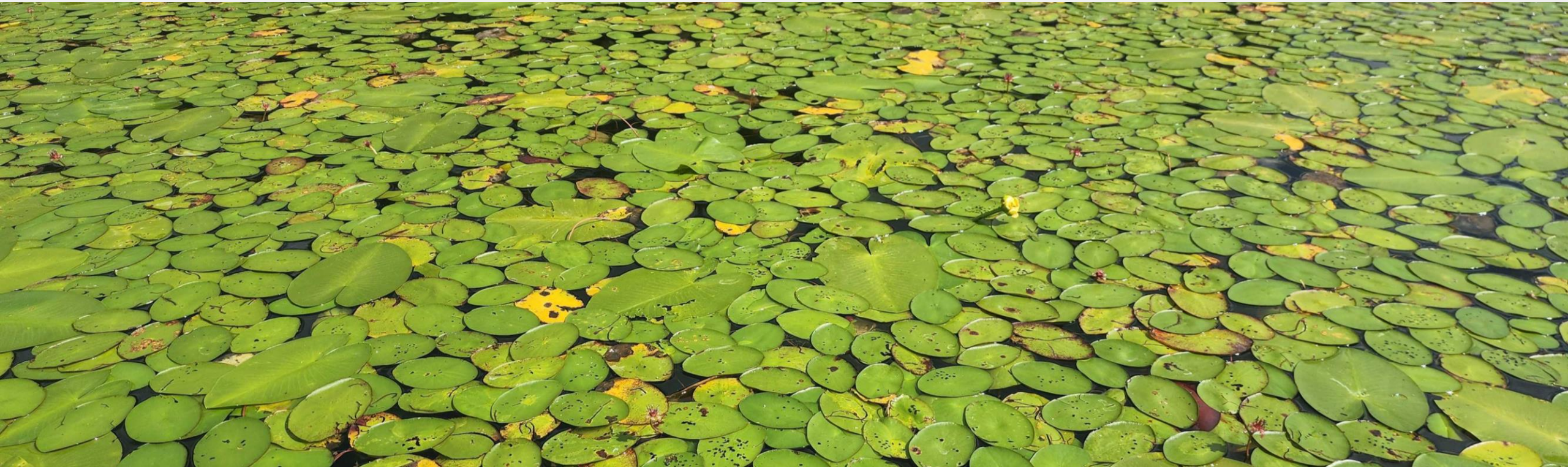
CLFLWD
WATERSHED DISTRICT

2022 Progress Summary

April 13, 2023 Regular Board Meeting

Emily Heinz, Planning Coordinator



Context

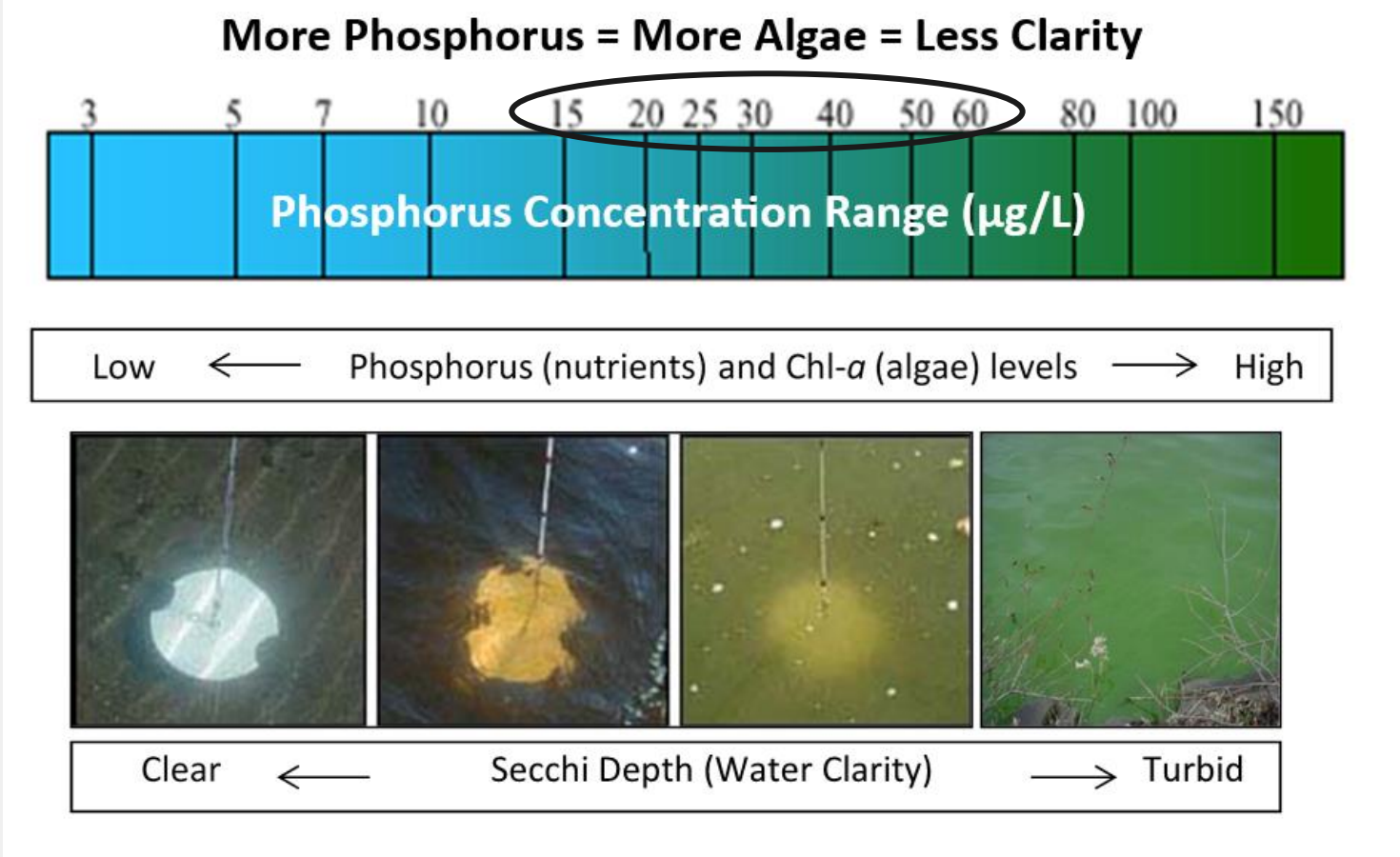
What does meeting goals/state standards mean?

- Cleaner, clearer water
  - See your toes in chest deep water
- Less frequent and less severe algae blooms
- A healthier, thriving lake ecosystem
  - Healthy native plant community
  - Thriving gamefish population

Context

What do we measure and why?

- Phosphorus: feeds algae
- Chl-a: measure of algae growth
- Secchi: measure of clarity
- Total suspended solids: measured in streams and lake inlets/outlets; indicator of land use in surrounding watershed



Intro/Example

Update on lake nutrient impairments

1. Water Quality Samples:
   - Phosphorus standard and
   - Chlorophyll-a or Secchi disk standard
   - *≥8 samples collected from 2 years within most recent 10-year period*
   - *10-year average phosphorus concentrations*
   - *2 most recent summer averages and the individual samples*
2. Trend/Management Activities
   - Improving trend in total phosphorus or
   - Management activities in place
   - "Significantly" improving/declining trends are statistically significant

Example Lake Phosphorus Deep Lake State Standard ≤ 40 µg/L Shallow Lake State Std ≤ 60 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average										
Samples 1-8. Sample dates vary by year. All samples shown were taken between June-September.	Orange cells indicate samples that do not meet state standards					Blue cells indicate samples that meet state standards				

