A Historical Reconstruction of Watershed Environment Surrounding Lake Matoaka, Virginia

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August 4, 2005

Sediment Collection

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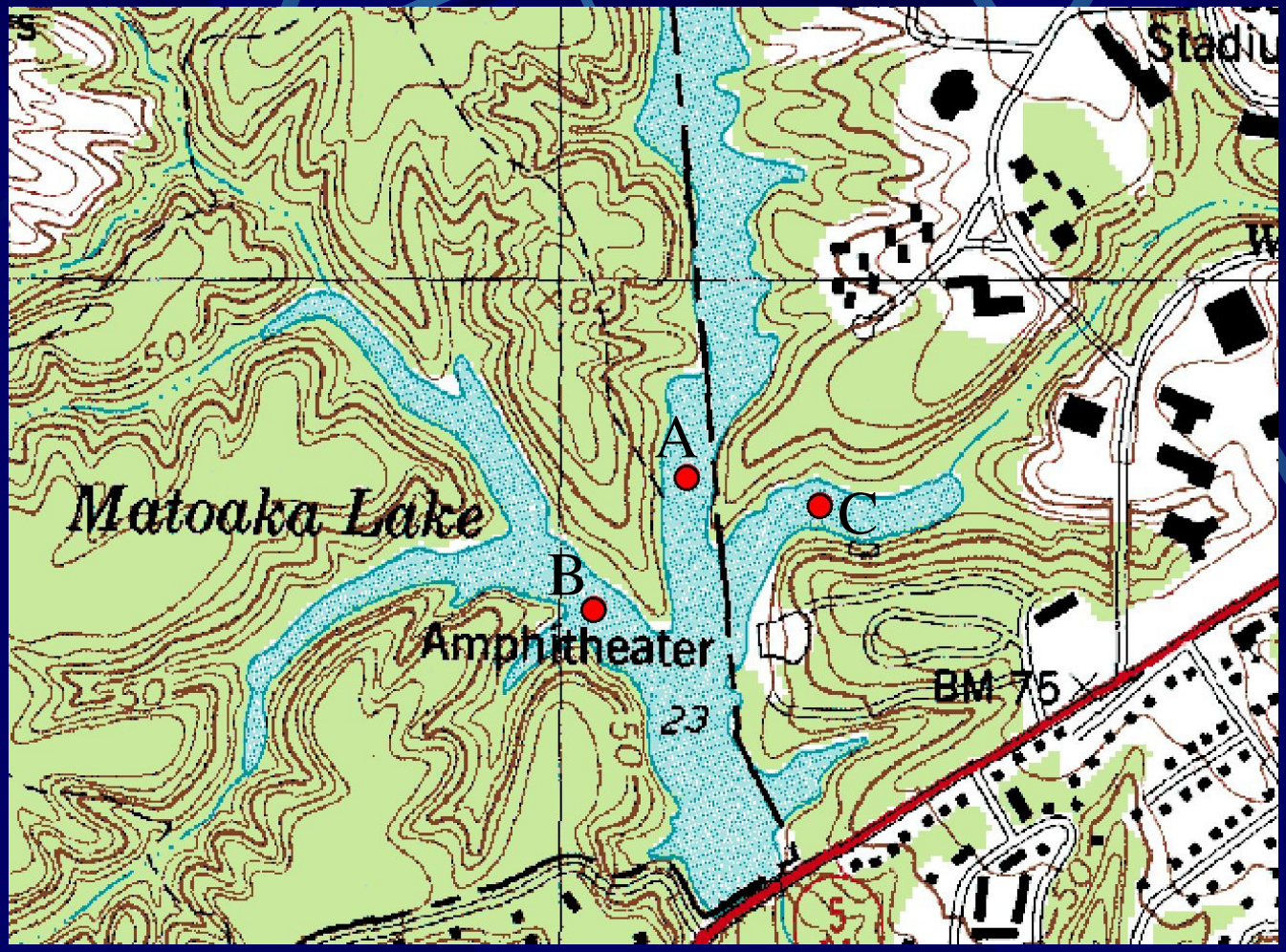


Core A-
Developed arm
100cm

Core B-
Undeveloped arm
140cm

Core C-
Icehouse Cove
Crimdell watershed
100cm

Sediment Analysis

- Sediment color, grain size, other characteristics
- % Water content
- % Organic matter (LOI)
- % C
- % N
- Total phosphate
- % SiO_2

