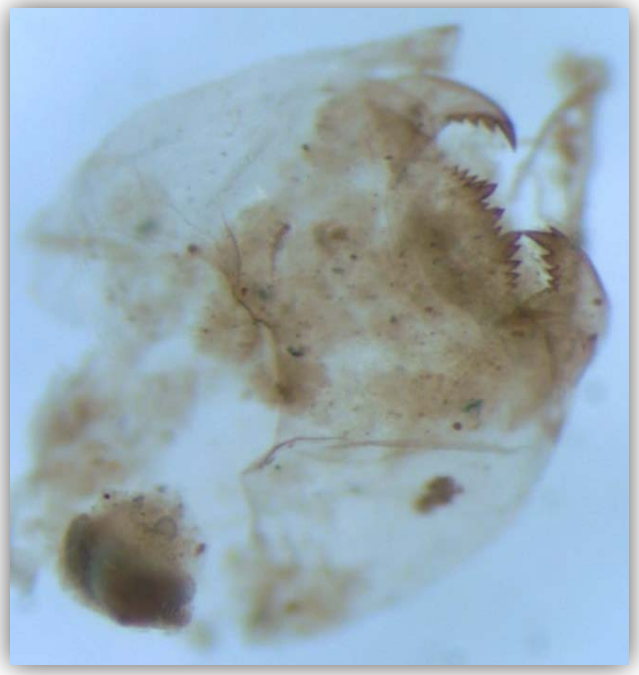

Aulacoseira ambigua
Aulacoseira granulata
Fragilaria crotonensis
Staurosira construens
Staurosira venter
Staurosirella pinnata
% Planktonic
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
0.02 0.06 0.10 0.14 0.18
0.0 0.1 0.2 0.3
0.000 0.024 0.048 0.072 0.096
0.0 0.1 0.2 0.3 0.4 0.5
0.06 0.09 0.12 0.15 0.18 0.21
0.024 0.048 0.072 0.096 0.120 0.144
0.0 0.2 0.4 0.6

