2018 Canandaigua Lake Sampling and Monitoring Program

Report to the Canandaigua Lake Watershed Council

June 5, 2019

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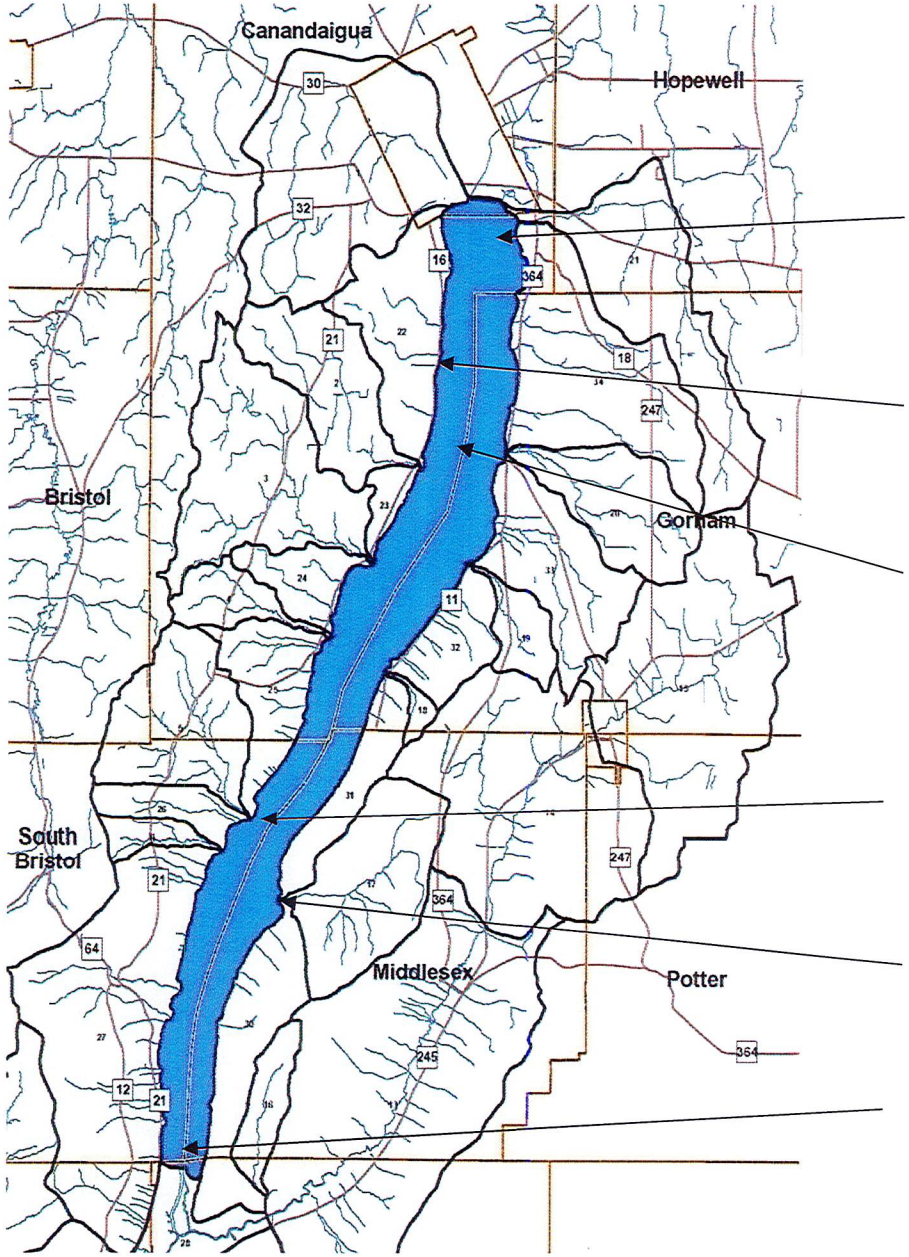
Program Background

- Program in it's 24th year (1996 – 2019)
- FLCC's role
- Lake attributes that are monitored each year since 1996:
  - Water clarity
  - Lake algal productivity
  - Lake nutrients
  - Water quality profiles: temperature, dissolved oxygen, pH, conductivity, blue-green algal cell counts

Recent Program Changes

- 2018:
  - New FLCC Steward
  - Partnership with the Finger Lakes Hub
  - Additional nearshore phosphorous sampling
  - Reduced sampling period:
    - From April to November
    - To May to October
- 2019:
  - Increased FLCC student participation
  - QAPP
  - Data archiving
  - Increased profile resolution sampling (2019)

Study Sites



Fallbrook (FB)

Hope Point (HP)

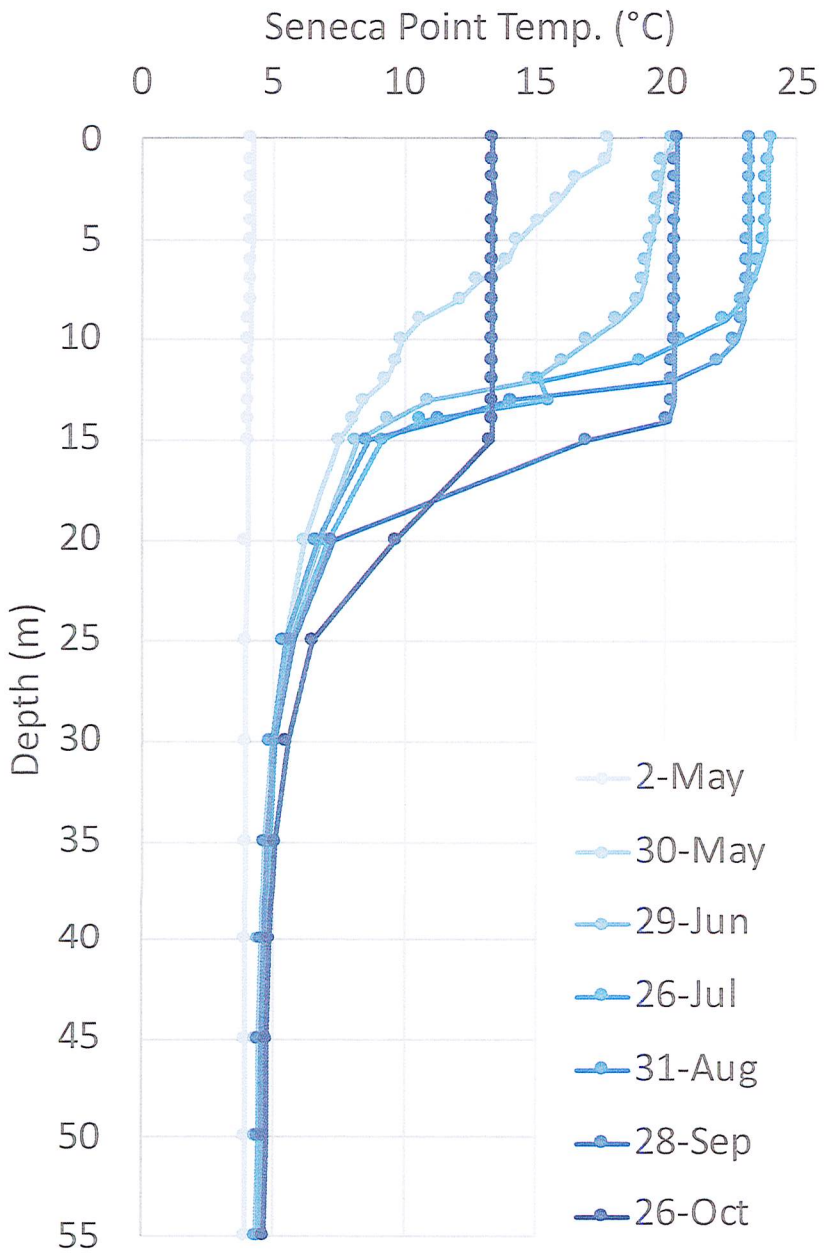
Deep Run (DR)