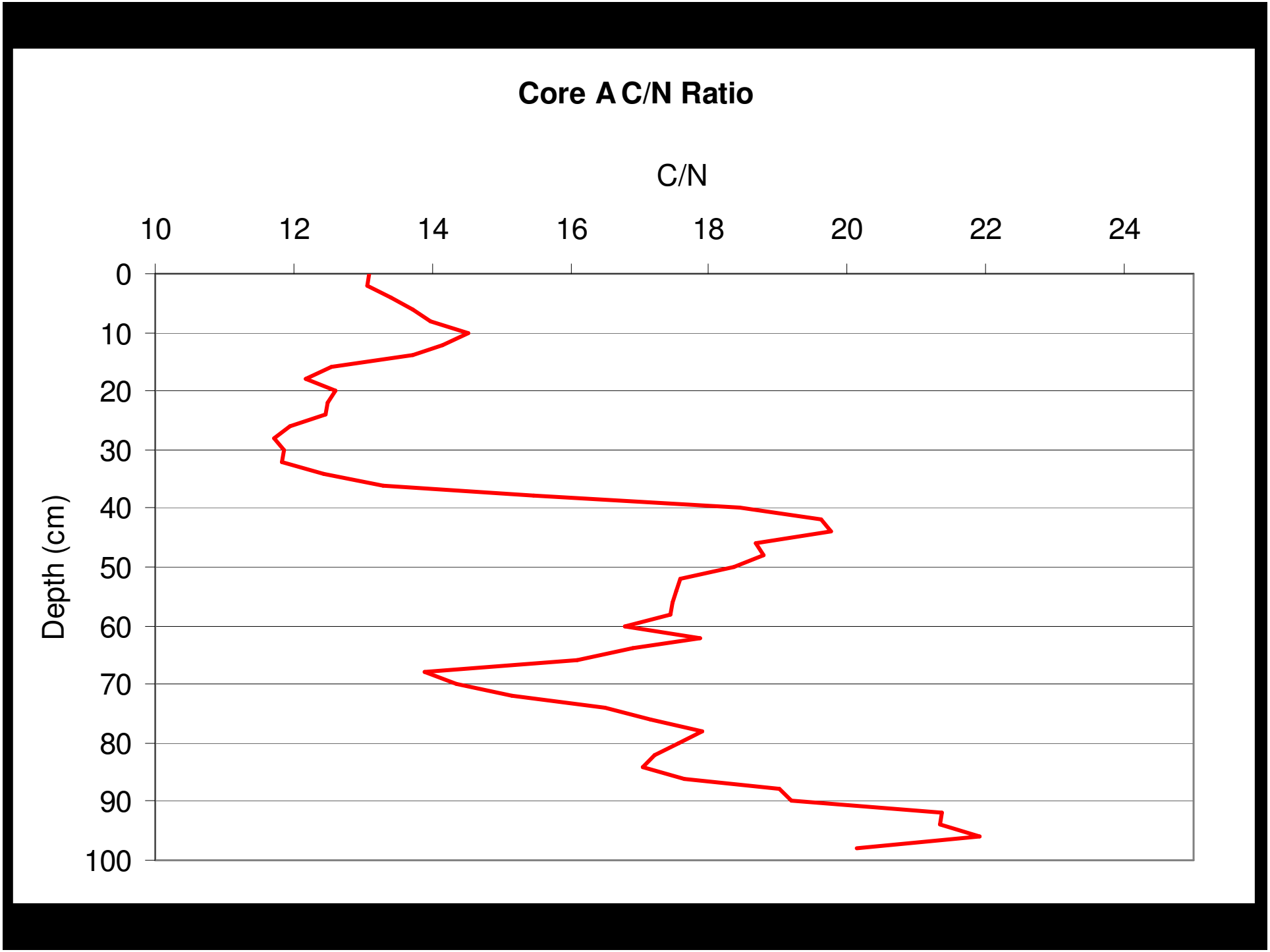
What is a C/N ratio?

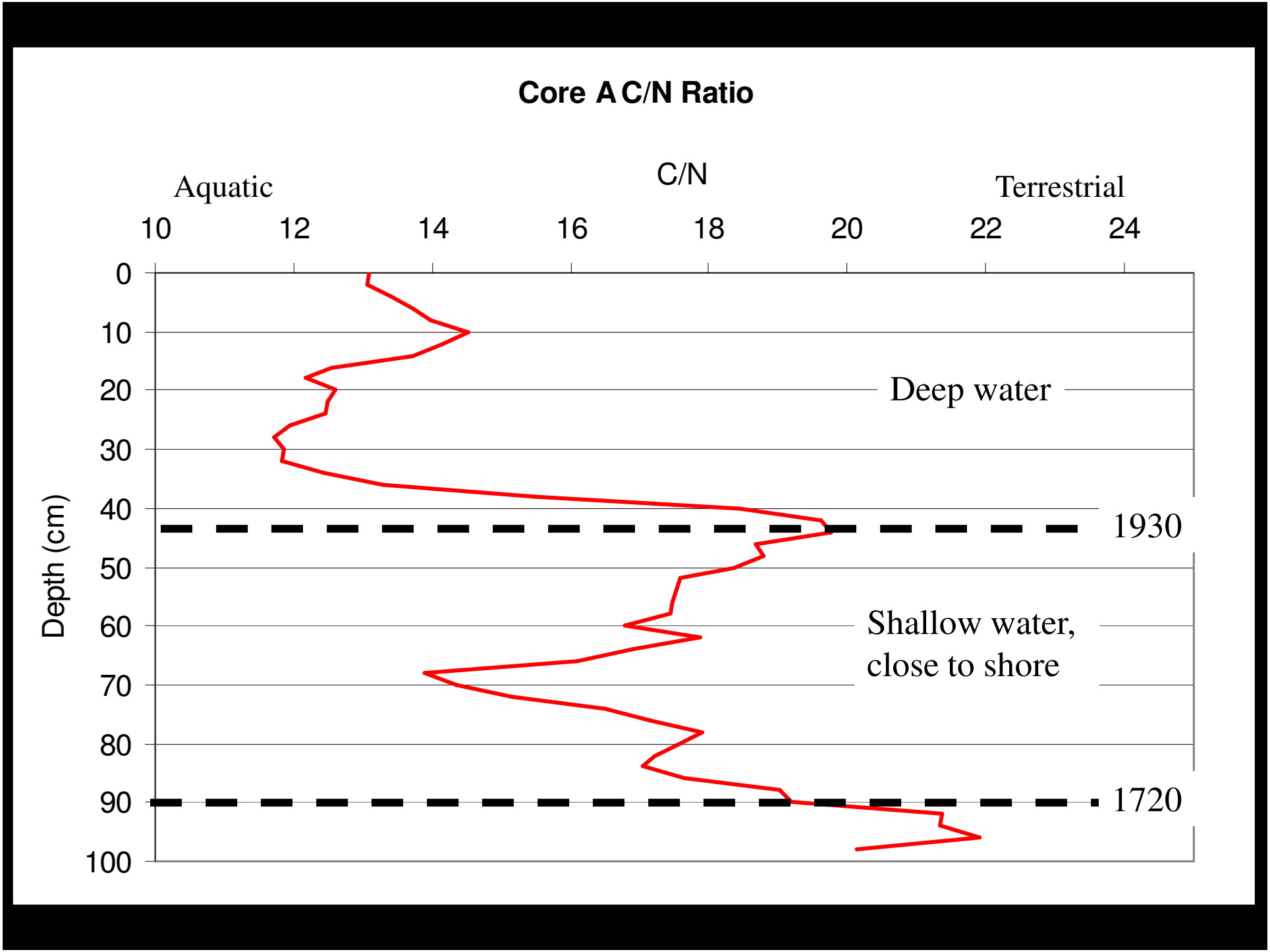
- Terrestrial material = high C/N
  More structure ⟶ more C, less N

