Nutrient reduction as a necessary mean to reduce nuisance and harmful algal blooms in Lake Huntington, NY.

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Lake Huntington

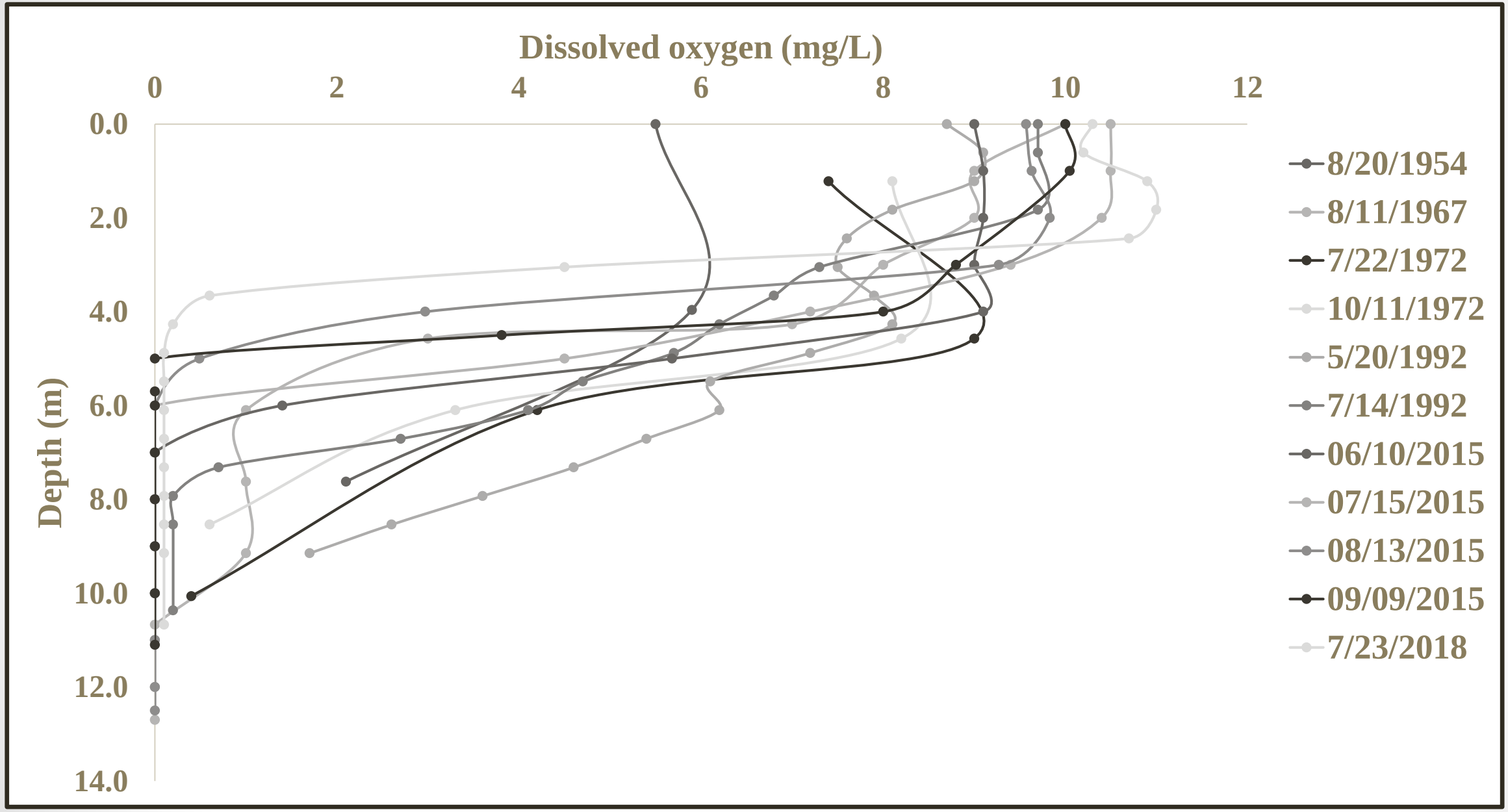
- 80 acre lake
- Max depth-41ft
- Mean depth-9ft
- Eutrophic
- Dimictic
- Spring fed
- Nutrient sink
- Class B(T)