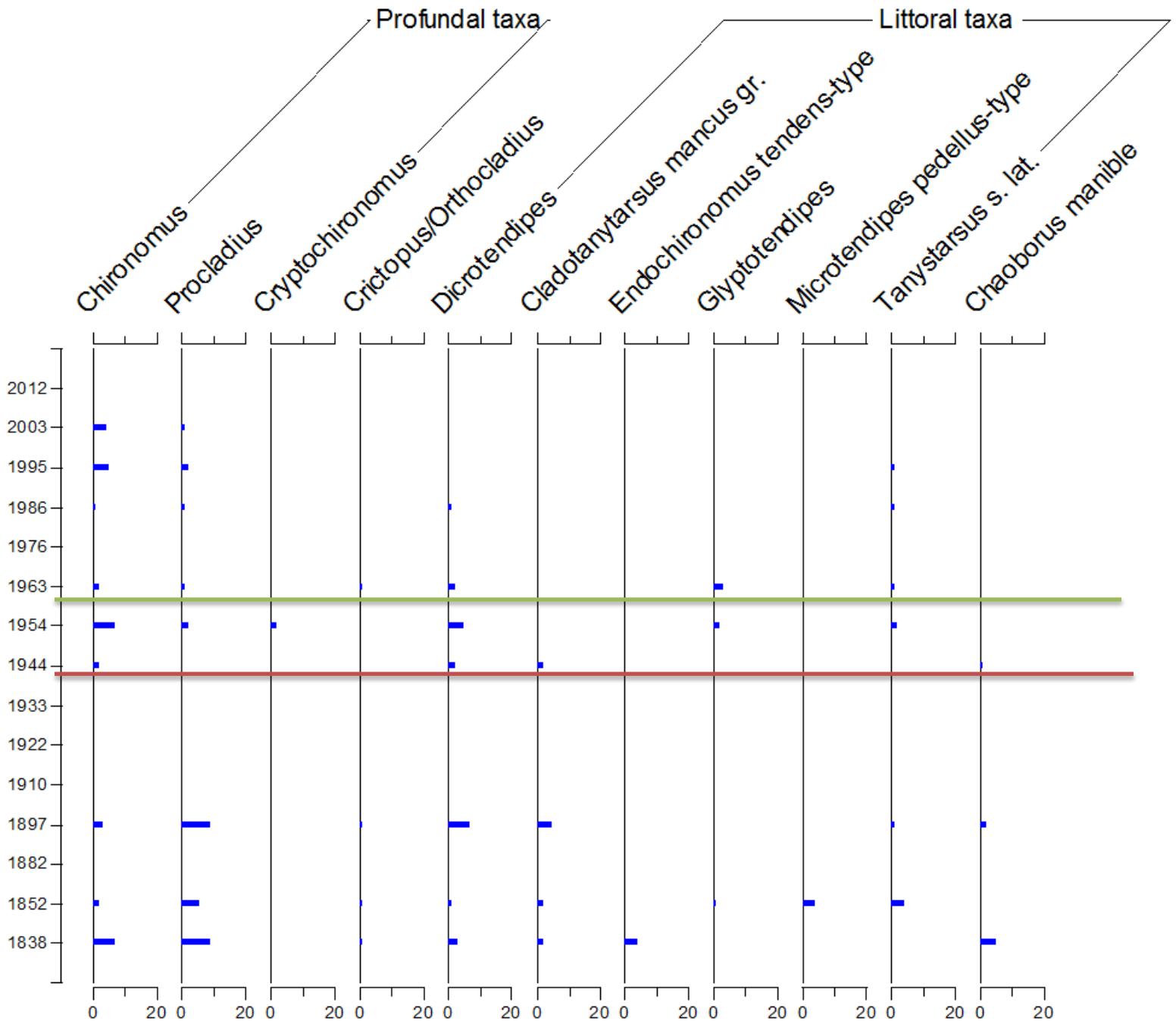


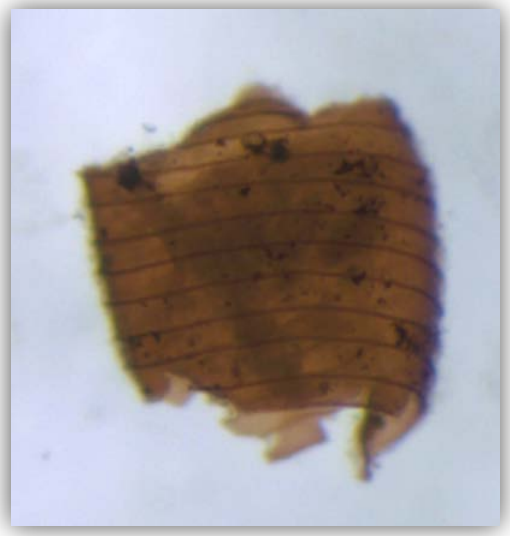


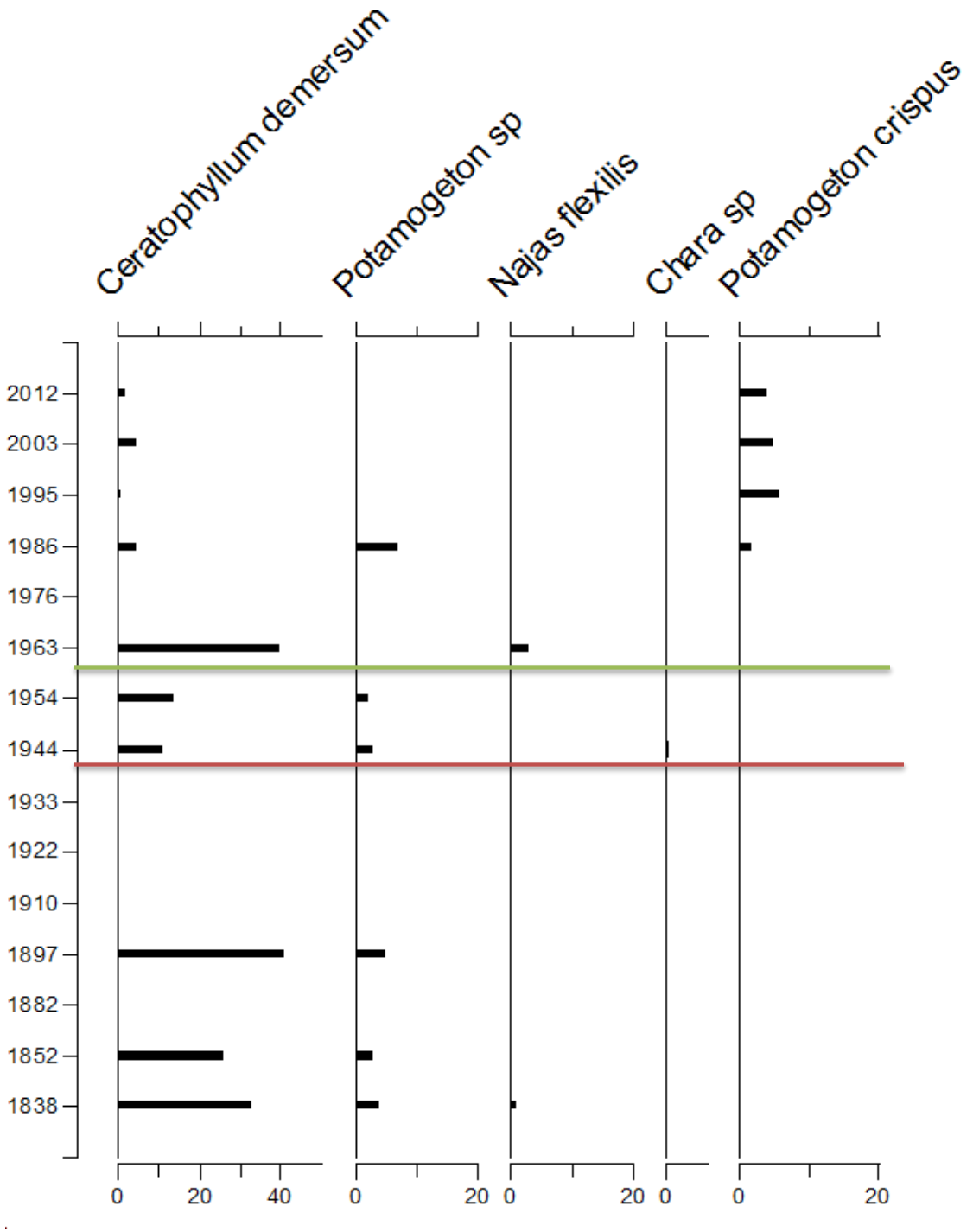




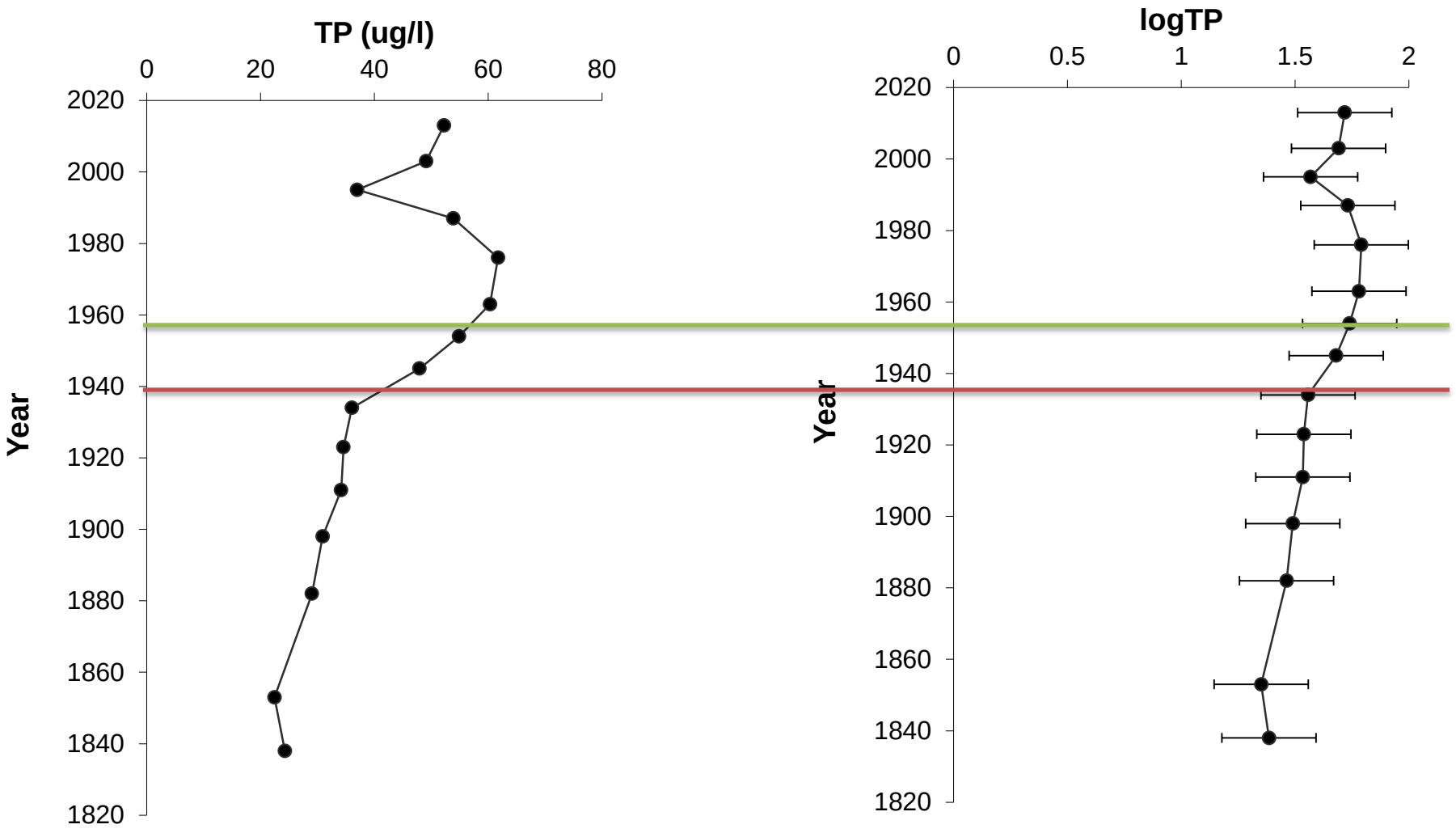

Chydorus breviabus
Bosmina longirostris complex
Camptocercus sp#
Alona sp
Acropersus harpae
Daphnia longirostris complex
Daphnia ephippium
Eurycecus sp#
Alonella pulchella
2012
2003
1995
1986
1976
1963
1954
1944
1933
1922
1910
1897
1882
1852
1838
80
160
240
320
0
20
40
60
0
20
0
20
40
0
0
0
0
20
0
20




Profundal taxa
Littoral taxa
Chironomus
Procladius
Cryptochironomus
Crictopus/Orthocladius
Dicrotendipes
Cladotanytarsus mancus gr.
Endochironomus tendens-type
Glyptotendipes
Microtendipes pedellus-type
Tanystarsus s. lat.
Chaoborus manible
2012
2003
1995
1986
1976
1963
1954
1944
1933
1922
1910
1897
1882
1852
1838
0
20




Ceratophyllum demersum
Potamogeton sp
Najas flexilis
Chara sp
Potamogeton crispus
2012
2003
1995
1986
1976
1963
1954
1944
1933
1922
1910
1897
1882
1852
1838
0
20
40
0
20
0
20
0
0
20


TP (ug/l)
0
20
40
60
80
Year
2020
2000
1980
1960
1940
1920
1900
1880
1860
1840
1820
logTP
0
0.5
1
1.5
2
Year
2020
2000
1980
1960
1940
1920
1900
1880
1860
1840
1820

Questions?