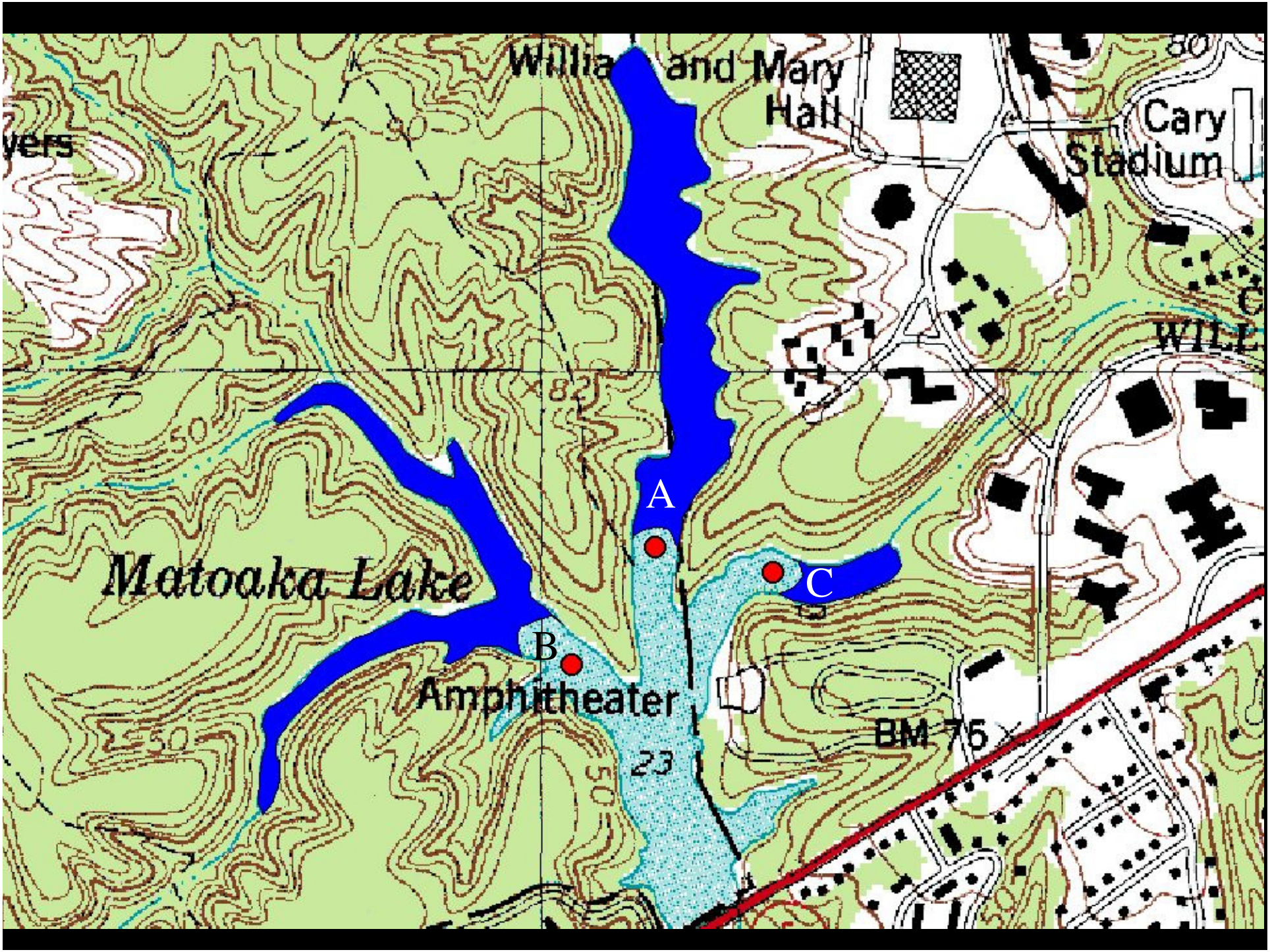
- Aquatic material = low C/N
  Less structure ⟶ less C, more N