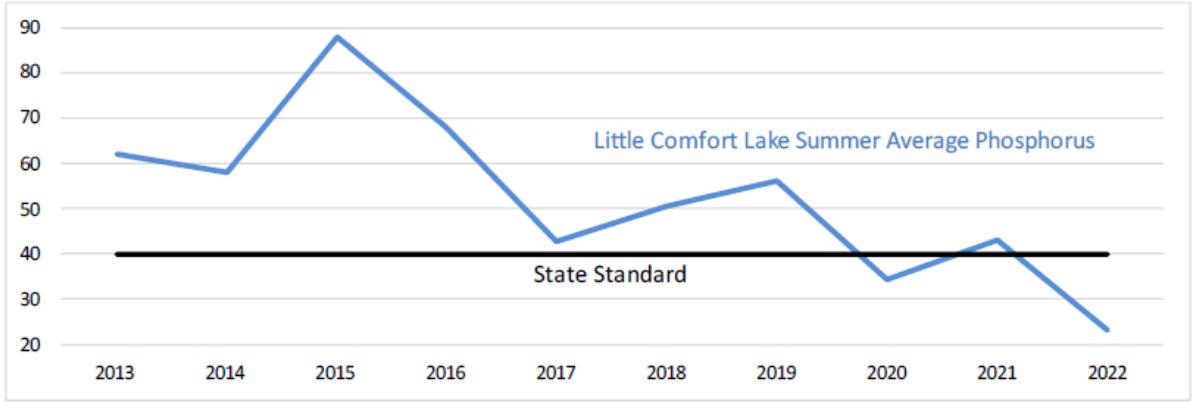
Little Comfort Lake

10-Year Average: 48 µg/L

Delisting Verdict:

Close, but not quite, do more projects

Lake	Total Phosphorus Trend	Chlorophyll-a Trend	Secchi Disk Trend
Little Comfort Lake	**Significantly Improving Trend Since 2013**	Improving Trend Since 2013	Improving Trend Since 2013



*"Significantly" improving/declining trends are statistically significant

Little Comfort Lake Phosphorus Deep Lake State Standard ≤ 40 µg/L 10-Year Average: 48 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**62**	**58**	**88**	**68**	**43**	**50**	**56**	**34**	**43**	**23**
Sample 1	32	63	26	28	19	33	74	33	54	24
Sample 2	64	93	67	176	42	33	37	29	86	24
Sample 3	65	97	74	44	26	45	41	44	34	31
Sample 4	62	50	366	50	63	114	76	30	12	26
Sample 5	64	40	56	61	71	52	113	36	22	24
Sample 6	37	44		56	34	50	39		34	17
Sample 7	47	72	23	71	36	33	29		100	12
Sample 8	80	25	28	92	50	43	39		24	10

Little Comfort Lake Secchi Deep Lake State Standard ≥ 4.6 ft 10-Year Average: 5.3 ft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**5.5**	**5.9**	**4.3**	**3.5**	**3.6**	**4.2**	**4.5**	**5.8**	**8.4**	**7.5**
Sample 1	7.5	6.0	6.0	5.0	3.5	6.0	5.5	5.7	9.8	8.5
Sample 2	6.0	3.5	3.5	2.5	3.0	4.5	4.5	4.8	9.8	8.2
Sample 3	3.0	3.7	2.0	4.0	1.5	3.0	5.5	6.2	9.5	7.2
Sample 4	5.0	5.5	3.5	3.0	2.0	2.5	2.0	5.6	10.2	7.1
Sample 5	5.5	8.5	4.5	2.5	3.0	3.0	3.5	6.6	7.2	7.5
Sample 6	7.5	5.5	4.5	4.0	3.5	3.5	4.8		5.9	6.9
Sample 7	6.0	5.0	4.5	3.0	5.0	4.5	5.5		4.6	8.5
Sample 8	5.5	7.5	4.5	4.0	7.0	7.0	4.5		7.2	7.2

Little Comfort Lake Chlorophyll-a Deep Lake State Standard ≤ 14 µg/L 10-Year Average: 19 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**25**	**22**	**28**	**47**	**26**	**26**	**27**	**13**	**7**	**7**
Sample 1	10	13	7	19	29	5	15	23	3	3
Sample 2	22	24	37	43	26	7	13	16	3	7
Sample 3	30	30	77	27	44	30	19	12	4	7
Sample 4	18	16	24	36	28	41	30	10	3	7
Sample 5	25	12	20	51	20	43	35	2	13	8
Sample 6	13	27		31	23	24	36		15	6
Sample 7	13	37	23	90	19	28	27		12	6
Sample 8	61	16	28	77	17	27	41		10	8

