

The Salisbury Lakes



Mirrors of the landscape



My name is Mary Silks and I am a property owner on Lakeville Lake. I am focusing on the lakes and not the other aquatic ecosystems in Salisbury such as streams, rivers, vernal pools, fens and bogs not because I think they are less important but because I don't know that much about them. I am more familiar with the lakes because I have been around the lakes quite a long time.



NOT THIS LONG



Not this long



AND NOT THIS LONG

But I do remember being able to look 25 feet down into the water and see the small native aquatic plants instead of milfoil.





Long enough to remember being able to paddle a canoe along the shore without running aground on a sediment delta 50 ft. from the shore



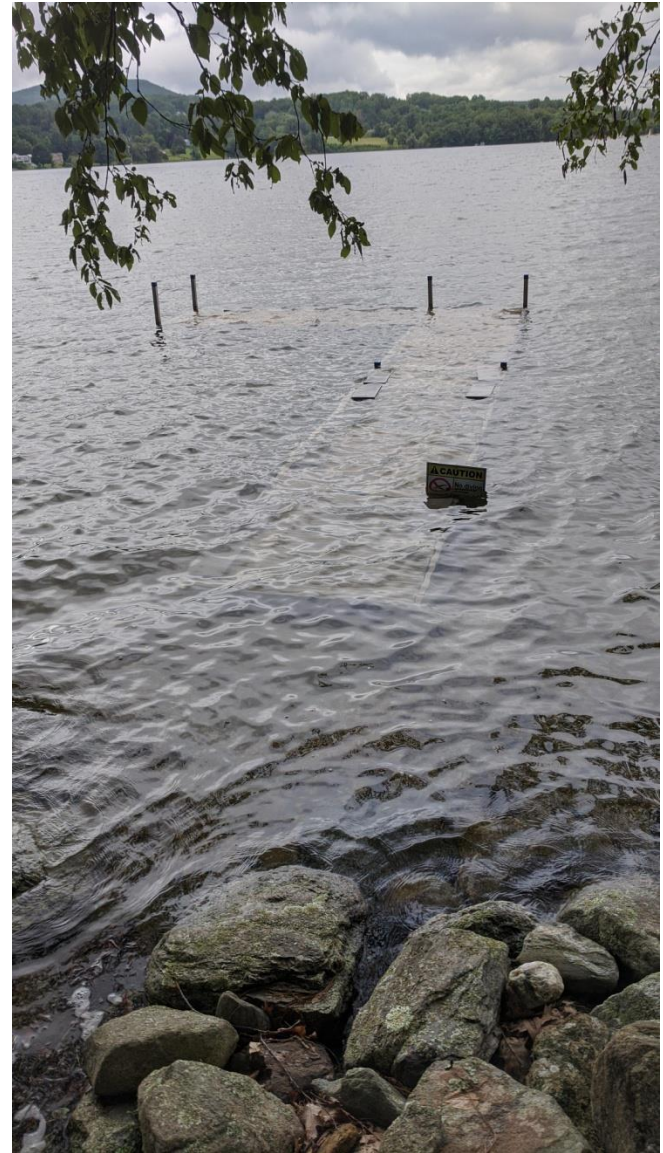


Long enough to remember diving off perch rock with it's thick pine forest that contained one of the three remaining places in New England that supported a colony of endangered ferns.



**Long enough to remember
skating on the lake on the
Christmas day that the
Lakeville theater burned
down**

**Long enough to remember
when 4 inches of rainfall
did not cause a 12 inch rise
in the level of the lake.**



Long enough to remember headlines like this in the newspaper in the 1970's when Lakeville Lake was mostly unusable due to a huge blue-green algae bloom that lasted for years and a parasite that caused "swimmers itch"

The Mess In The Lake

Lakeville 11.10.77

Salisbury's disappointing experience with State and Federal help to save Lake Wononscopomuc emphasizes one fundamental point: If anything meaningful is to be done, the Town and townspeople are going to have to initiate it themselves. That the lake urgently needs treatment no one should doubt. One whiff of the odor in parts of the lake, one glance at the weeds and the slimy condition of the water ought to persuade even the most skeptical that what was once a jewel of clarity is now very sick. And the rapid eutrophication over the past few years is a problem quite apart from the worsening "swimmer's itch" caused by parasites carried by snails.

In a sense, the reneged promises of State and Federal grants for extension of sewers the remainder of the way around the lake may be a blessing in disguise. The Union Carbide study which recommended sewerage recognized that the full effect on the lake would not be felt for perhaps 10 years. Director Thomas McGowan of the Northwestern Connecticut Regional Planning Agency has pointed out, too, that sewerage is not an unalloyed benefit. It brings pressure for rezoning into smaller lots, and consequently more building and more net pollution. Whether Salisbury could escape such fate over the long range is at least doubtful.