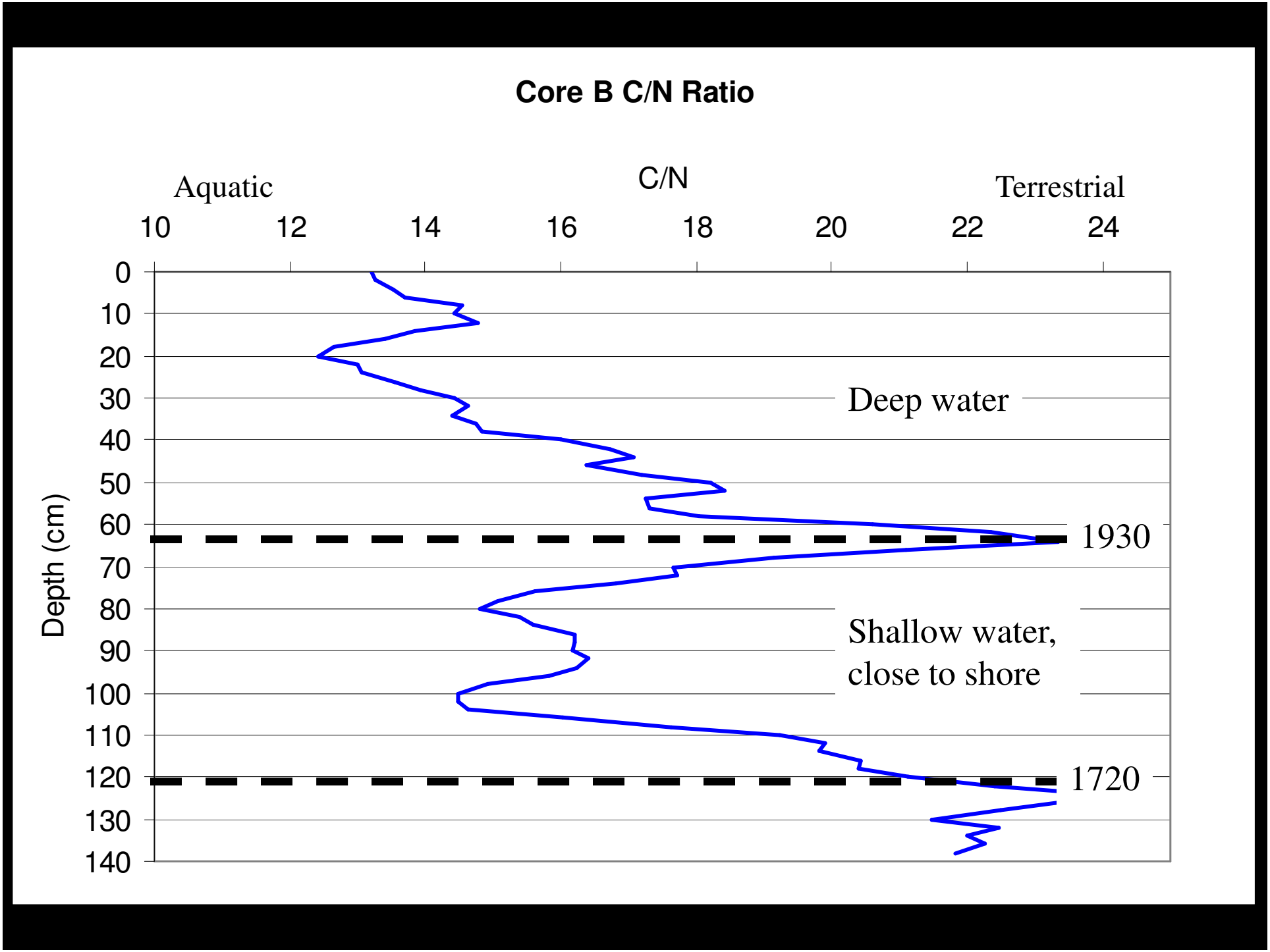
What is %SiO_2?