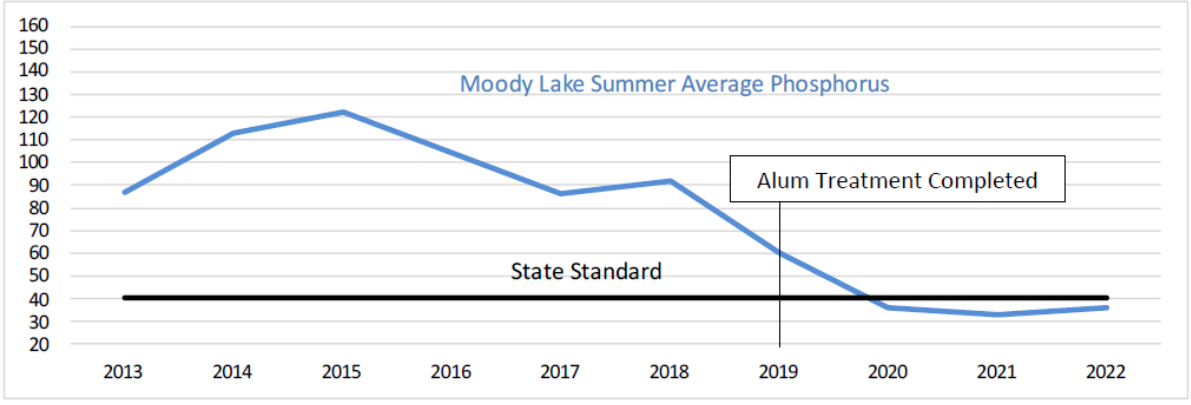
NOT Meeting State Standards | Meeting State Standards

Moody Lake

10-Year Average: 82 µg/L

Delisting Verdict:
Close, but not quite, continue monitoring

Lake	Total Phosphorus Trend	Chlorophyll-a Trend	Secchi Disk Trend
Moody Lake	**Significantly Improving Trend Since 2005**	Improving Trend Since 2005	Improving Trend Since 2005



*"Significantly" improving/declining trends are statistically significant

Moody Lake Phosphorus Deep Lake State Standard ≤ 40 µg/L 10-Year Average: 82 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**87**	**113**	**122**	**104**	**86**	**92**	**60**	**36**	**33**	**36**
Sample 1	49	185	79	59	101	73	75	58	30	46
Sample 2	80	220	114	72	107	103	83	24	62	39
Sample 3	178	102	158	130	152	84	67	45	47	51
Sample 4	144	95	175	106	63	153	109	31	55	37
Sample 5	105	78	195	91	68	112	64	34	14	44
Sample 6	65	62	138	117	72	112	57	30	14	26
Sample 7	60	54	89	162	71	41	37	40	11	17
Sample 8	62	44	84	91	54	60	40	32	27	20

Moody Lake Secchi Deep Lake State Standard ≥ 4.6 ft 10-Year Average: 3.0 ft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**3.7**	**2.7**	**2.1**	**2.7**	**1.9**	**1.8**	**2.4**	**3.6**	**8.7**	**4.2**
Sample 1	7.5	3.0	3.0	4.0	4.0	2.5	1.5	2.6	8.9	5.9
Sample 2	6.5	1.5	3.5	3.0	1.0	1.0	2.0	4.3	8.5	5.6
Sample 3	2.5	2.5	1.5	2.0	1.2	1.5	1.7	2.0	7.2	4.9
Sample 4	2.0	2.0	1.0	2.5	1.5	0.5	0.8	3.6	7.9	3.6
Sample 5	3.5	2.0	2.0	2.0	1.5	1.2	1.5	3.3	7.2	3.0
Sample 6	2.5	3.0	1.5	1.5	2.0	1.0	1.0		7.2	3.3
Sample 7	3.0	3.0	1.5	3.0	2.0	3.5	4.0	5.2	9.8	4.3
Sample 8	2.5	3.5	1.5	3.0	2.0	3.5	2.0	3.9	12.5	5.2