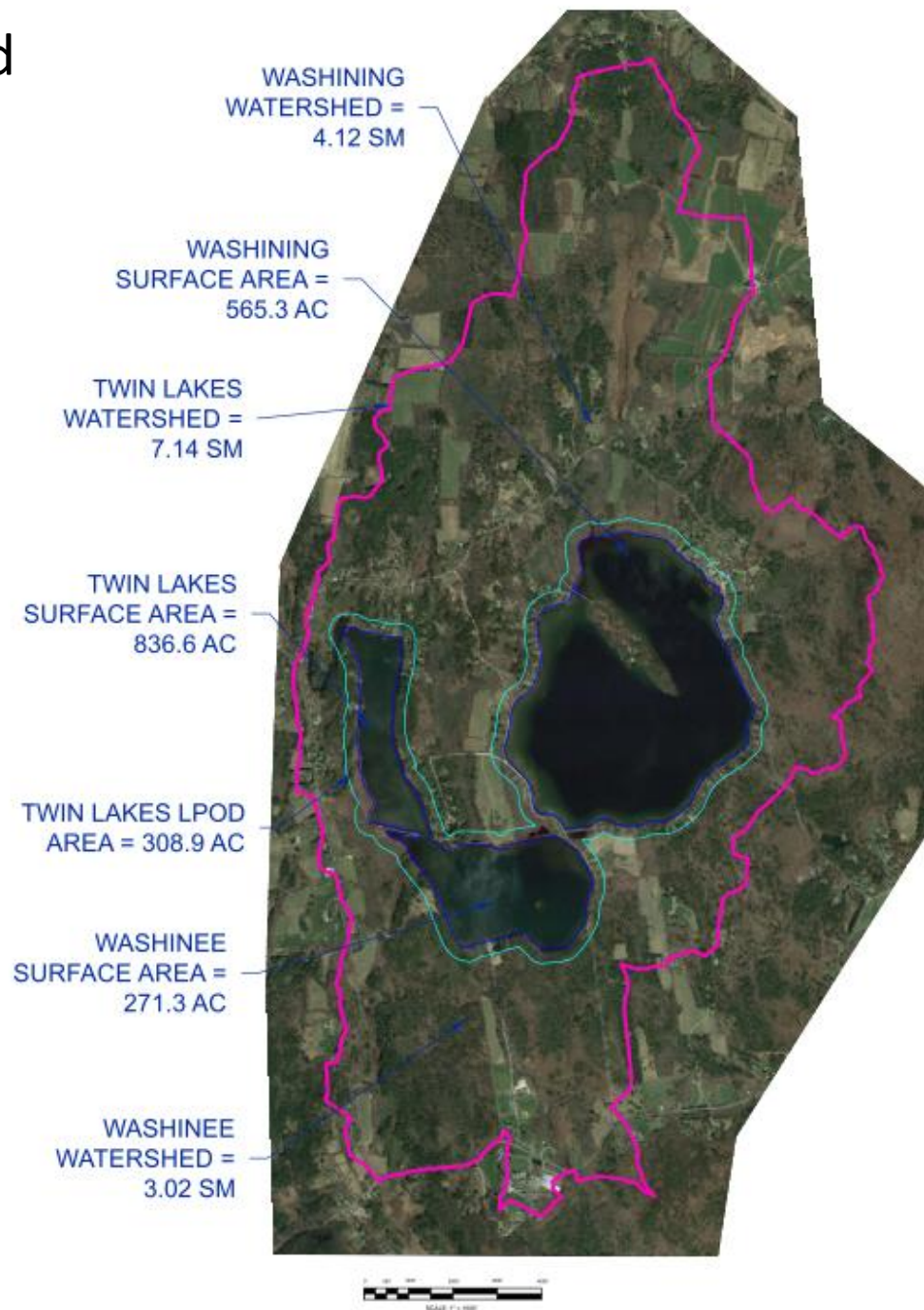
Yet the search for more immediate remedies is confused by conflicting advice from agencies of the State Department of Environmental Protection. Officials of the Water Compliance Unit have suggested

"destratification" through a kind of aeration as a means of curbing algae growth — a sensible-sounding procedure somewhat similar to but much less expensive than what was once suggested by Union Carbide. Fish and Game officials protest, however, that this might inhibit the growth of trout and salmon, and instead recommend that bottom water be siphoned into Factory Brook. But Water Compliance people reply that this might pollute the stream and could not be allowed.