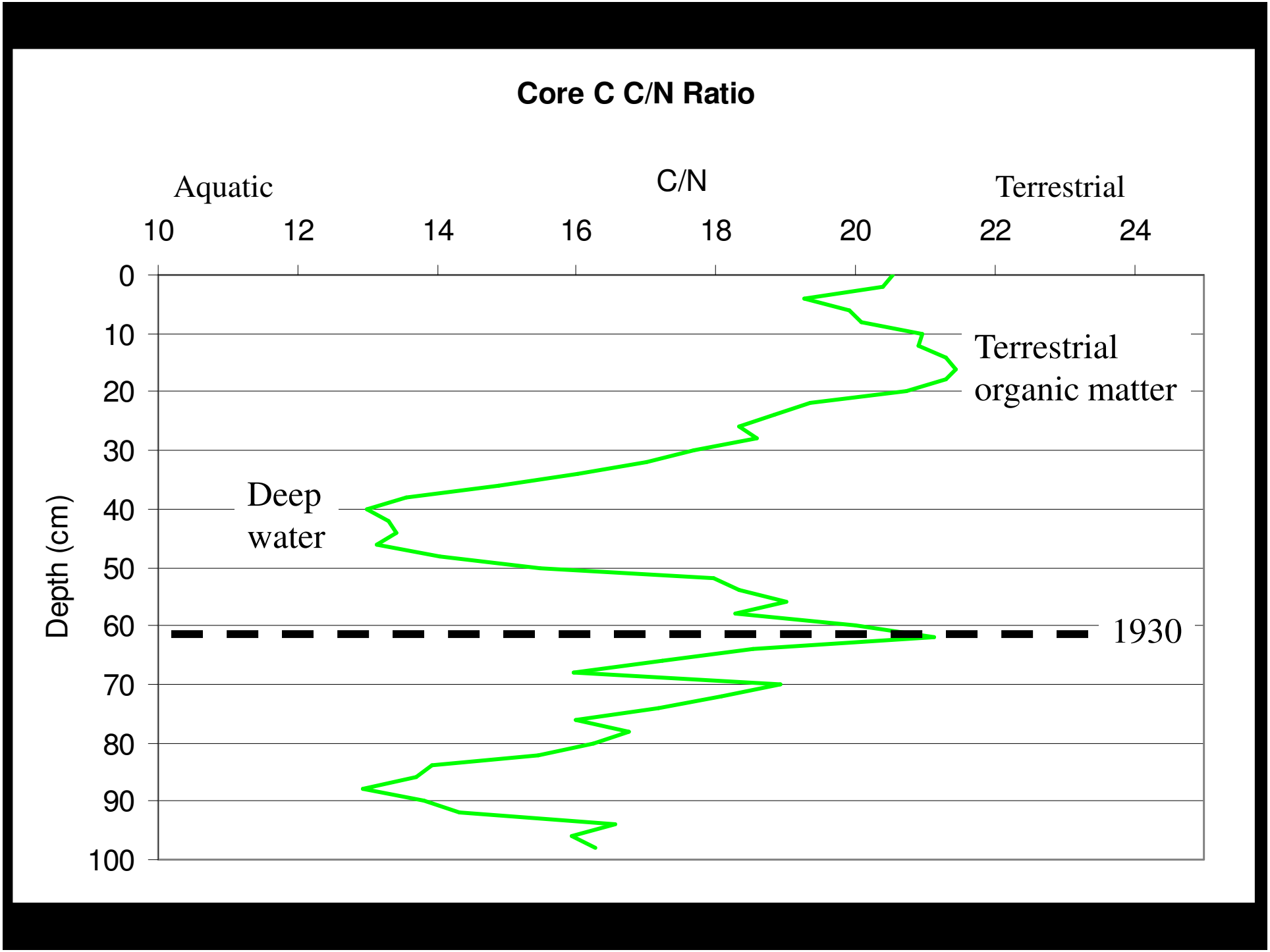
- High diatom (algae) concentration
  $\longrightarrow$ high %SiO_2
- Low diatom (algae) concentration
  $\longrightarrow$ low %SiO_2