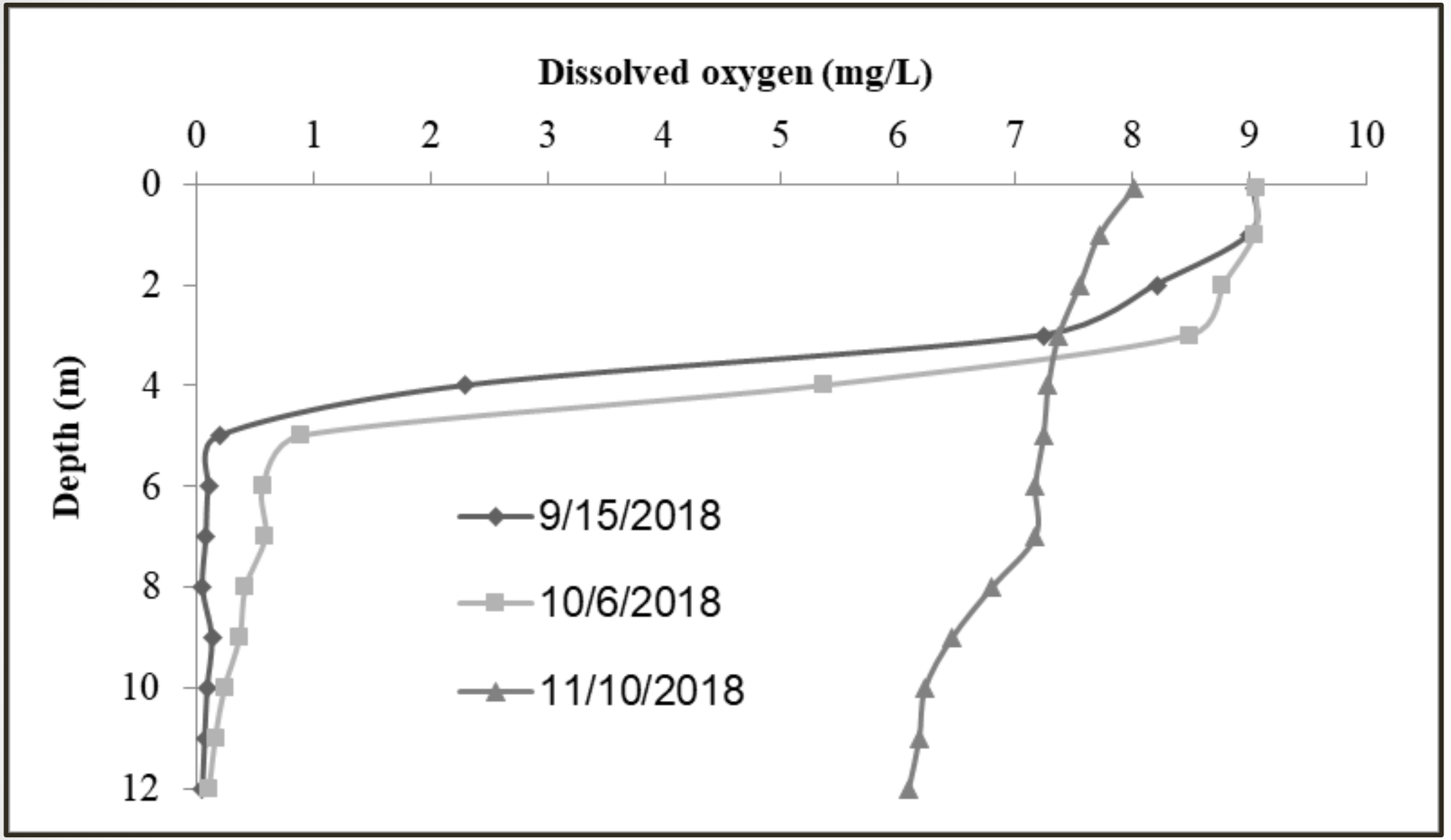
Work done at Lake Huntington

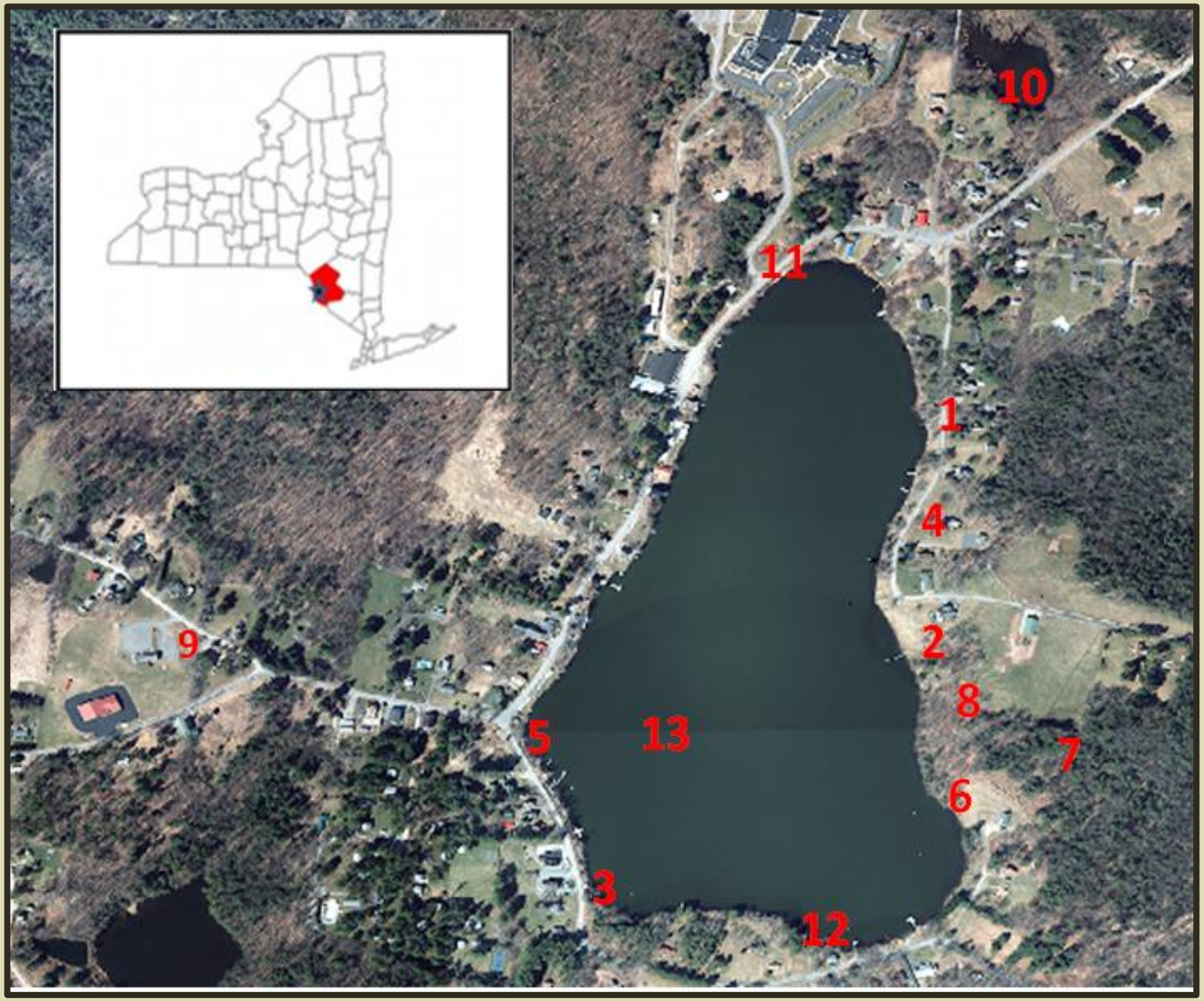
- State of the lake/interim management plan
- Lake morphometry
- Land use
- Watershed soil septic suitability
- Water quality analysis
- Nutrient sampling
- Aquatic macrophyte survey
- Zooplankton analysis
- Fishery analysis

Stakeholder concerns

- Increased rate of algal blooms, harmful and nuisance in recent years
- Excess nutrients from the watershed
- Safety
- Time of action


Dissolved oxygen (mg/L)
0
2
4
6
8
10
12
Depth (m)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
8/20/1954
8/11/1967
7/22/1972
10/11/1972
5/20/1992
7/14/1992
06/10/2015
07/15/2015
08/13/2015
09/09/2015
7/23/2018


Dissolved oxygen (mg/L)
0
1
2
3
4
5
6
7
8
9
10
Depth (m)
0
2
4
6
8
10
12
9/15/2018
10/6/2018
11/10/2018