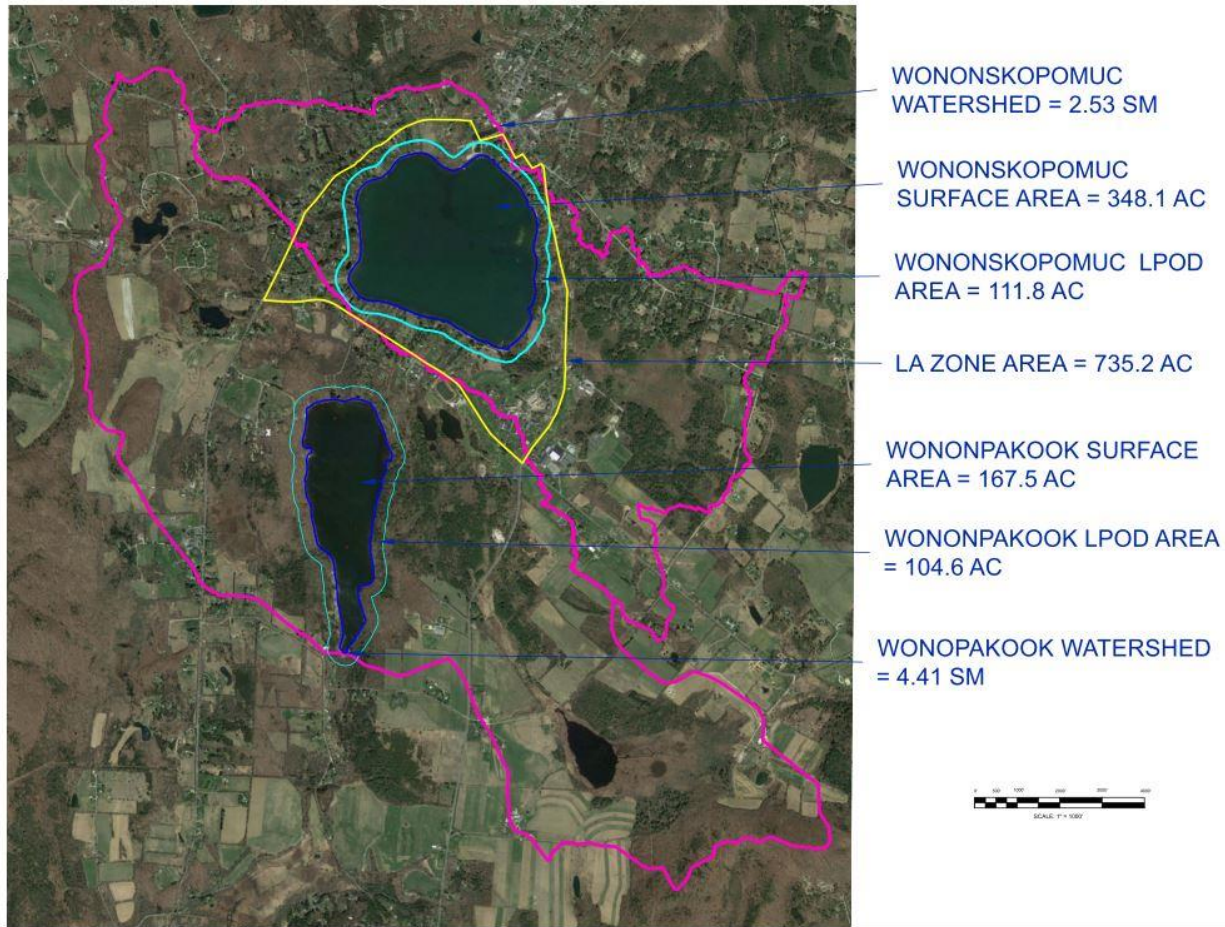
Plainly Environmental Protection Commissioner Stanley Pac is going to have to settle this dispute between his two subsidiaries. Especially since the State exercises veto power on what may be done, it is reasonable to ask Mr. Pac to come up promptly with a unified recommendation to produce the best results with the least damage. Meanwhile, there is the opportunity to proceed with lesser remedies. Homeowners and farmers can take steps to reduce septic tank and fertilizer pollution in the lake watershed. The Town can continue the program to discourage waterfowl on the lake, can consider weed harvesting and can accumulate funds toward the cost of possible aeration.

The problem of the lake has never been a political one, and citizens may be counted on to pull together in any program that is undertaken. As soon as a response can be obtained from Commissioner Pac, it would be useful for town officials to hold an informal public discussion meeting to lay out their own proposals for a program.

Twin Lakes Watershed



Lakeville Lake and Long Pond Watershed





East Twin Lake

Salisbury, CT



Connecticut Department of
Energy & Environmental Protection

This map shows lake depth. It is intended for general informational purposes only. Lake bathymetry contour lines may not align well with other features on the map. Please refer to the Boating or Angler's Guide for current boating regulations. Map date September 2011.

Lake acreage: 569.03

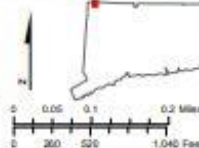
— Lake depth (ft)

- - - Trail

● Dam

DEEP car top/carry-in launch

DEEP trailer launch





Wonoscoponuc Lake

Salisbury, CT

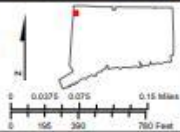


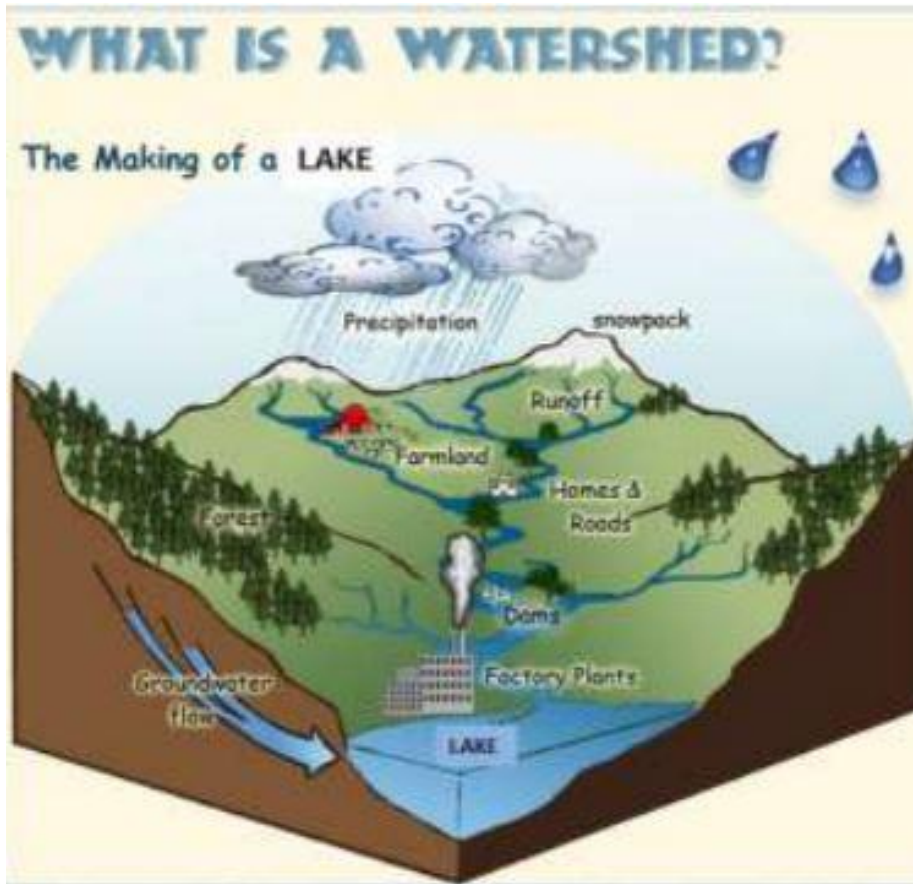
Connecticut Department of
Energy &
Environmental Protection