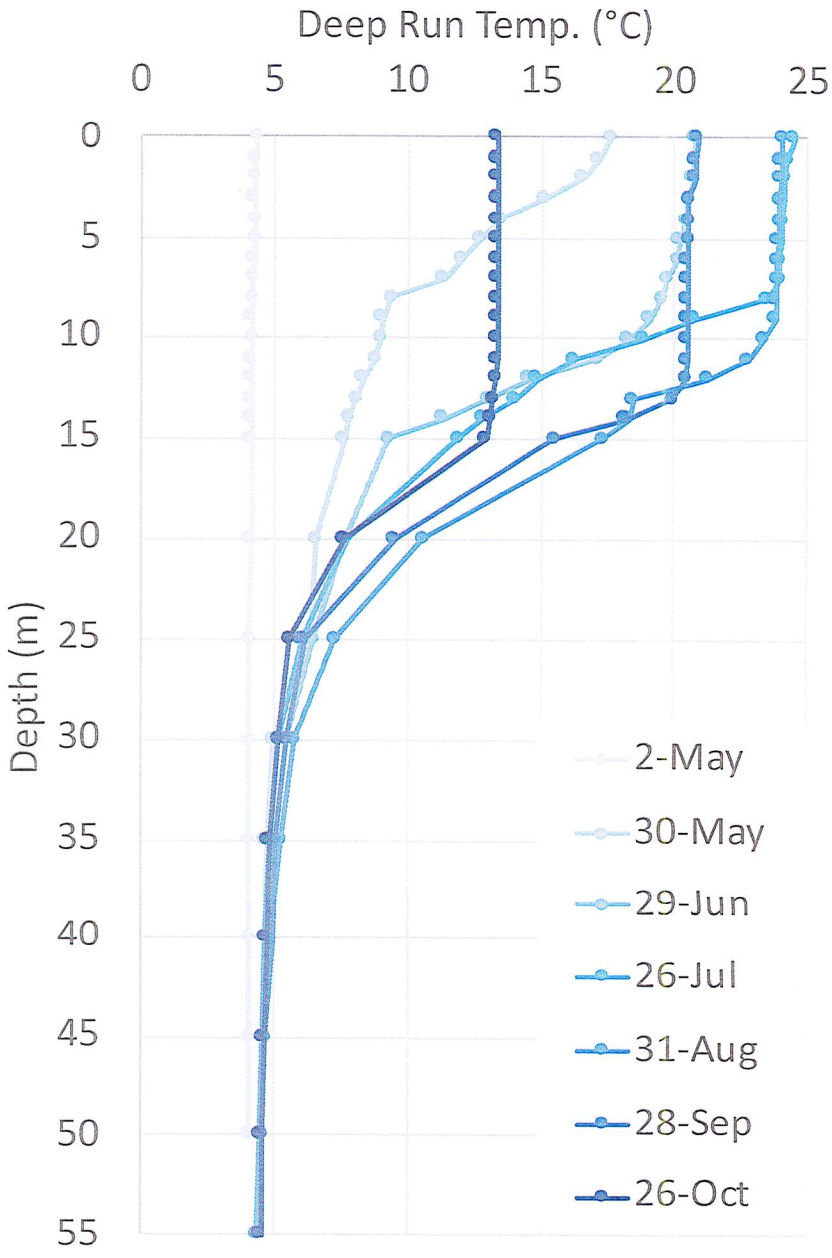
mid-lake locations

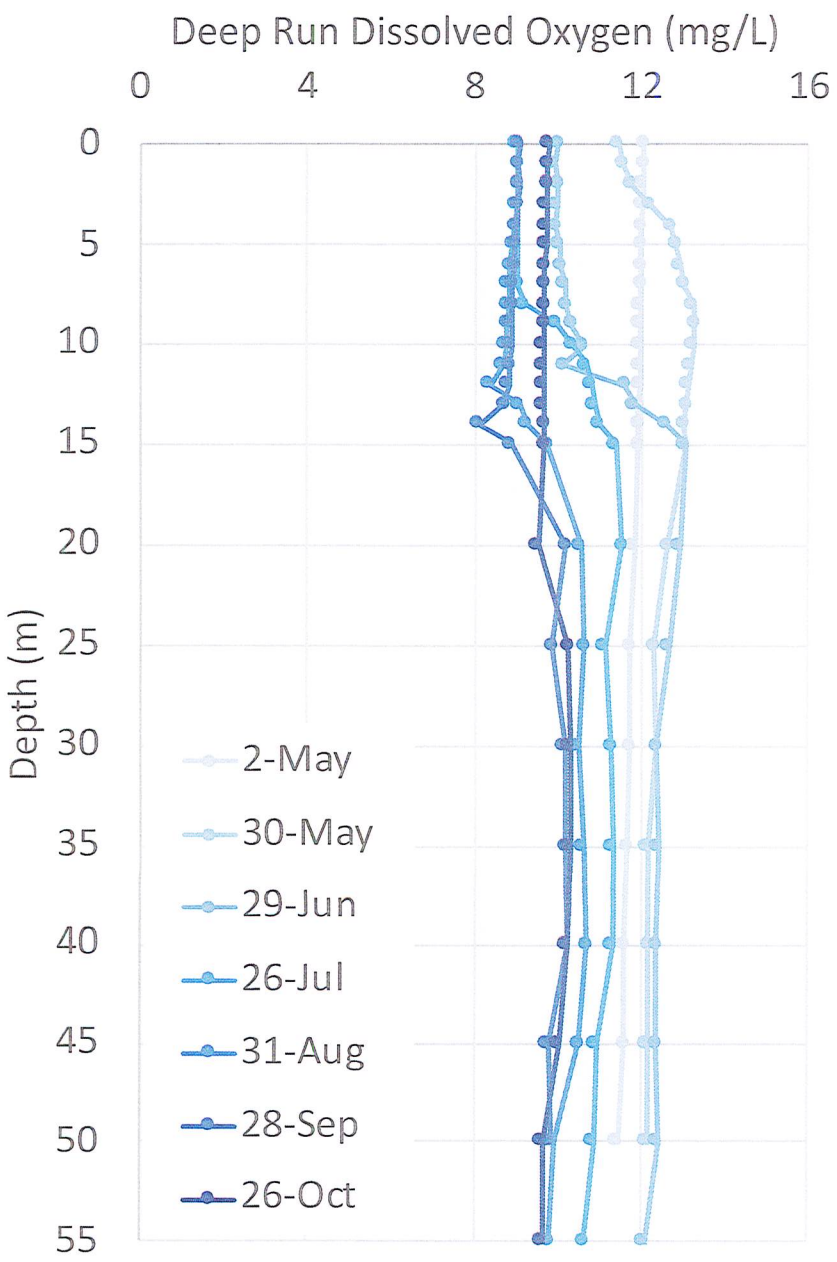
Seneca Point (SP)