Moody Lake Chlorophyll-a Deep Lake State Standard ≤ 14 µg/L 10-Year Average: 43 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**32**	**45**	**59**	**42**	**44**	**77**	**41**	**22**	**4**	**24**
Sample 1	12	36	46	28	22	34	60	33	3	8
Sample 2	25	110	17	38	80	110	45	11	5	11
Sample 3	33	61	67	48	66	73	63	41	4	23
Sample 4	49	41	110	30	72	130	45	17	2	20
Sample 5	54	51	67	47	34	84	19	27	7	20
Sample 6	30	45	69	74	27	93	46	23	5	20
Sample 7	33	33	65	44	30	43	22	9	5	11
Sample 8	31	23	47	33	24	30	54	17	1	8

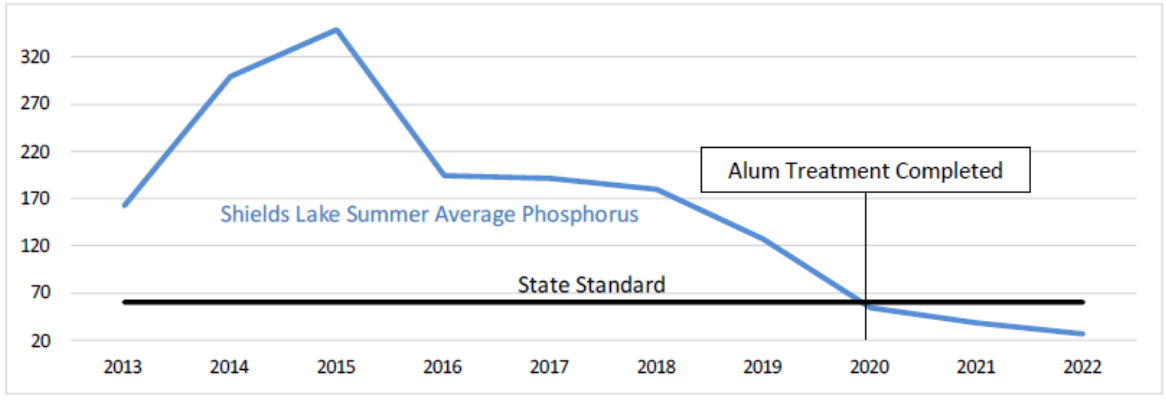
NOT Meeting State Standards | Meeting State Standards

Shields Lake

10-Year Average: 161 µg/L

Delisting Verdict:
Qualifies, but collect more years of data

Lake	Total Phosphorus Trend	Chlorophyll-a Trend	Secchi Disk Trend
Shields Lake	**Significantly Improving Trend Since 2012**	Improving Trend Since 2001	Improving Trend Since 2012



*"Significantly" improving/declining trends are statistically significant

Shields Lake Phosphorus Shallow Lake State Standard ≤ 60 µg/L 10-Year Average: 161 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**162**	**299**	**349**	**194**	**191**	**180**	**128**	**54**	**38**	**27**
Sample 1	98	255	358	121	74	222	102	19	27	22
Sample 2	128	326	366	238	170	210	150	45	27	33
Sample 3	358	291	333	317	262	283	212	66	28	32
Sample 4	275	356	346	241	300	201	141	81	25	23
Sample 5	190	299	329	153	203	174	138	75	104	21
Sample 6	81	327	383	128	226	149	93	65	36	36
Sample 7	83	332	303	190	190	122	82	24	51	22
Sample 8	90	288	582	168	118	76	114		23	14