This map shows lake depths. It is intended for general informational purposes only. Lake bathymetry contour lines may not align well with other features on the map. Please refer to the Boating or Angler's Guide for current boating regulations. Map date September 2011.

Lake acreage: 348.08

- Lake depth (ft)
- Trail
- Dam
- DEEP car top/carry-in launch
- DEEP trailer launch





A watershed is the land that water flows across or under on it's way to a stream, river or lake.

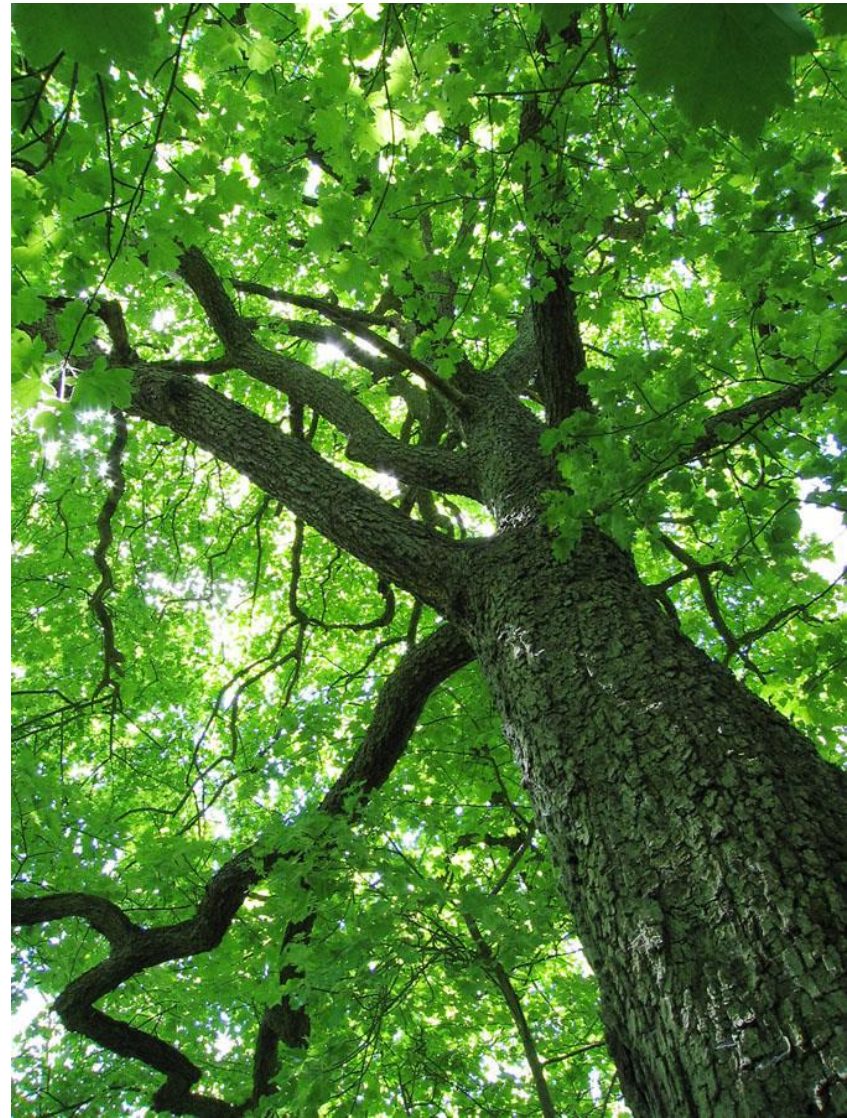
Watersheds come in many shapes and sizes.

We all influence what happens in our watershed, both good and bad.

WE ALL LIVE IN A WATERSHED

Periodic assessments of the watershed, including land use cover, are important because of the influence the watershed has on lake water quality. Research has shown that Connecticut lakes in watersheds that have remained about 80% forest cover tended not to experience water quality changes while those in watersheds that exceeded 25% residential changed the most.

AER analysis of land use cover indicates that forested or wooded areas, including forested wetlands, are 55.4% of the Twin Lakes watershed, less than the theoretical 80% optimum coverage.



CLIMATE CHANGE - NEW THREAT TO LAKES

New research shows that climate change is a series of ecological processes that is impacting the health of aquatic ecosystems.

Climate change has affected freshwater lakes in many ways, including shifts in thermal structure, stability, ice cover, annual mixing regimes and length of growing season, all of which impact ecosystem structure and function.