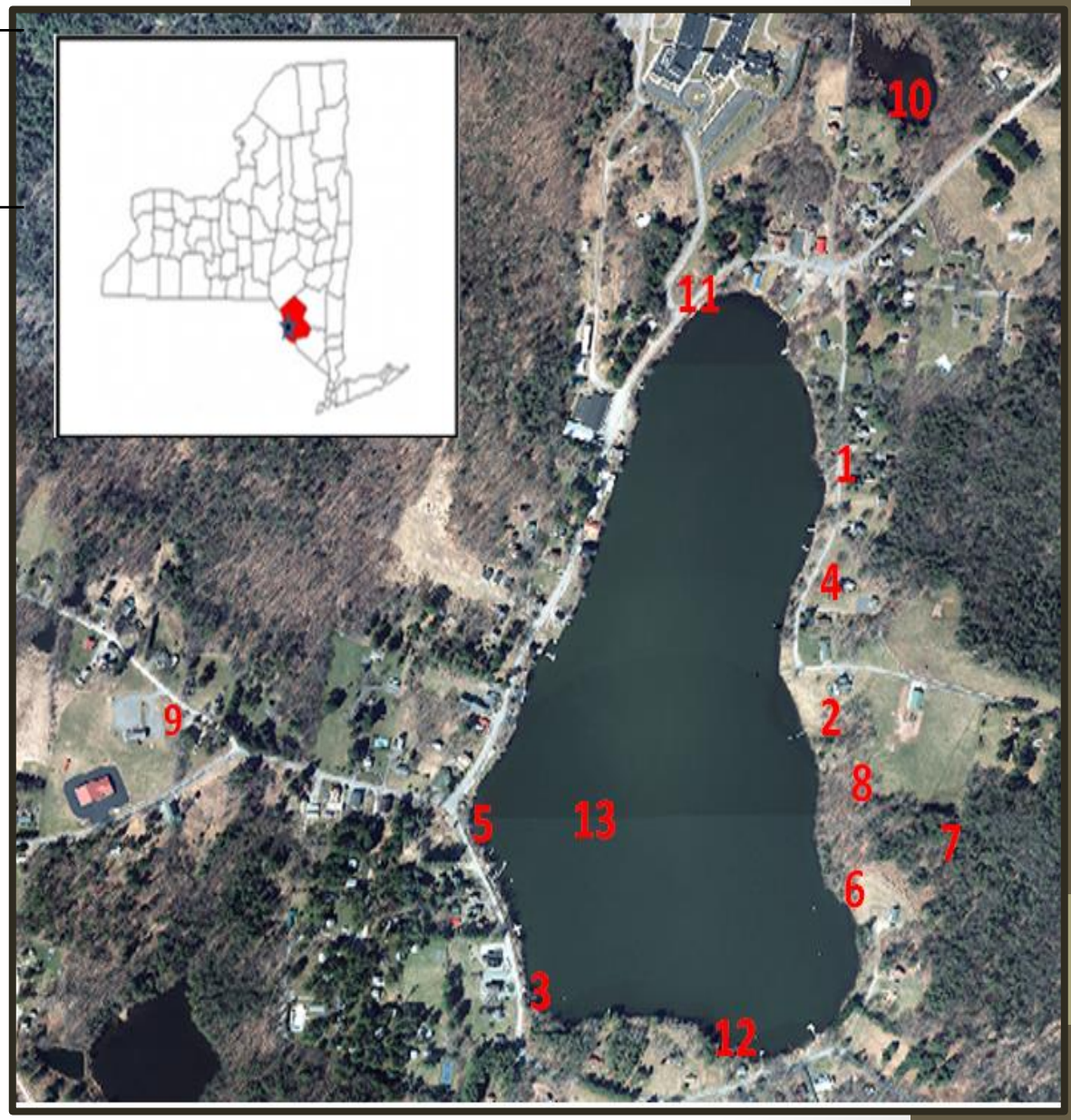
Sampling points

In-lake nutrient sampling

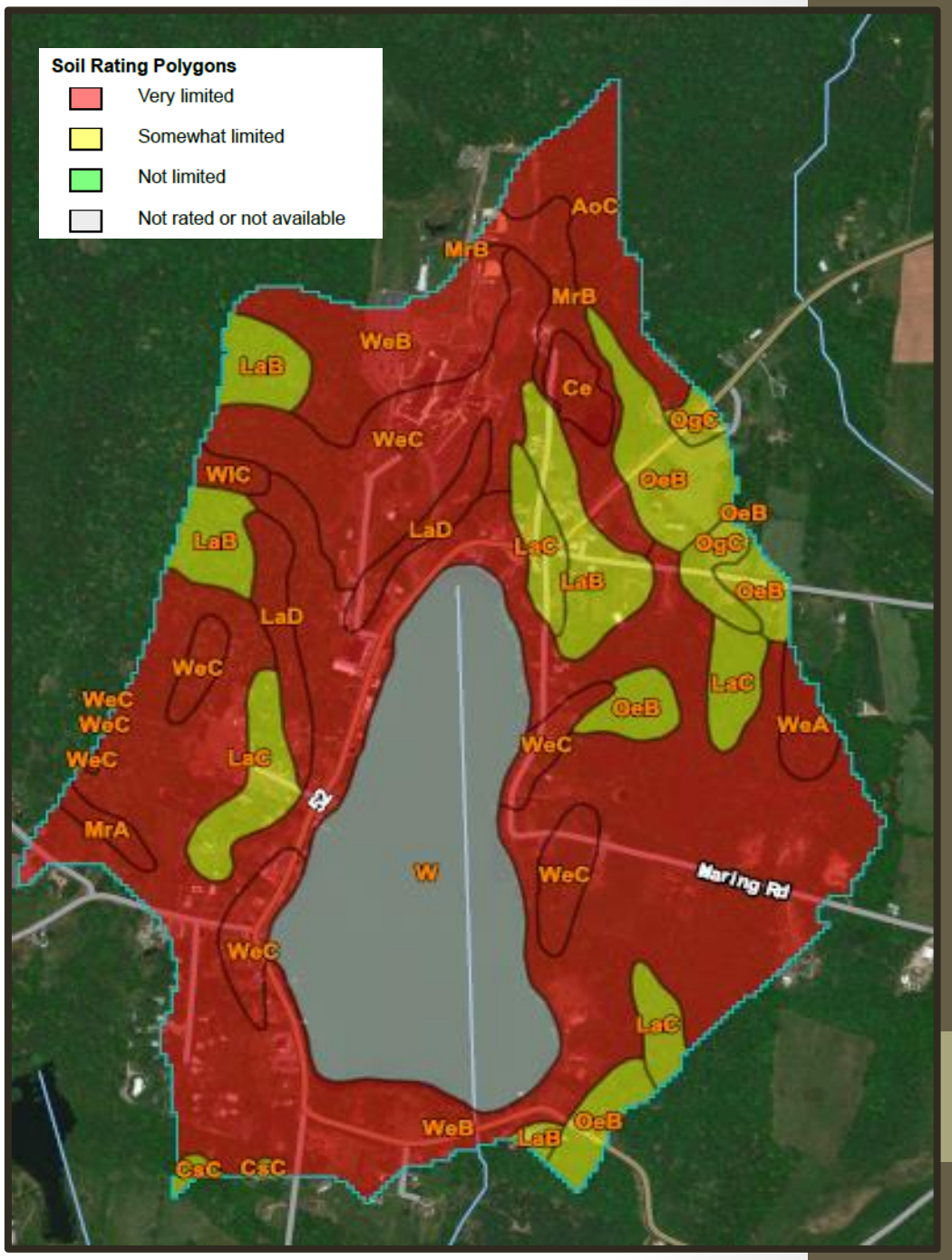
Date	Depth (m)	NO3 and NO2 (mg/L)	TN (mg/L)	TP (mg/L)
9/15/2018	0	bd	0.45	0.012
9/15/2018	2	bd	0.45	0.013
9/15/2018	4	bd	1.12	0.022
9/15/2018	6	bd	2.05	0.133
9/15/2018	8	bd	2	0.139
9/15/2018	10	bd	3.28	0.485
9/15/2018	12	bd	3.35	1.080
10/6/2018	0	bd	0.32	0.007
10/6/2018	2	bd	0.48	0.013
10/6/2018	4	bd	0.42	0.010
10/6/2018	6	0.11	1.29	0.006
10/6/2018	8	1.06	0.75	0.013
10/6/2018	10	2.27	2.42	0.023
10/6/2018	12	1.23	2.12	0.146