Shields Lake Secchi Shallow Lake State Standard ≥ 3.3 feet 10-Year Average: 3.7 ft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**4.1**	**3.4**	**1.9**	**2.7**	**2.2**	**1.9**	**2.5**	**3.7**	**8.4**	**6.5**
Sample 1	7.0	5.0	3.5	5.0	6.5	4.0	5.5	5.9	13.6	7.9
Sample 2	8.0	3.5	1.0	3.0	4.5	0.5	2.0	3.6	14.4	6.6
Sample 3	4.0	3.0	1.5	2.5	1.0	1.0	1.5	5.2	14.4	5.2
Sample 4	2.0	2.5	1.5	2.5	1.0	1.5	3.2	3.3	8.4	5.9
Sample 5	3.5	2.0	1.0	2.0	1.5	1.7	0.5	2.5	2.6	6.9
Sample 6	3.0	2.5	1.0	1.5	1.5	1.5	2.0	2.0	6.6	6.6
Sample 7	2.0	3.5	1.0	2.5	1.0	2.0	2.0	3.6	4.3	7.9
Sample 8	2.0	2.5	1.5	3.5	2.0	3.0	2.5		5.9	6.9

Shields Lake Chlorophyll-a Shallow Lake State Standard ≤ 20 µg/L 10-Year Average: 42 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**39**	**34**	**77**	**52**	**64**	**67**	**52**	**31**	**6**	**7**
Sample 1	9	11	59	22	7	21	25	14	1	9
Sample 2	15	44	120	37	35	160	88	25	2	1
Sample 3	18	33	64	76	160	99	52	13	4	5
Sample 4	52	39	75	82	97	56	28	48	9	7
Sample 5	69	28	86	59	92	68	62	45	9	8
Sample 6	60	37	98	41	55	47	68	58	10	7
Sample 7	39	59	64	51	58	52	73	13	5	5
Sample 8	70	47	126	65	39	36	51		14	5

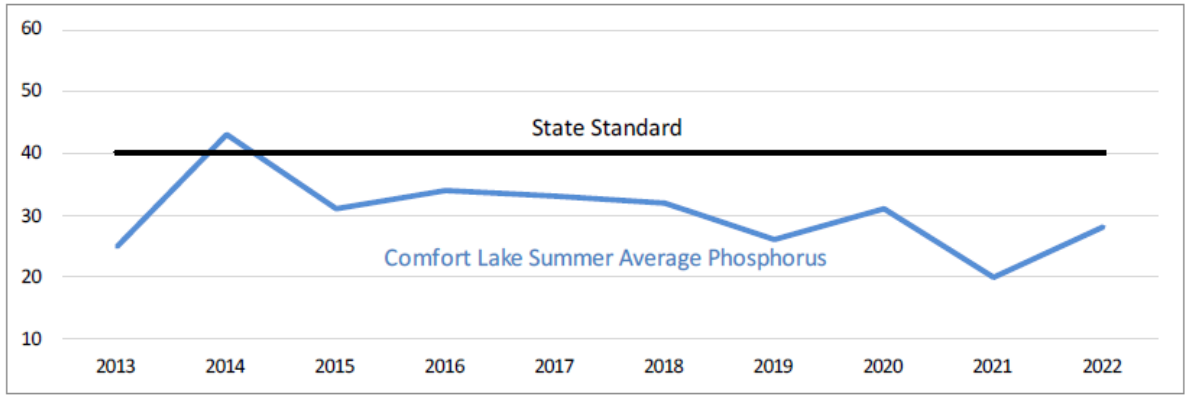
NOT Meeting State Standards | Meeting State Standards

Comfort Lake

10-Year Average: 30 µg/L

Delisting Verdict:
Qualifies, but more projects in progress

Lake	Total Phosphorus Trend	Chlorophyll-a Trend	Secchi Disk Trend
Comfort Lake	Improving Trend Since 1994	Significantly Improving Trend Since 2013	Significantly Improving Trend Since 2013