Warmer temperatures

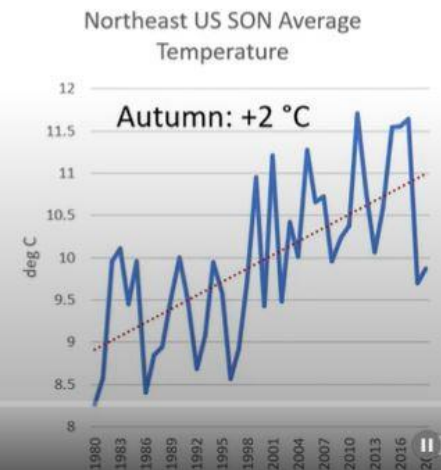
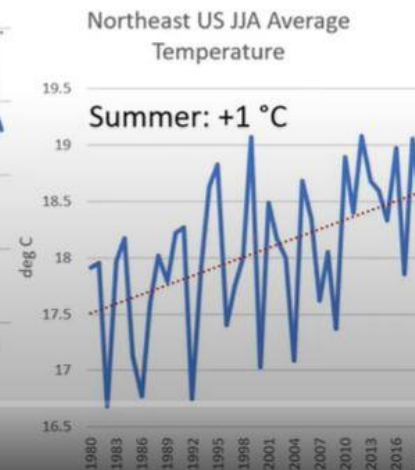
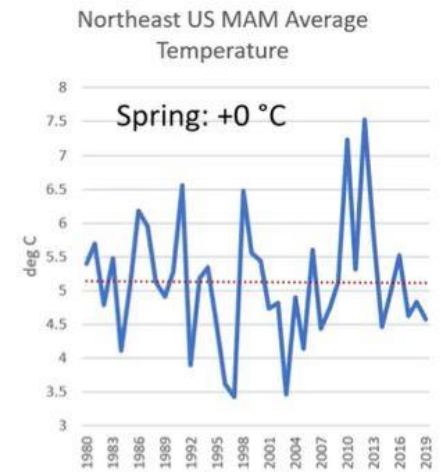
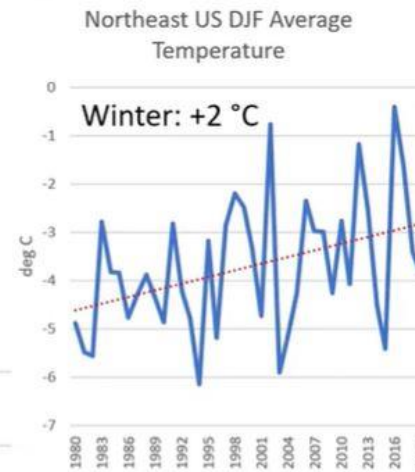
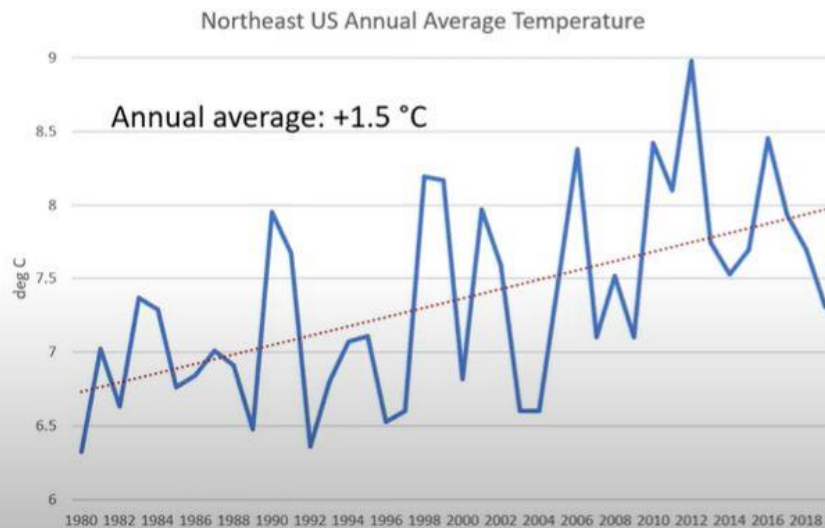
Increased annual precipitation