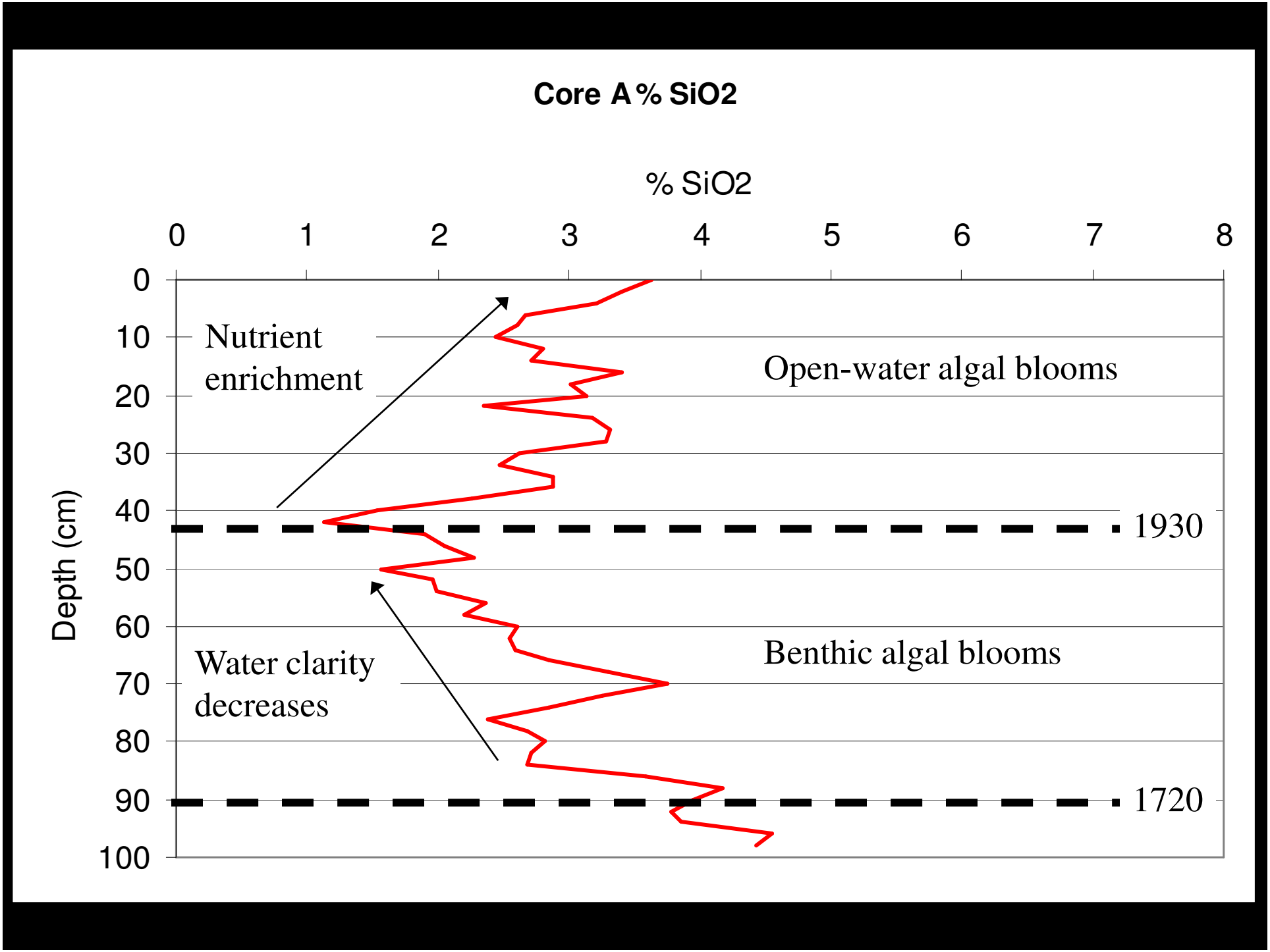

Core A C/N Ratio
C/N
10
12
14
16
18
20
22
24
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100

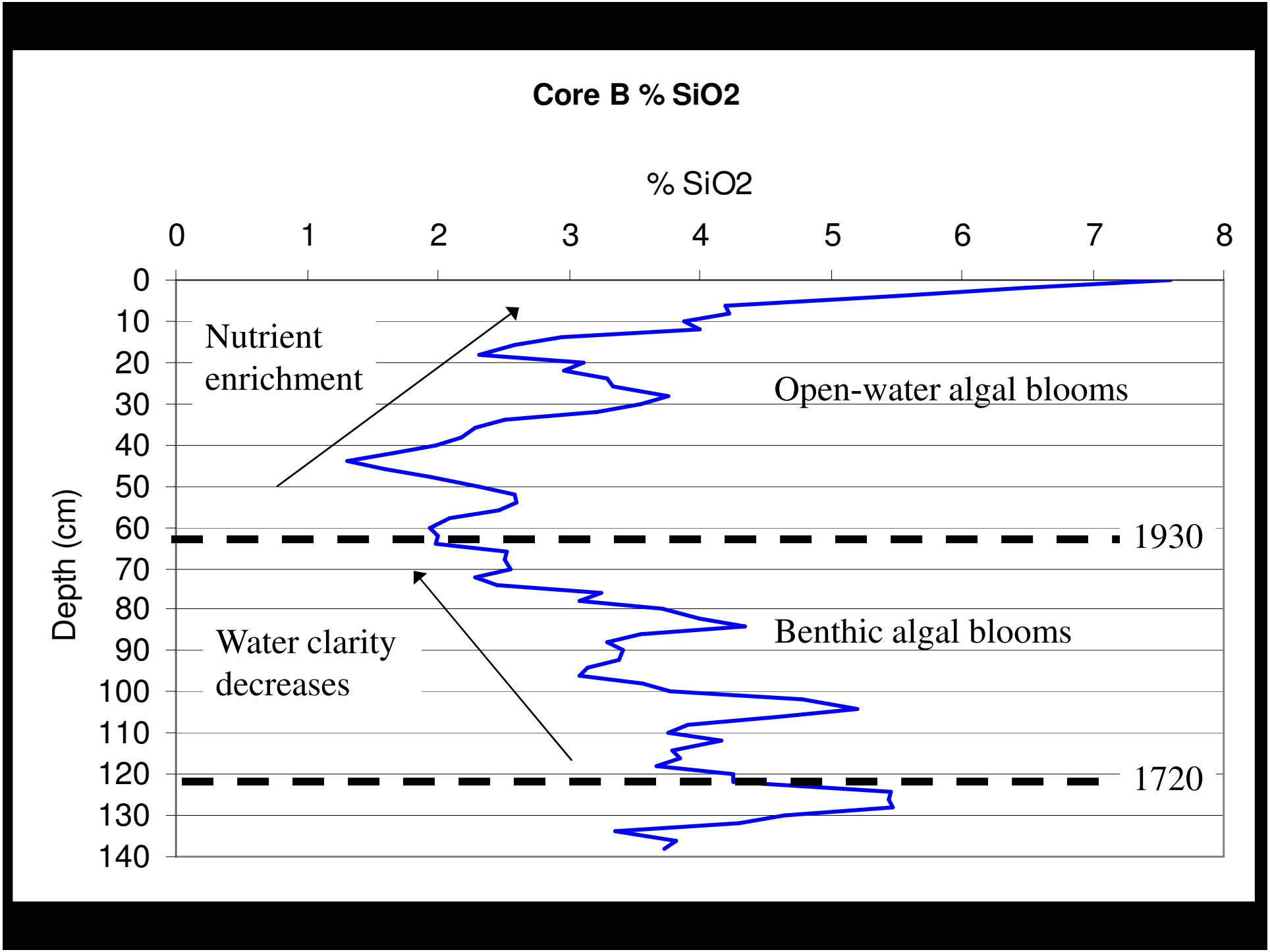

Core A C/N Ratio
Aquatic
C/N
Terrestrial
10
12
14
16
18
20
22
24
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
Deep water
1930
Shallow water,
close to shore
1720