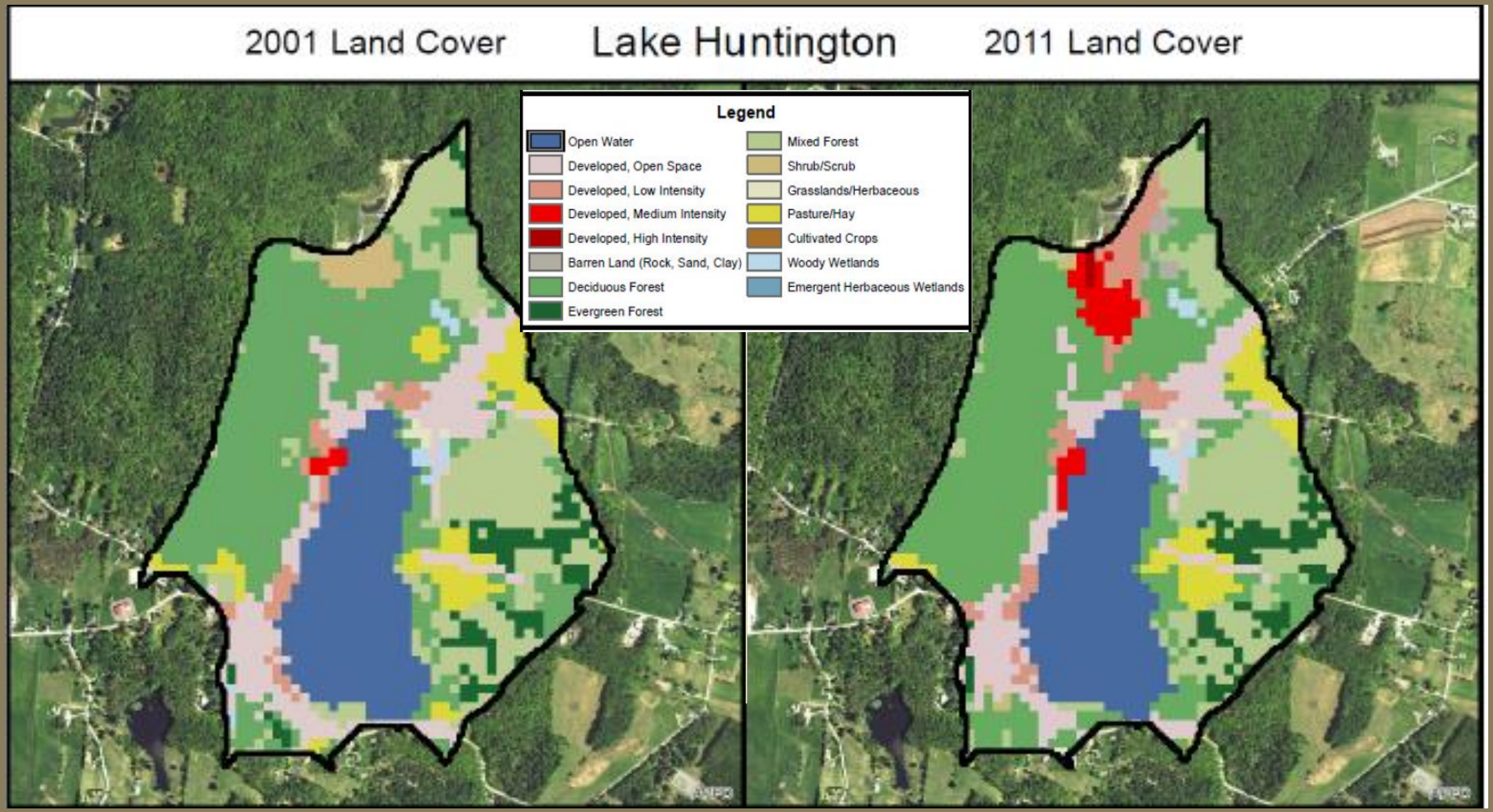
Watershed nutrient sampling

Date	Site location	NO3 & NO2 (mg/L)	TN (mg/L)	TP (mg/L)
9/15/18	1	0.88	1.37	0.333
9/15/18	12	bd	0.71	0.015
10/20/18	1	0.86	0.91	0.027
10/20/18	2	0.19	0.42	0.166
10/20/18	3	0.18	0.37	0.013
10/20/18	4	0.26	1.13	0.083
10/20/18	5	0.34	0.59	0.052
10/20/18	6	0.36	1.69	13.70
10/20/18	7	0.2	0.57	2.520
10/20/18	8	bd	0.57	3.640
10/20/18	9	bd	0.5	0.060
10/20/18	10	bd	0.74	3.020
10/20/18	11	0.34	0.54	0.055
10/20/18	12	bd	0.27	0.021