More extreme rainfall events

Less ice and snowpack

More short term droughts

Climate Change in New England – Warming trends and changing seasonality

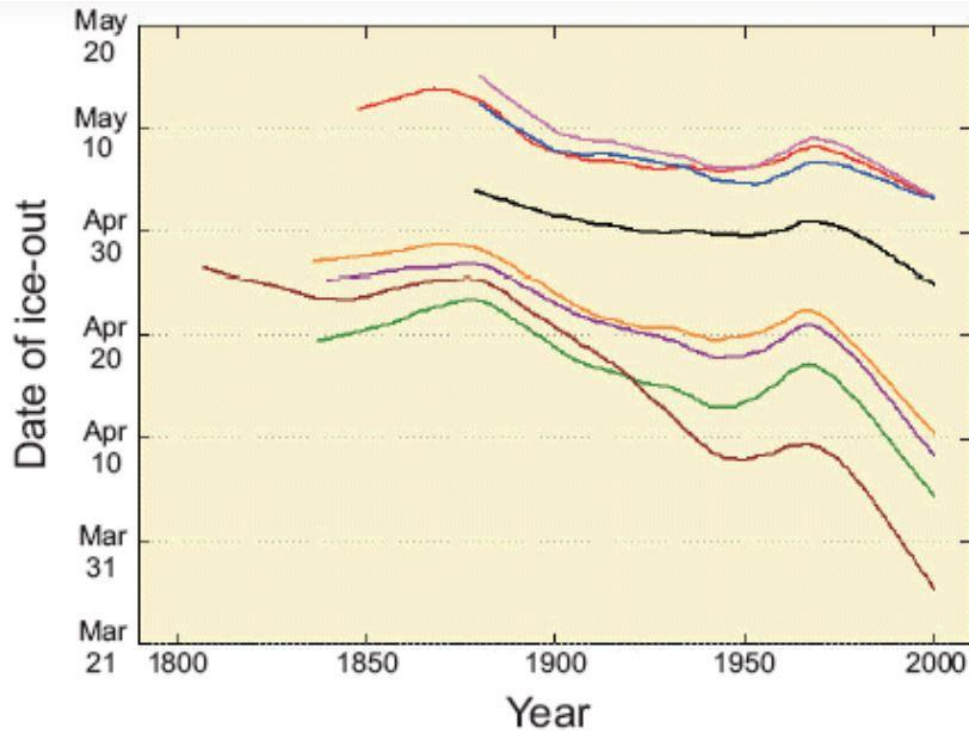


<https://climatoreanalyzer.org/>

The Northeastern US is warming faster than any other region. Especially winters which have warmed 3 times faster than summer.

Shorter periods of ice cover

Less ice and snow cover allows more light penetration and heating of the water. Invasive species of plants and animals that could not survive in our area before are now able to adapt and thrive. The extended growing season will produce more rooted plant and algae growth. Cold water fish species will decline.



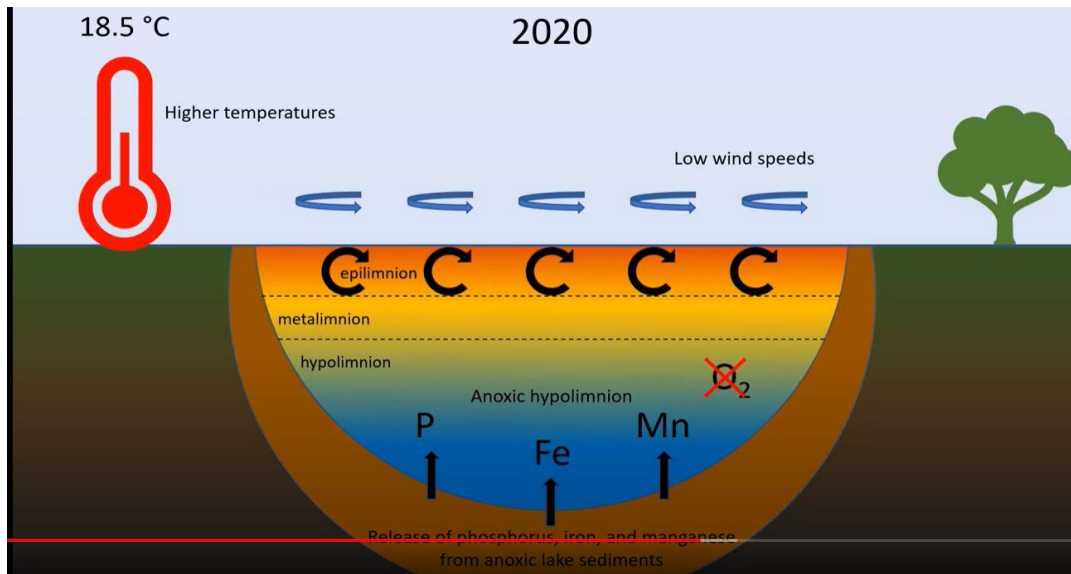
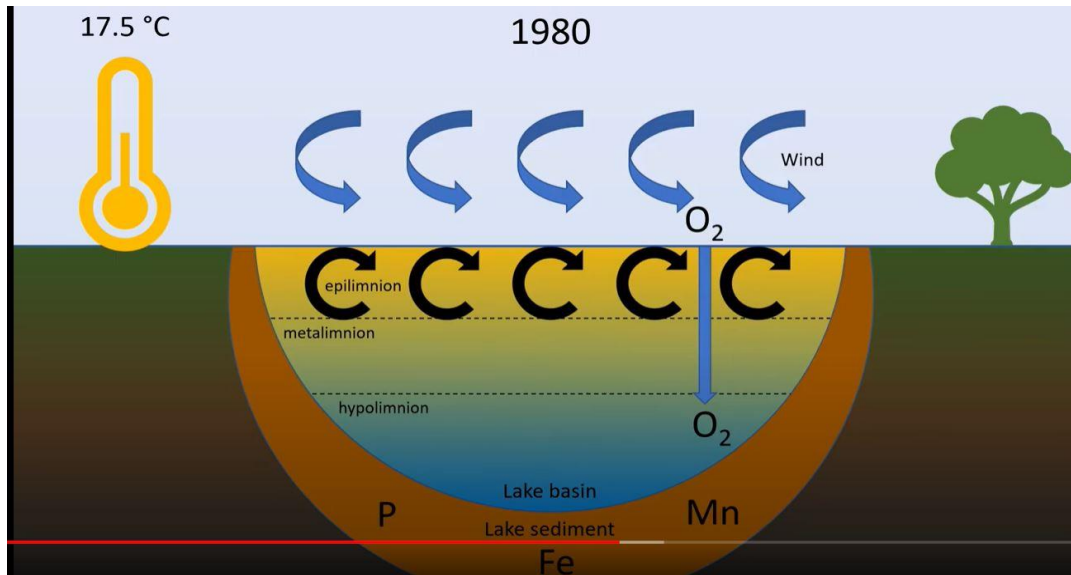
Ice-out Dates for Eight Lakes in New England with the Longest Periods of Record.