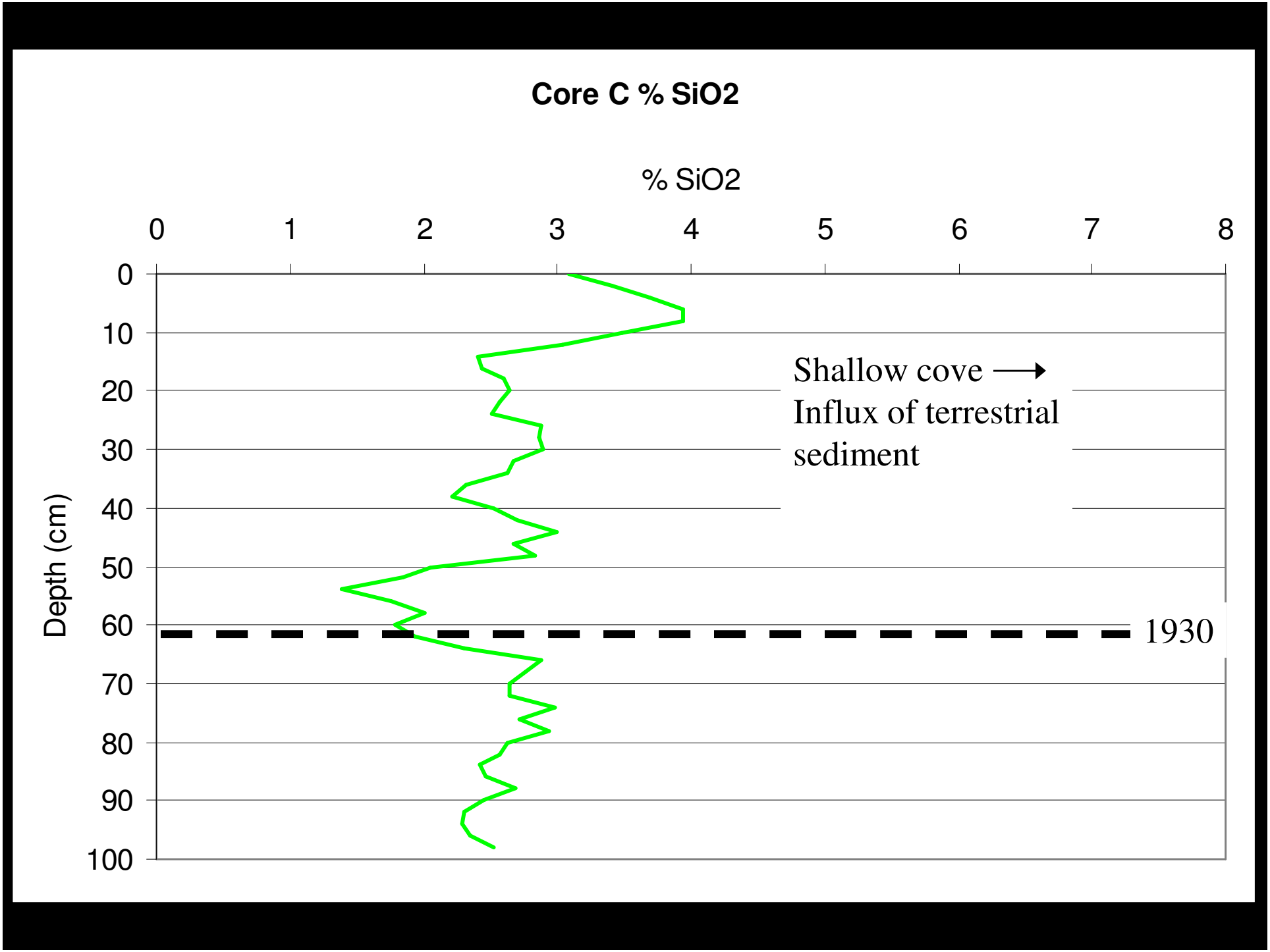

Willia
and Mary
Hall
Cary
Stadium
Matoaka Lake
A
B
C
Amphitheater
BM 76
23
50
82
80