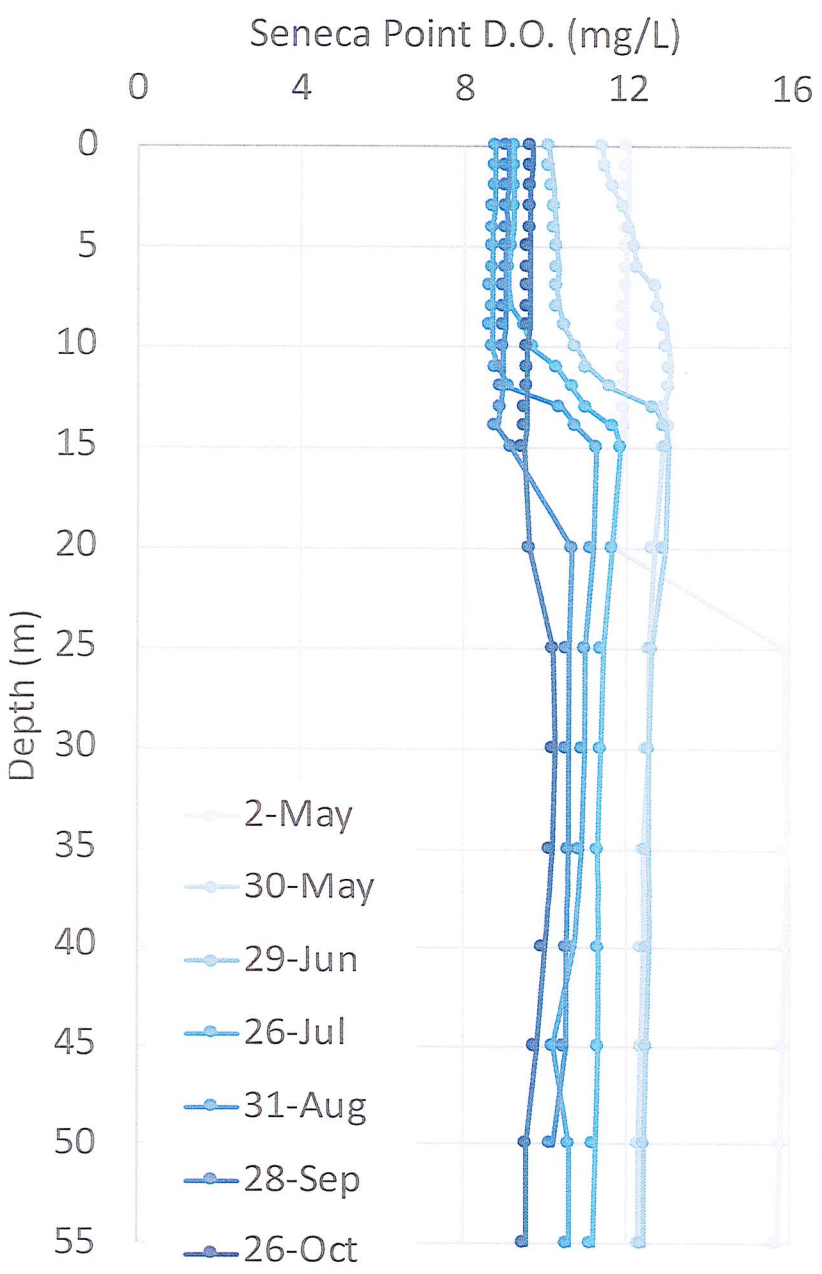
Vine Valley (VV)

West River (WR)


Seneca Point Temp. (°C)
0
5
10
15
20
25
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
2-May
30-May
29-Jun
26-Jul
31-Aug
28-Sep
26-Oct


Deep Run Temp. (°C)
0
5
10
15
20
25
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
2-May
30-May
29-Jun
26-Jul
31-Aug
28-Sep
26-Oct


Deep Run Dissolved Oxygen (mg/L)
0
4
8