Rating	Acres in AOI	Percent of AOI
Very limited	295.3	65.30%
Somewhat limited	76.4	16.90%
Not rated	80.3	17.80%
Totals for AOI	452.1	100.00%




2001 Land Cover
Lake Huntington
2011 Land Cover
Legend
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land (Rock, Sand, Clay)
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grasslands/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands

Nuisance algal blooms

- Large filamentous algal blooms
- Recreationally impeding
- Not aesthetically pleasing

Harmful Algal Blooms (HABs)

- Health concerns
- NYSDEC HAB archive page-2014, 2016, 2017
- Implications for biological problems

In-lake management options

- Artificial circulation
- Hypolimnetic aeration
- Hypolimnetic withdrawal
- Algaecides
- Phosphorus inactivation

Artificial circulation

- Delivers compressed air through a pipe into the hypolimnion
- If sufficiently powered, will provide lake wide circulation eliminating temperature stratification
- Could affect algal populations, circulation decreases amount of time spent in photic zone
- Stand alone technique
- Benefits generally delayed
- Relatively low cost

Hypolimnetic aeration

- Adds enough oxygen content to the hypolimnion without adding turbulence to disrupt stratification
- Air lift system brings hypolimnetic waters to the surface aerates and waters sink back to the bottom
- Can also pump pure oxygen into the hypolimnion
- Appropriate in lakes with large hypolimnions
- Used during summer stratification
- Expensive costs

Hypolimnetic withdrawal

- Installation of a pipe or siphon along the bottom of the lake
- Water flows out by gravity to receiving waters
- May need to use an auxiliary pump
- Relatively passive lake management tool
- Biggest disadvantage is potential negative outcomes to receiving waters
- Expensive

In-lake management options

- Algaecides
- Copper sulfate application
- Short term fix
- Popular in NYS
- Quick action and low cost
- Rebound effect

https://www.indiamart.com/proddetail/copper-sulfate-crystal-16707362355.html

https://www.platinumlakemanagement.com/blog/copper-sulfate-can-i-apply-it-myself

In-lake management options

Phosphorus inactivation

- Precipitate and inactivate
- Binds phosphorus to sediments and removes from water column
- Alum
- Used in NYS in certain aspects
- Other alternatives- phoslock

https://www.desertcart.ae/products/34288934-phoslock-40-lbs

https://www.sepro.com/aquatics/phoslock

Nuisance waterfowl

https://nrdc.ncsu.gov/wildlife/nuisance-problem-species/nuisance-native-species/canada-geese_control

- Stakeholders expressed concerns about Canada geese (*Branta canadensis*) adding nutrients to the lake
- Discourage feeding of geese, including agricultural subsidies
- Limit near lake habitat
- Eliminate easy pathways to the lake
- Plant decorative shrubs or bushes along the shoreline (helps with erosion too)
- Oiling or destroying eggs

Implementation of BMPs


https://tahoecd.org/2015/03/best-management-practices-bmp-workshops-grow-nevada/

Agricultural BMPs

- Maintenance of a cover crop during winter months
- Filter strip along field edges
- Riparian buffer along stream banks
- Strip cropping
- Grassed waterways or farmed ponds to capture sediments from fields
- Planned, rotational grazing of livestock to help reduce soil erosion

Residential BMPs

- Replacing impermeable surfaces with gravel
- Add trees, shrubs, and mulch to capture and hold rainwater
- Disconnect devices that deliver rainwater to roadside ditches (i.e. gutters)
- Diversion of water to rain gardens so water has time to infiltrate soils


http://www.aascd.org/Agriculture/best-management-practices/

Recommendations moving forward

- Oxygen in the hypolimnion
- Implement BMPs
- Join CSLAP
- Public collaboration
- Sullivan West High School
- Natural state of the lake

https://sullivancounty4sale.com/property/33-nearing-lane-lake-huntington-ny-12726/

Acknowledgements

- Lake Huntington Lake Association (LHLA)
- Clark Foundation
- SUCO BFS

Questions?


GREEN ACRES on Lake Huntington, Sullivan County, N. Y. Phone Lake Huntington 3