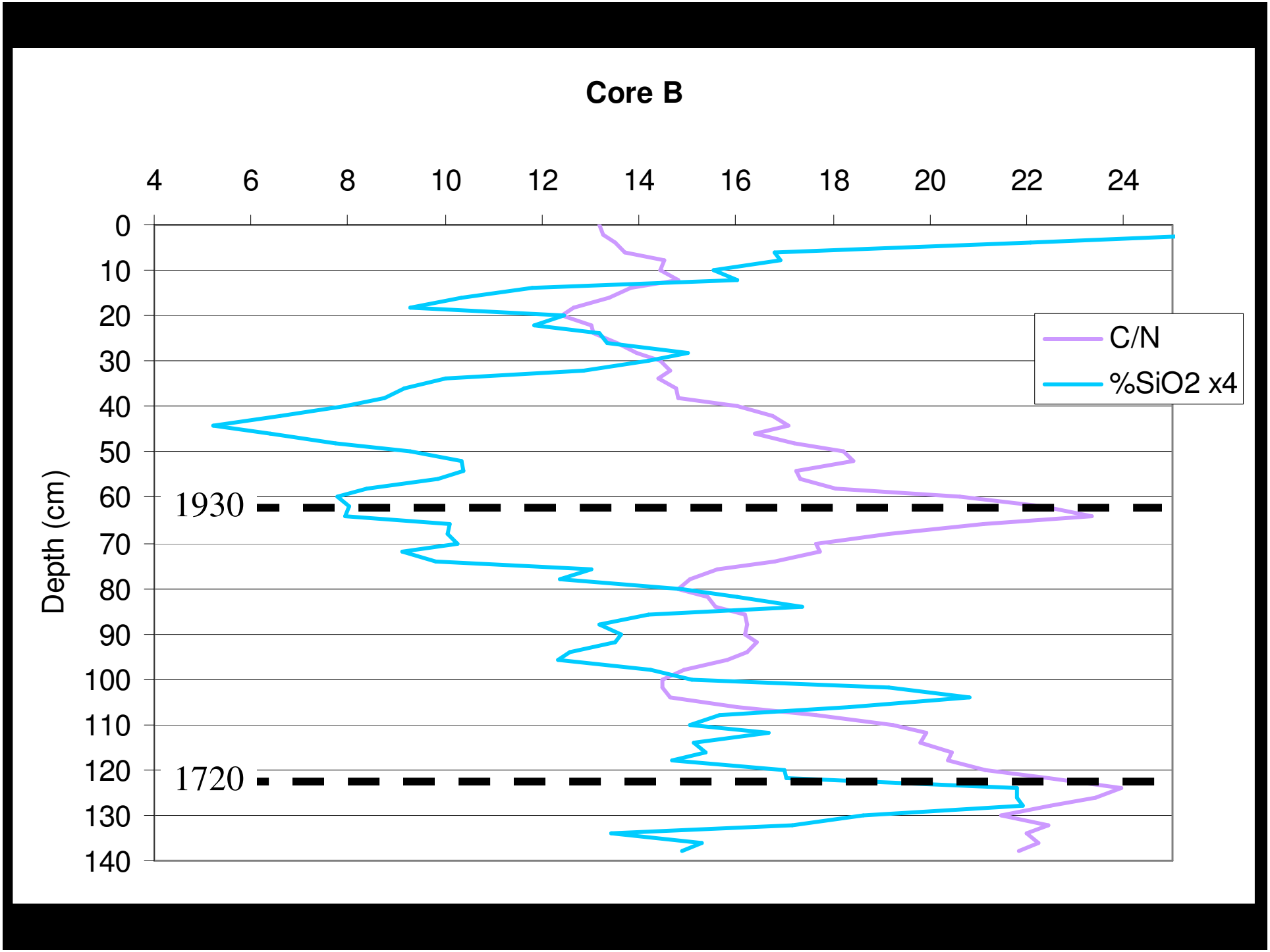

Core B C/N Ratio
Aquatic
C/N
Terrestrial
10
12
14
16
18
20
22
24
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Depth (cm)
Deep water
1930
Shallow water,
close to shore
1720


Core C C/N Ratio
Aquatic
C/N
Terrestrial
10
12
14
16
18
20
22
24
0
10
20
30
40
50
60
70
80
90
100
Depth (cm)
Terrestrial
organic matter
Deep
water
1930


Core A % SiO2
% SiO2
0
1
2
3
4
5
6
7
8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
Nutrient enrichment
Open-water algal blooms
1930
Water clarity decreases
Benthic algal blooms
1720


Core B % SiO2
% SiO2
0
1
2
3
4
5
6
7
8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Nutrient enrichment
Open-water algal blooms
1930
Benthic algal blooms
Water clarity decreases
1720


Core C % SiO2
% SiO2
0
1
2
3
4
5
6
7
8
Depth (cm)
0
10
20
30
40
50
60
70
80
90
100
Shallow cove ⟶
Influx of terrestrial sediment
1930


Core B
4
6
8
10
12
14
16
18
20
22
24
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Depth (cm)
1930
1720
C/N
%SiO2 x4

Conclusions

- C/N ratios and %SiO_2 can be used to locate certain major events in the lake's sediment record
  - 1720 and 1930
  - Means of dating
- C/N ratios and %SiO_2 can show certain trends of increasing or decreasing algae populations
  - Hypotheses about changing lake conditions
- Compare conditions of different regions of the lake

Conclusions

- Before 1720: Benthic algae in swamp
- 1720-1930: Decreasing water clarity from runoff causes benthic algae population to decrease
- 1930: Rise in lake level stimulates growth of open-water algal blooms
- 1930- present: nutrient runoff (fertilizers, sewage) to lake stimulates increase in algae populations
- 1930- present in icehouse cove: construction on campus increases impervious surface. Excess runoff introduces large amounts of terrestrial material in to the cove