12
16
Depth (m)
0
5
10
15
20
25
30
35
40
45
50
55
2-May
30-May
29-Jun
26-Jul
31-Aug
28-Sep
26-Oct


Seneca Point D.O. (mg/L)
0
4
8
12
16
Depth (m)
0
5
10
15
20
25
30
35
40
45
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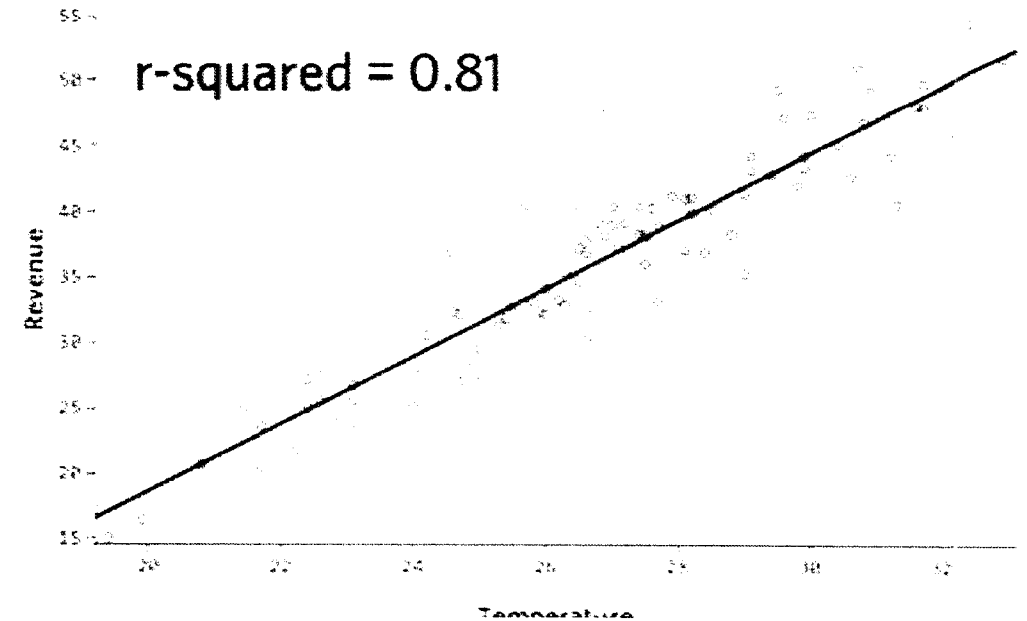
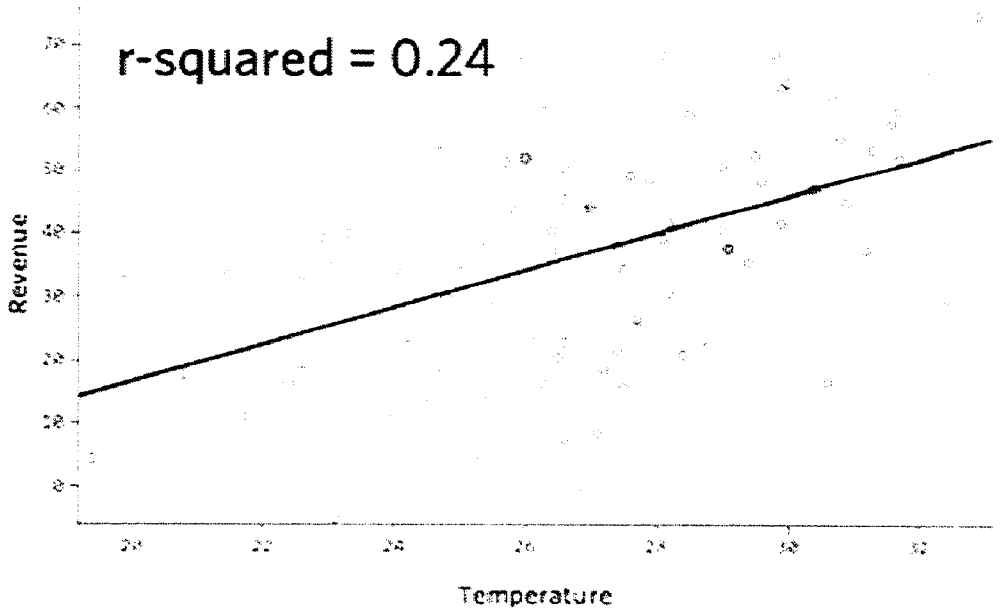
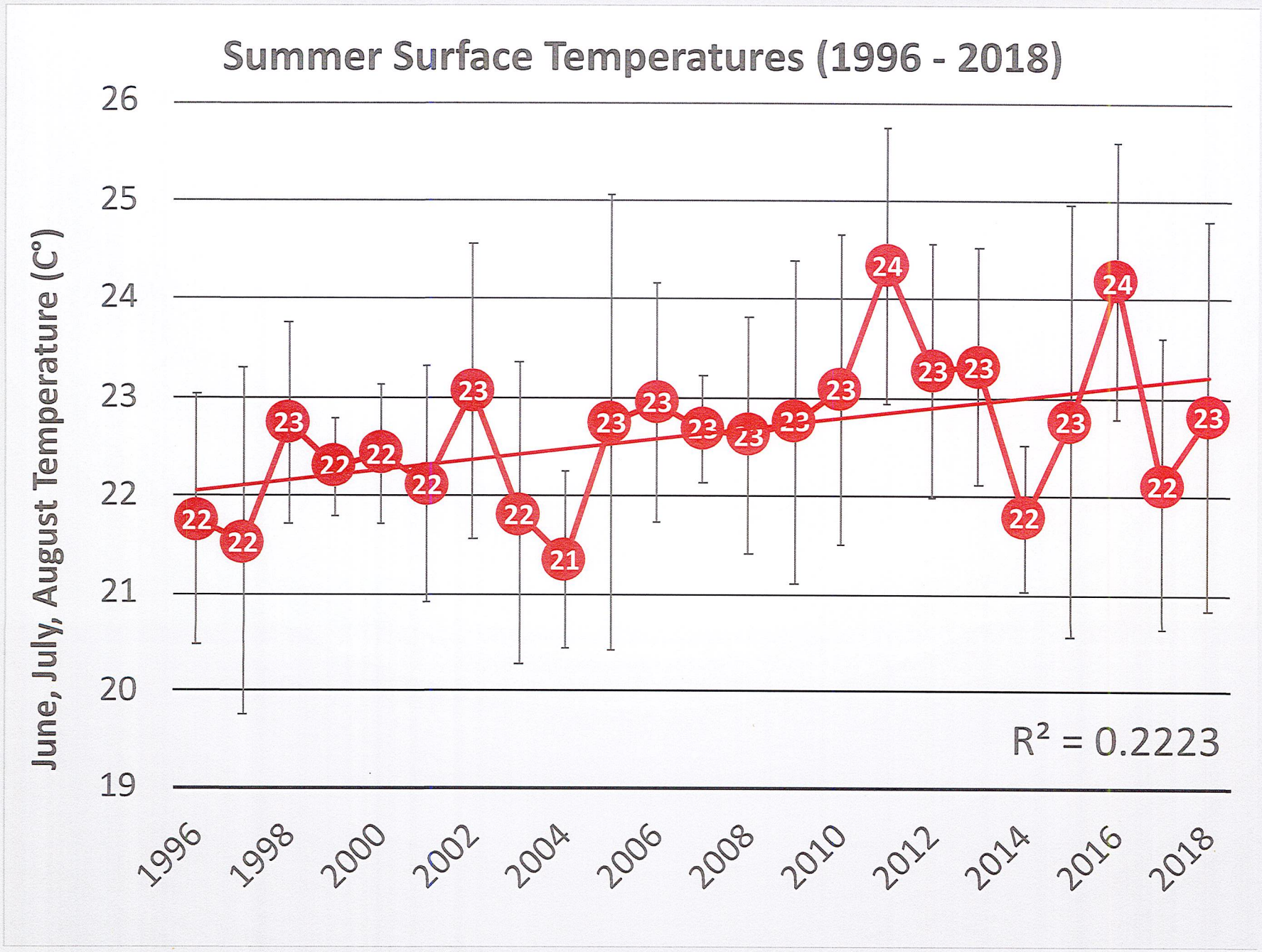
55
2-May
30-May
29-Jun
26-Jul
31-Aug
28-Sep
26-Oct