*"Significantly" improving/declining trends are statistically significant

Comfort Lake Phosphorus Deep Lake State Standard ≤ 40 µg/L 10-Year Average: 30 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**25**	**43**	**31**	**34**	**33**	**32**	**26**	**31**	**20**	**28**
Sample 1	18	45	23	16	18	51	57	21	31	26
Sample 2	21	61	14	27	67	20	22	13	44	34
Sample 3	38	85	28	86	27	34	24	17	20	38
Sample 4	40	45	50	28	55	38	20	16	8	25
Sample 5	24	17	38	32	23	24	30	73	12	25
Sample 6	20	16	36	29	23	22	33	45	15	15
Sample 7	21	41	38	29	17		19	30	16	24
Sample 8	20	30	28	27	18		23	18	15	33

Comfort Lake Secchi Deep Lake State Standard ≥ 4.6 ft 10-Year Average: 5.7 ft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**5.7**	**4.6**	**5.5**	**5.5**	**5.8**	**7.7**	**5.3**	**6.0**	**8.4**	**5.9**
Sample 1	6.5	6.0	7.5	8.0	7.5	14.0	7.5	6.6	9.8	8.2
Sample 2	9.0	4.0	6.5	6.0	6.5	8.5	6.0	9.5	9.8	6.6
Sample 3	4.5	3.5	4.5	6.5	6.0	7.0	5.5	7.5	8.9	4.6
Sample 4	4.0	4.0	3.0	6.0	4.5	4.5	5.0	5.6	10.2	5.2
Sample 5	3.5	4.5	4.5	3.0	4.5	6.0	4.0	6.0	7.9	4.6
Sample 6	5.0	6.0	4.5	4.5	6.0	6.0	4.5	5.7	9.2	5.9
Sample 7	6.5	4.5	4.5	4.0	5.5		5.5	5.5	6.2	6.9
Sample 8	7.0	4.5	5.0	4.5	6.0		6.0	4.9	5.6	5.6

Comfort Lake Chlorophyll-a Deep Lake State Standard ≤ 14 µg/L 10-Year Average: 14 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**14**	**17**	**20**	**16**	**12**	**14**	**16**	**10**	**4**	**10**
Sample 1	16	6	10	7	9	4	9	5	4	2
Sample 2	7	28	10	10	1	9	13	7	7	8
Sample 3	14	16	26	9	13	10	21	6	2	16
Sample 4	18	24	27	14	17	33	21	8	1	10
Sample 5	16	16	28	31	13	12	15	16	3	13
Sample 6	15	7	25	22	13	14	27	10	4	8
Sample 7	7	16	26	25	13		20	11	8	8
Sample 8	21	26	24	23	21		15	12	6	13

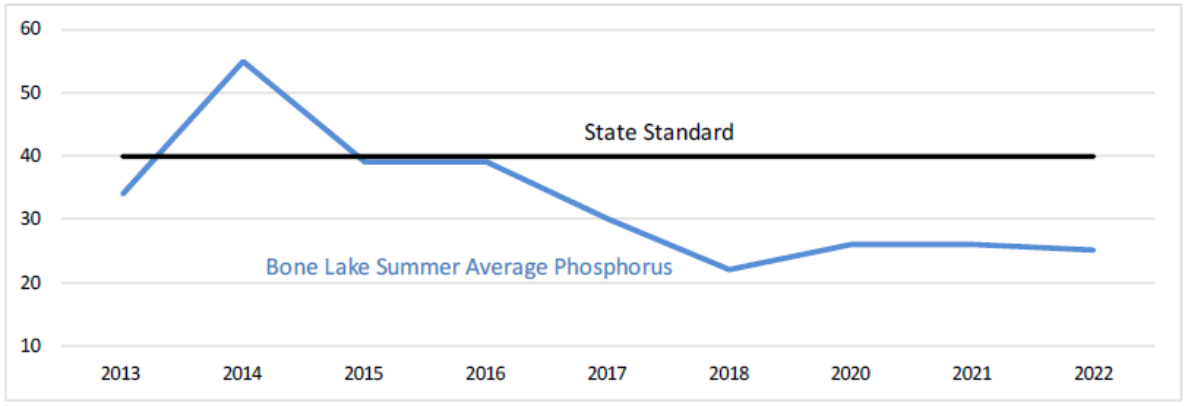
NOT Meeting State Standards | Meeting State Standards

Bone Lake

10-Year Average: 32 µg/L

Delisting Verdict: Qualifies!