In Lakeville Lake, Don Mayland reported “ice in” on Jan. 31, 2021 and “ice out” on March 25, 2021.

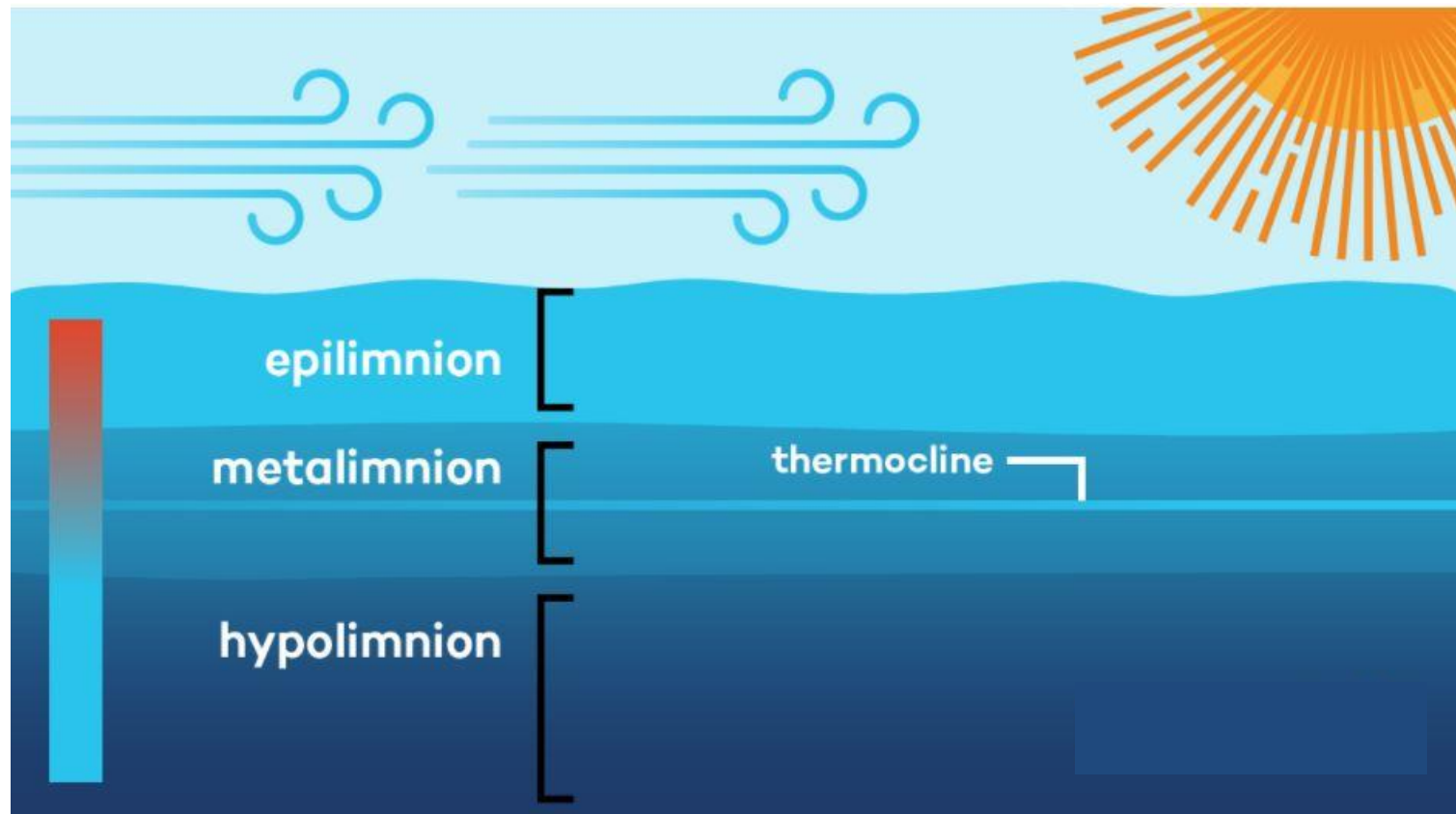
“We had only 53 days of ice cover, which 9 days more than 2020 but still well below the average of 77 days”.

WIND SPEED

Wind speed is decreasing everywhere due to climate change. Larry Marsicano (AER), Peter Siver and others have published a study on the effects of wind on lakes using 30 yrs of data from Candlewood Lake. They believe that the 35-38% drop in wind could be responsible for the amount of blue-green algae at Candlewood Lake. The previous theory was that nutrients such as phosphorus and nitrate were the cause but over the length of this study these levels were actually improving. There are many factors at play when it comes to algae and wind isn't the only thing responsible. The take away message is lakes, like any ecosystem, are very complex.