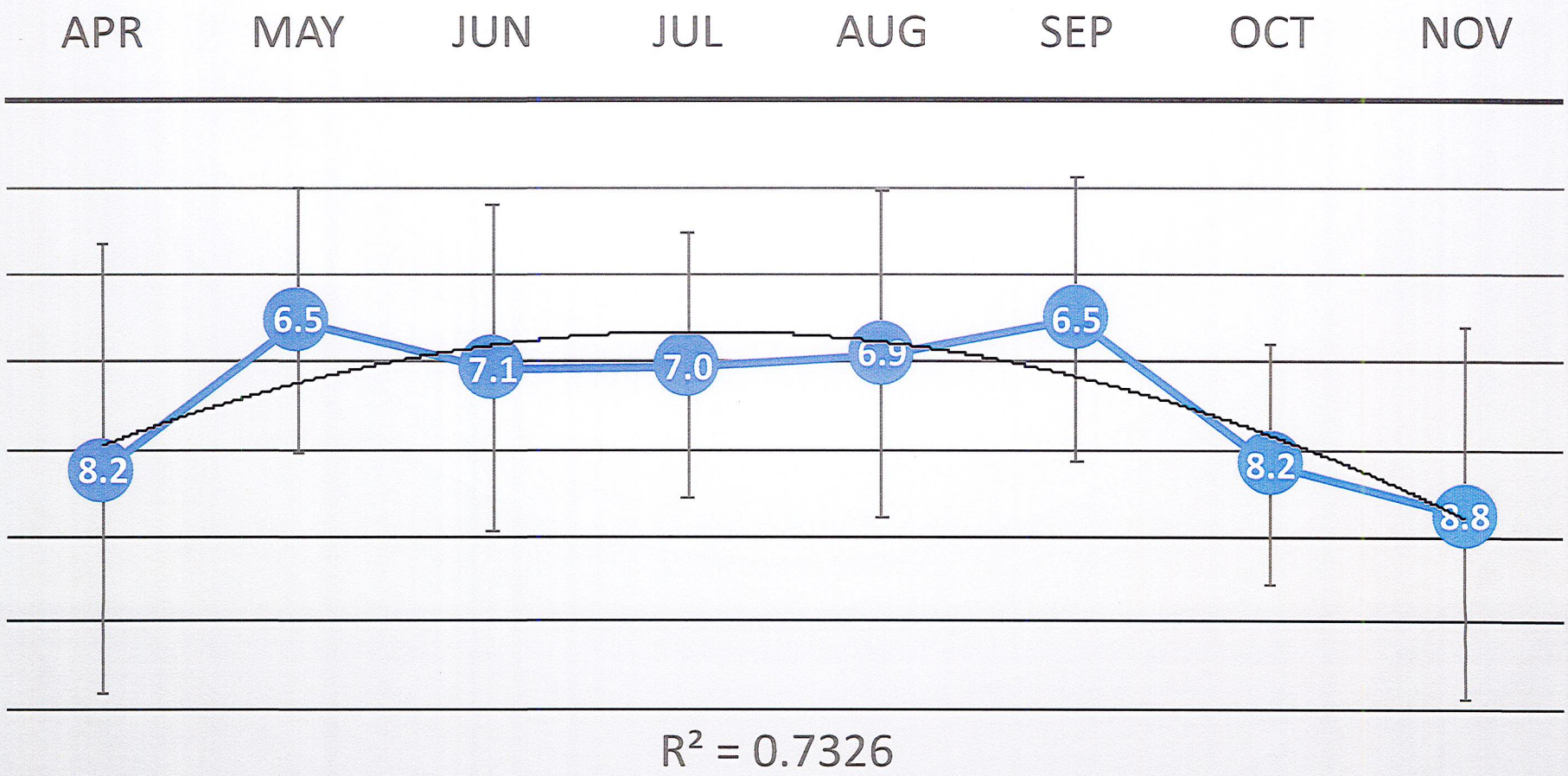
A word about R^2

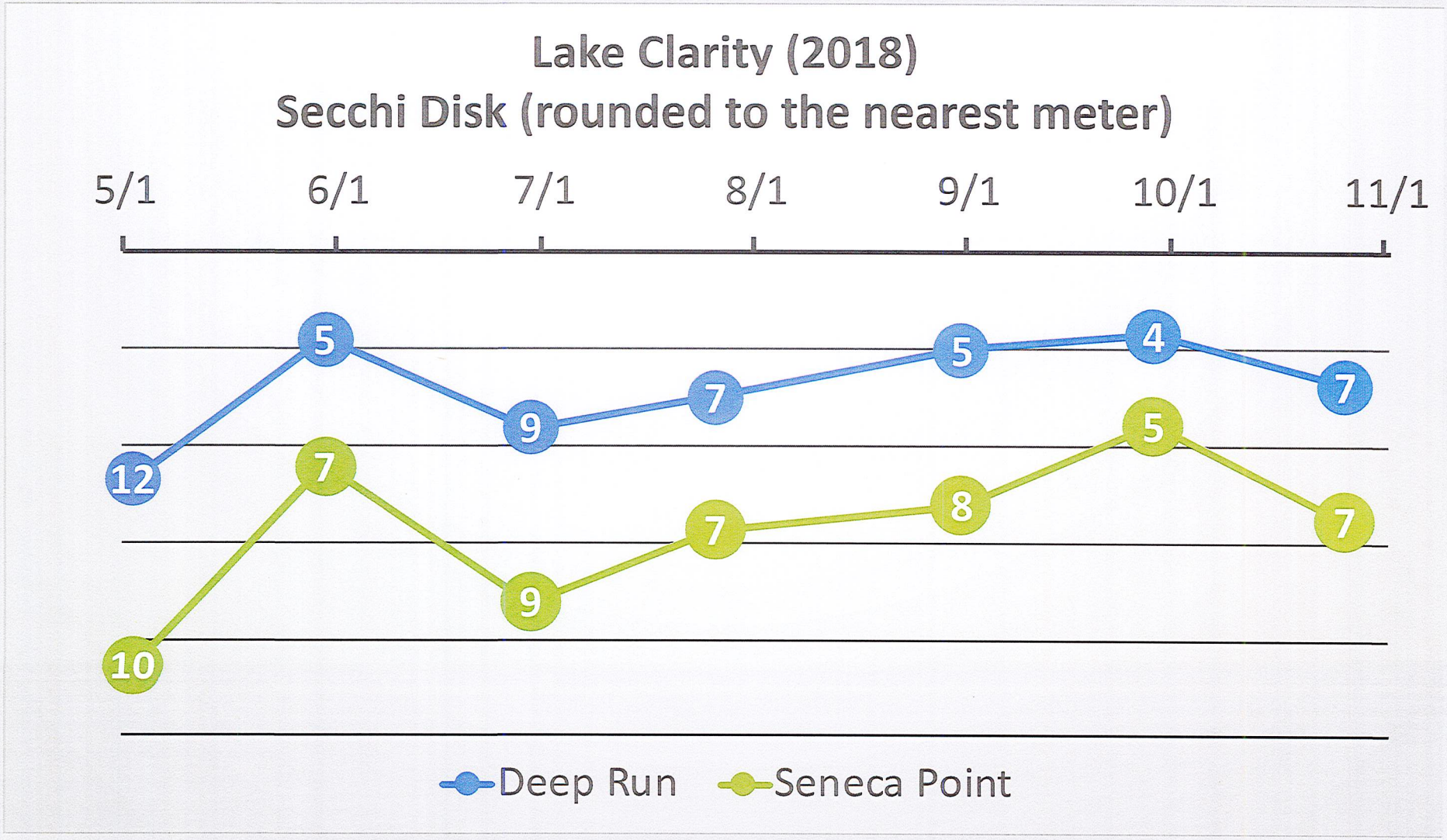


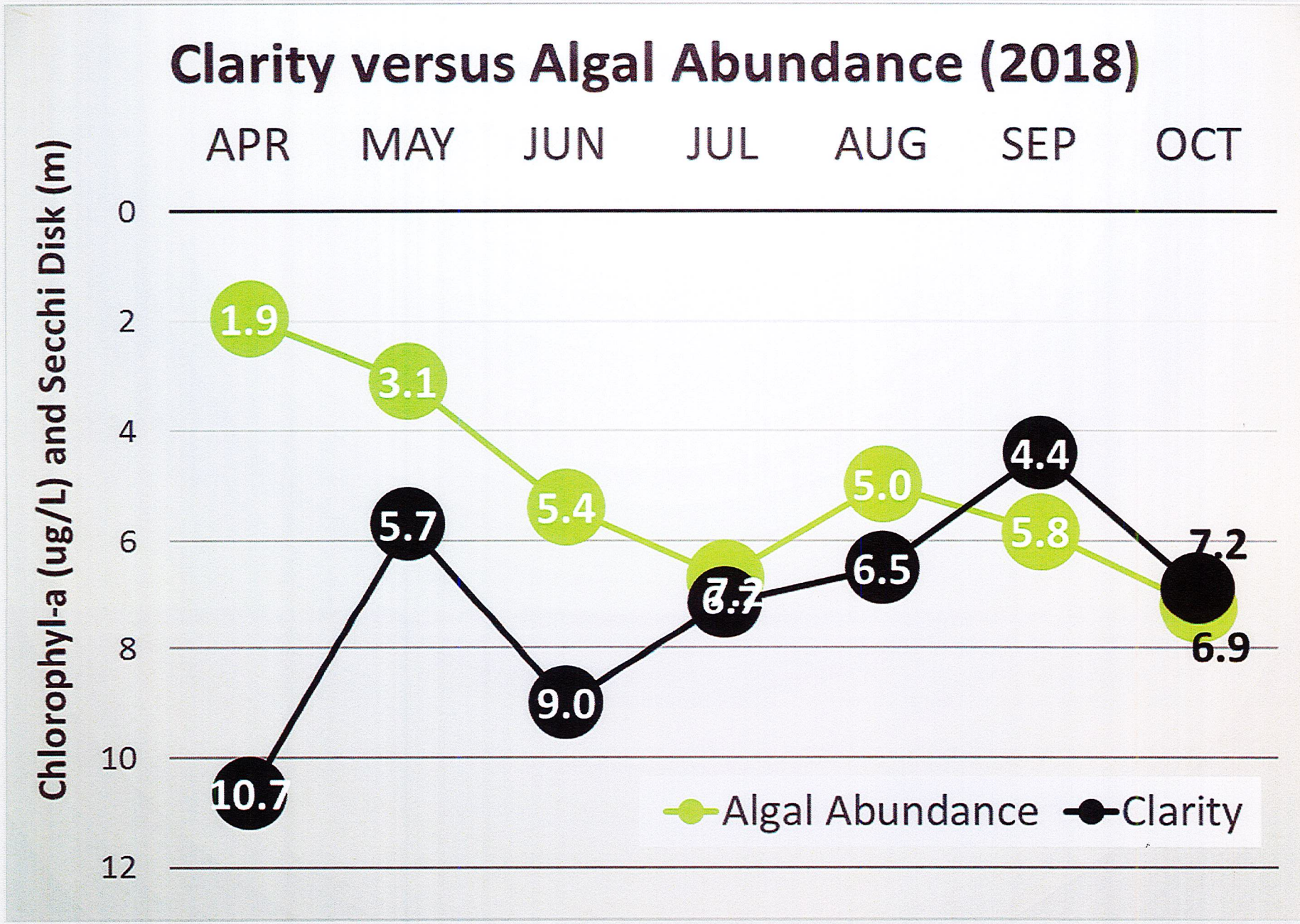


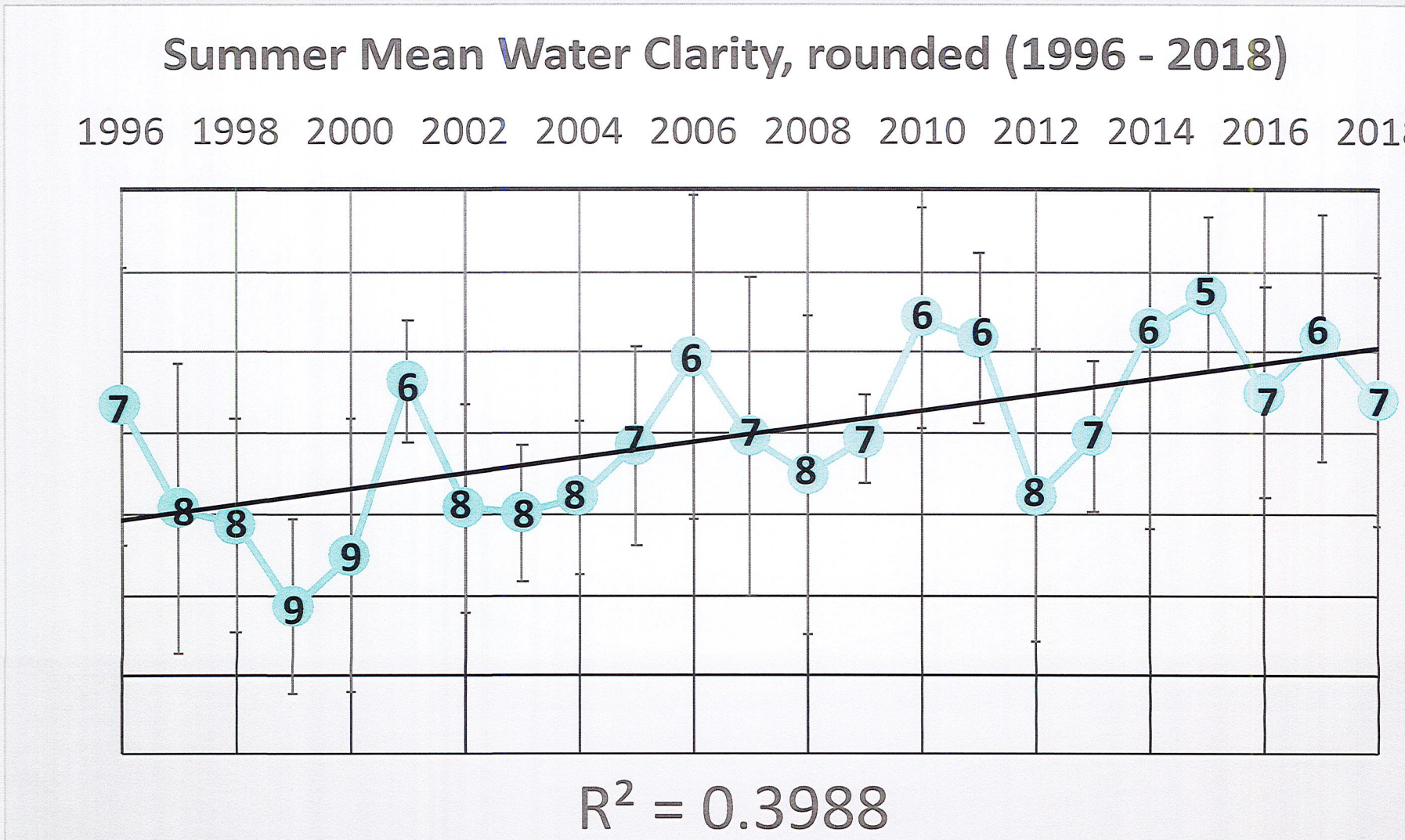

Summer Surface Temperatures (1996 - 2018)
June, July, August Temperature (C°)
26
25
24
23
22
21
20
19
22
22
23
22
22
22
23
22
21
23
23
23
23
23
23
24
23