Lake	Total Phosphorus Trend	Chlorophyll-a Trend	Secchi Disk Trend
Bone Lake	Significantly Improving Trend Since 2013	Significantly Improving Trend Since 2013	Significantly Improving Trend Since 2013



*"Significantly" improving/declining trends are statistically significant

Bone Lake Phosphorus Deep Lake State Standard ≤ 40 µg/L 10-Year Average: 32 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**34**	**55**	**39**	**39**	**30**	**22**	**29**	**26**	**26**	**25**
Sample 1	32	24	44	35	35	22	24	30	32	24
Sample 2	36	46	26	37	41	21	23	45	36	37
Sample 3	53	130	32	58	38	24	28	13	31	26
Sample 4	35	103	36	31	28	26	35	20	17	16
Sample 5	39	34	45	51	20	22	30	31	28	29
Sample 6	32	25	53	28	23	20	29	22	18	24
Sample 7	33	31	42	41	26	19	30	18	22	19
Sample 8	25	48	37	42	23	20	33		22	28

Bone Lake Secchi Deep Lake State Standard ≥ 4.6 ft 10-Year Average: 4.9 ft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**3.9**	**3.6**	**3.9**	**4.2**	**5.8**	**6.5**	**5.0**	**5.8**	**7.3**	**5.9**
Sample 1	4.5	4.3	4.0	3.5	2.5	6.5	7.0	4.9	6.2	4.3
Sample 2	4.5	4.6	3.5	4.0	4.5	7.0	6.0	5.6	6.9	5.2
Sample 3	3.5	3.9	4.5	4.5	3.5	6.5	5.0	8.5	7.9	6.6
Sample 4	4.5	3.3	4.0	3.5	4.5	7.5	4.5	5.6	7.5	8.2
Sample 5	3.0	3.0	3.0	3.5	6.5	4.5	3.0	5.6	8.2	6.9
Sample 6	5.0	2.6	3.5	5.5	9.5	5.0	4.5	6.6	8.2	5.9
Sample 7	4.5	3.3	4.0	5.5	8.5	9.0	4.5	3.9	8.2	5.6
Sample 8	3.0	3.6	4.0	4.0	7.0	6.0	5.5		4.9	4.3

Bone Lake Chlorophyll-a Deep Lake State Standard ≤ 14 µg/L 10-Year Average: 17 µg/L	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Summer Average	**20**	**24**	**30**	**22**	**20**	**10**	**21**	**12**	**8**	**14**
Sample 1	31	22	14	26	59	9	10	16	10	11
Sample 2	18	31	13	20	15	6	11	11	6	18
Sample 3	15	26	20	27	26	1	15	4	6	8
Sample 4	18	26	36	21	12	12	26	9	6	10
Sample 5	33	26	56	24	11	20	40	12	6	15
Sample 6	18	13	33	15	7	10	18	19	6	18
Sample 7	20	23	43	17	9	7	26	11	5	18
Sample 8	15	27	37	33	17	16	21		15	16

NOT Meeting State Standards | Meeting State Standards

Bone Lake

Delisting Verdict: Qualifies!

Provide the data to PCA staff and they will decide.

Reduction Goal: 786 lbs

Progress (Completed + In Progress Projects): 100%

Figure 3. Bone Lake Phosphorus Reduction Goals and Project Progress Graph

Forest Lake

Not Impaired

Protect against becoming impaired

Watershed projects address external loading, alum treatment will address internal loading

Lake	Total Phosphorus Trend	Chlorophyll-a Trend	Secchi Disk Trend
Forest Lake West	**Significantly Improving Trend Since 1984**	**Significantly Improving Trend Since 2001**	**Significantly Improving Trend Since 2013**
Forest Lake Middle	Declining Trend Since 2013	Declining Trend Since 2013	Declining Trend Since 2013
Forest Lake East	Declining Trend Since 2013	Declining Trend Since 2013	Improving Trend Since 2013

*"Significantly" improving/declining trends are statistically significant