23
22
23
24
22
23
R² = 0.2223
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

Seasonal Mean Lake Clarity (1996-2018)

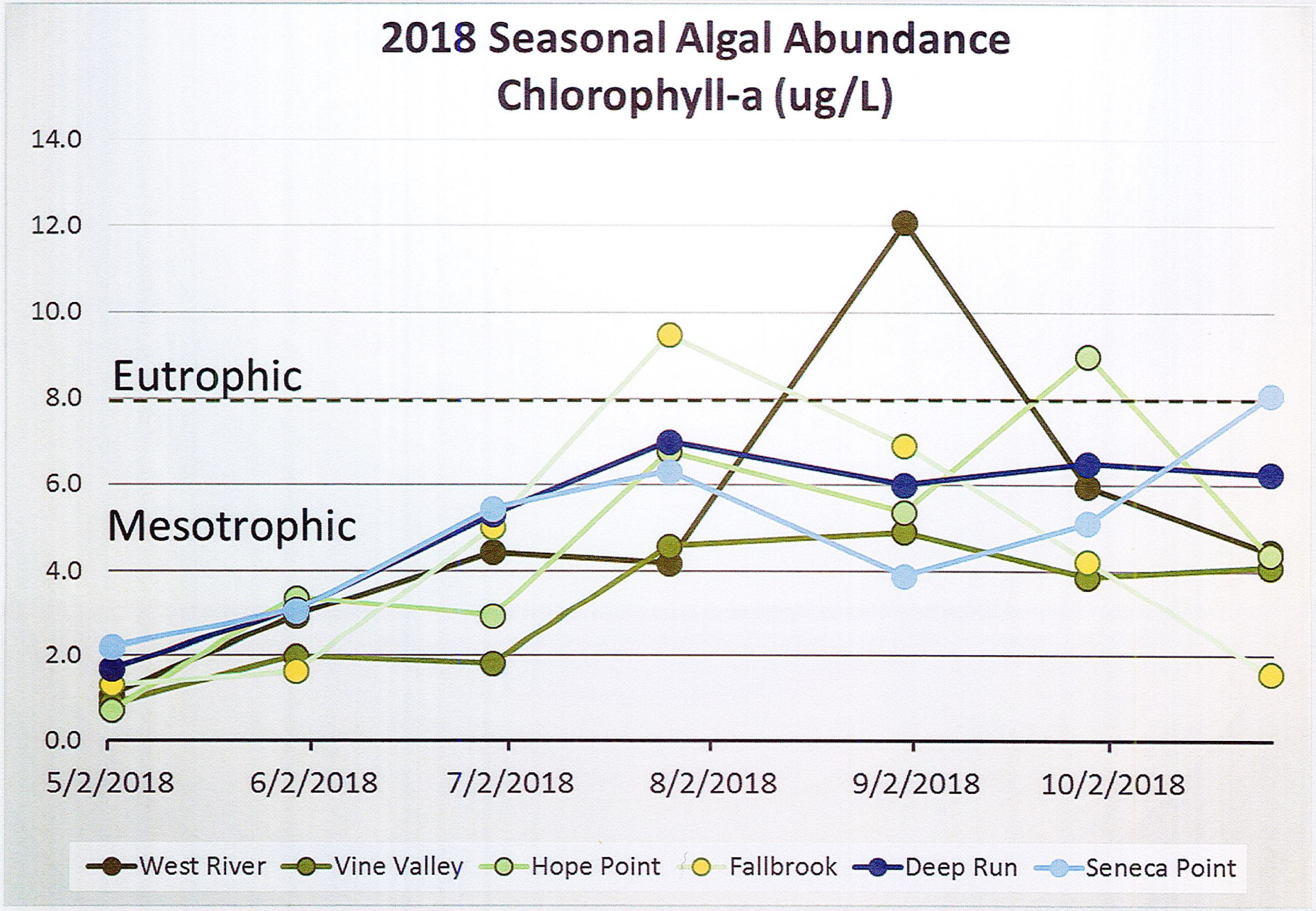



Lake Clarity (2018)
Secchi Disk (rounded to the nearest meter)
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12
5
9
7
5
4
7
10
7
9
7
8
5
7
Deep Run
Seneca Point

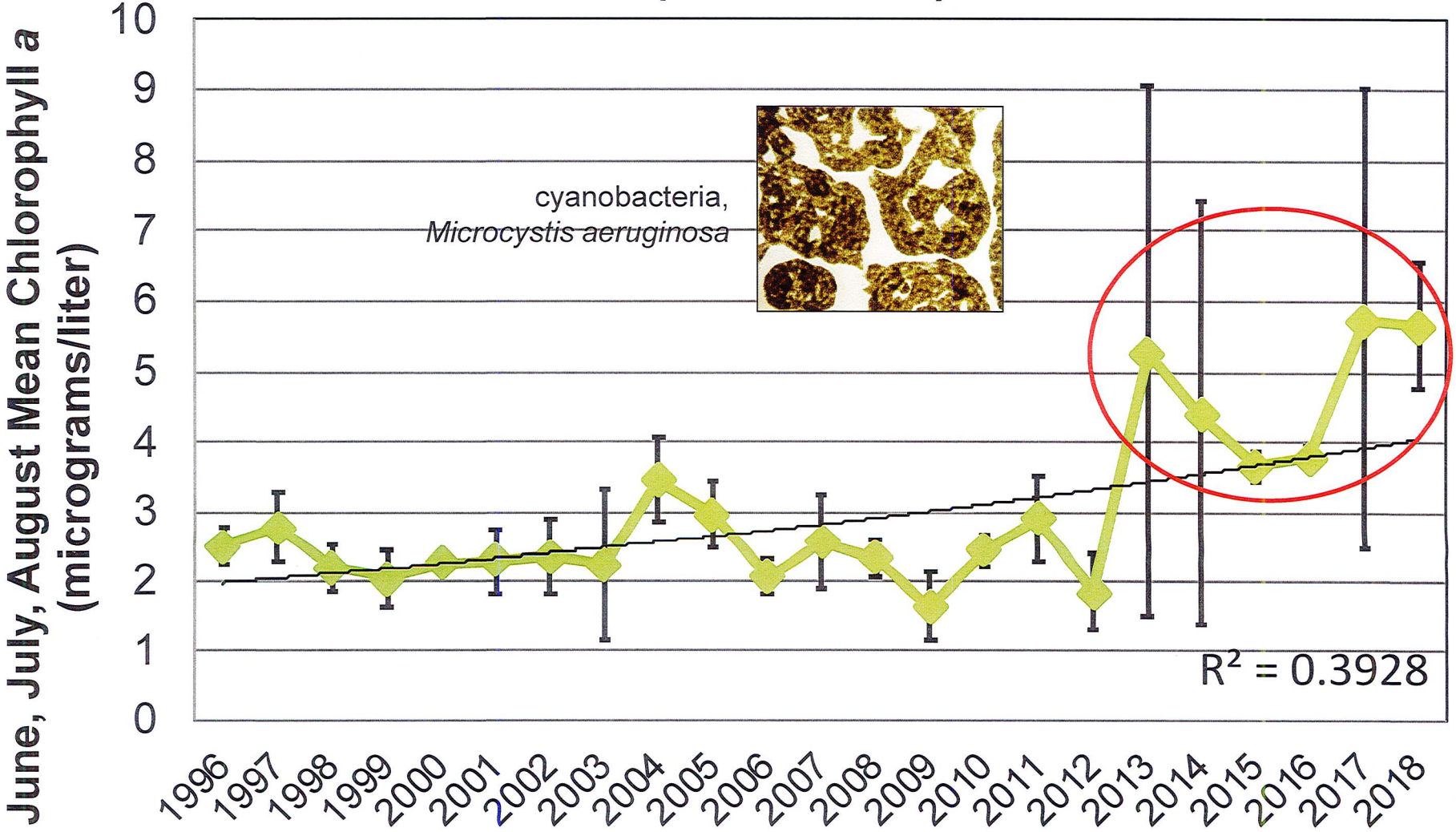

Clarity versus Algal Abundance (2018)
APR
MAY
JUN
JUL
AUG
SEP
OCT
Chlorophyl-a (ug/L) and Secchi Disk (m)
0
2
4
6
8
10
12
1.9
3.1
5.4
6.7
5.0
5.8
6.9
10.7
5.7
9.0
6.5
4.4
7.2
Algal Abundance
Clarity



Long-term summer average clarity = 7.02 m

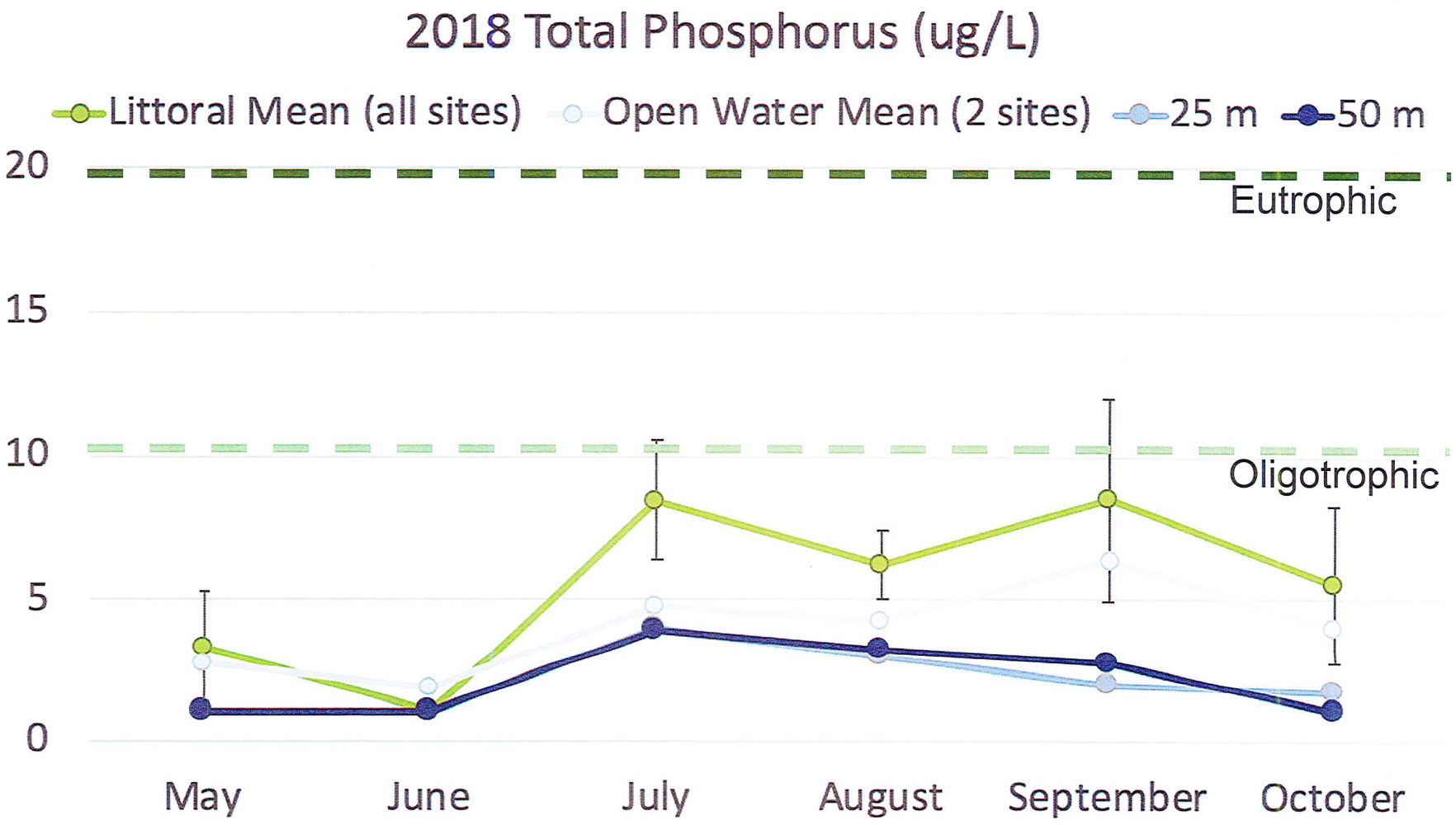

2018 Seasonal Algal Abundance
Chlorophyll-a (ug/L)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Eutrophic
Mesotrophic
5/2/2018
6/2/2018
7/2/2018
8/2/2018
9/2/2018
10/2/2018
West River
Vine Valley
Hope Point
Fallbrook
Deep Run
Seneca Point

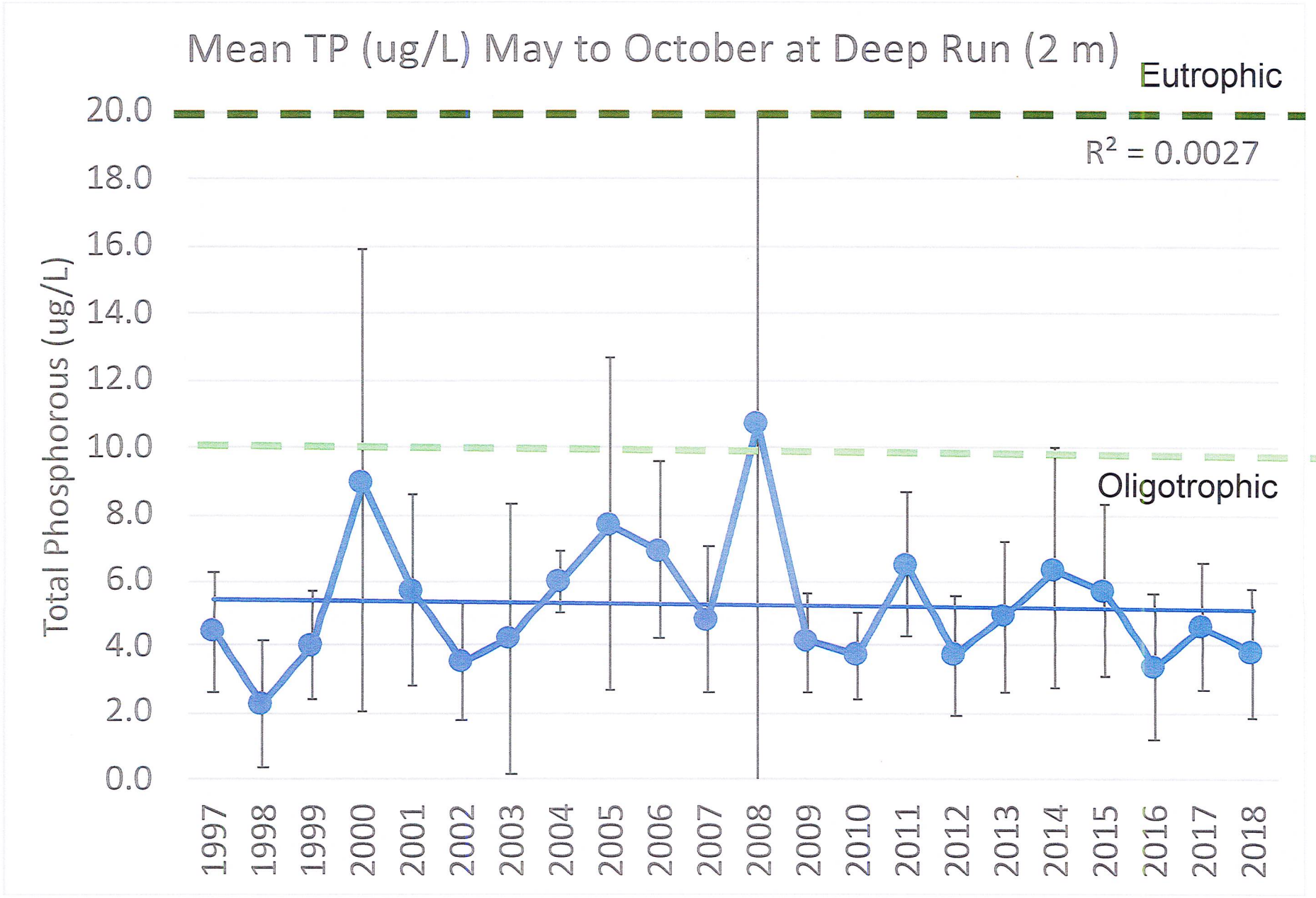
Long-term Summer Mean Algal Abundance (1996-2018)



Total Phosphorous

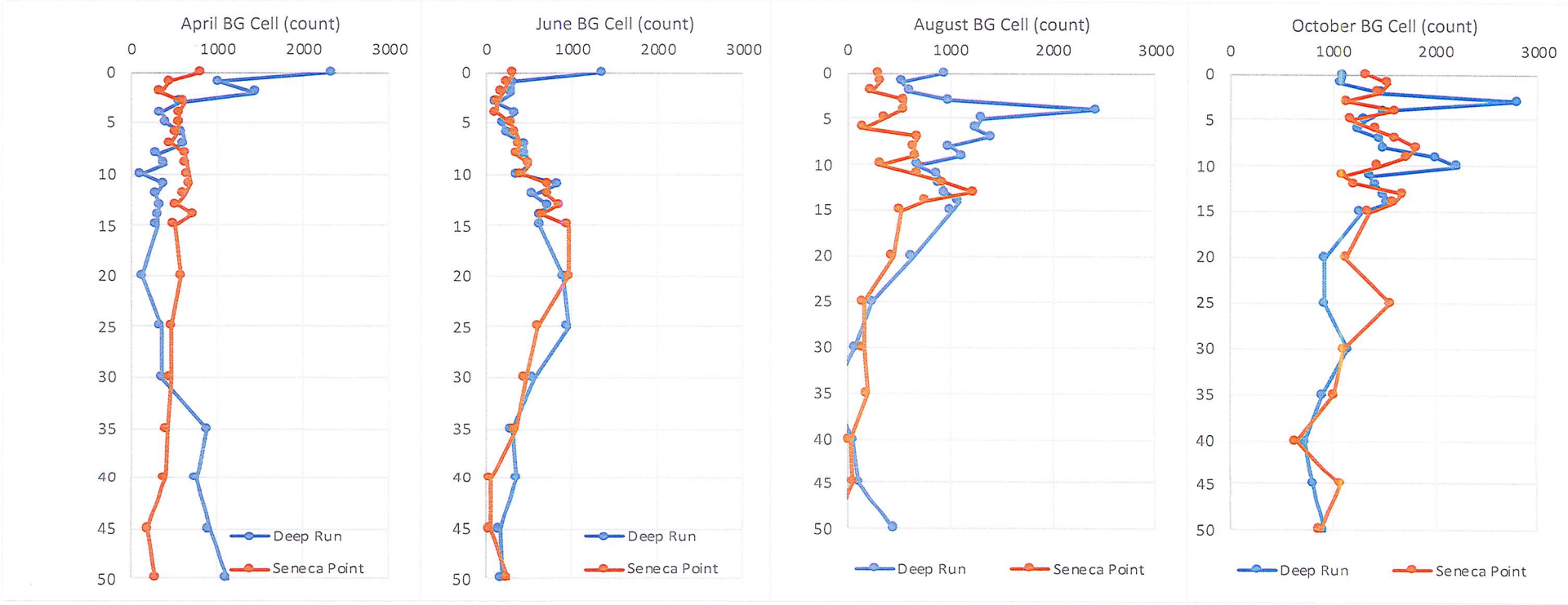
- Includes ortho-phosphate and the phosphorus in suspended plant and animal fragments
- New York State's trophic assessments
  - Eutrophic: total phosphorus readings exceeded 20 ug/l
  - Mesotrophic: between the two categories
  - Oligotrophic: total phosphorus readings below 10 ug/l


2018 Total Phosphorus (ug/L)
Littoral Mean (all sites)
Open Water Mean (2 sites)
25 m
50 m
20
15
10
5
0
Eutrophic
Oligotrophic
May
June
July
August
September
October


Mean TP (ug/L) May to October at Deep Run (2 m)
Eutrophic
Oligotrophic
R^2 = 0.0027
Total Phosphorous (ug/L)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

Blue-green Algal Distribution

WHO lists low probability of health effects <20,000 cells/mL
(or 10 µg/L chlorophyll *a*, or 10 µg/L microcystin-LR)



modifying factors: time of day (diurnal behavior)
zooplankton herbivory
surface weather conditions
shoreline sites may be significantly higher

What affects algal abundance?

Nutrients – managing nutrients is complicated! It requires monitoring external loading of phosphorus and nitrogen, and total concentrations in the lake.

- Some sources of nutrients are "easily" managed
  - Effective watershed regulations may reduce external loading
- Other sources of nutrients "require higher levels of resource commitment and restoration/enhancement activities"
  - Intense storm events produce locally high nutrient runoff, leading to sub-watershed storm water management projects
- The impact of biologically-bound phosphorus affects the concentrations detected in the lake
  - Changing role of invasive quagga and zebra mussels living in the benthic zone of the lake

Thank you! Questions?

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