Lake stratification

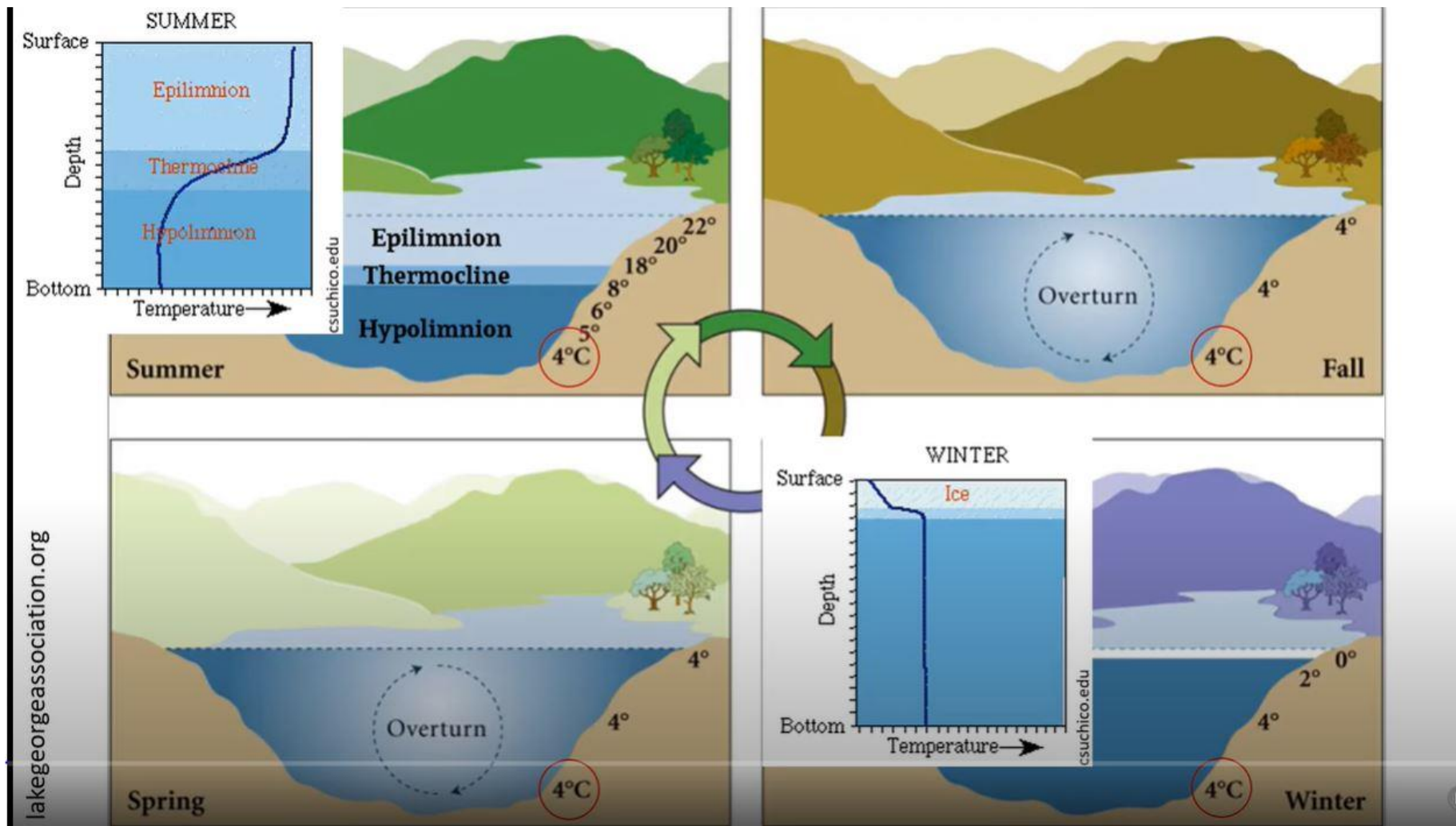


Have you ever been swimming and experienced drop in temperature in the water near your feet, while the surface water remains a comfortable temperature? This is thermal stratification- when lakes divide into different layers of density due to differing temperatures. Stratification is dependant on temperature and wind. Climate change has increased temperature and reduced wind.

CLIMATE CHANGE AND LAKE STRATIFICATION

When spring turns to summer, lakes experience both thermal stratification and turnover due to differences in temperature and density. As the water warms, the upper layer (the epilimnion) becomes less dense and interacts with the wind and sunlight and at this time contains the most oxygen. The deepest layer (the hypolimnion) gets no warmth from the sun and is isolated from the air at the surface of the lake. It contains the lowest amount of oxygen and can often become anoxic when the lake is stratified. The middle layer is the metalimnion or thermocline. It is the barrier that prevents mixing between the other layers.

The effects of climate change are altering the length of stratification in our lakes. Less wind and warmer temperature are making lakes stratify earlier and stay stratified longer. The RTRM (Relative Thermal Resistance to Mixing) figure in our lake reports is a unitless number that describes the difference in water density in the water column. Higher numbers specify stronger stratification and less mixing. Without the mixing that brings oxygen to the hypolimnion it becomes anoxic sooner and remains anoxic longer. Not only does this affect cold water fish that need a certain level of oxygen to live but it causes internal loading of phosphorus which is harmful to the lake.



As climate change causes temperatures to rise, lakes will begin to stratify earlier and remain stratified longer.

More extreme rainfall events produce more stormwater runoff



- **Runoff exits the culverts and scours channels where it enters the lake.**

- **Sediment can cause severe water quality degradation.**



A Twin Lakes homeowner recently commented “that he is more concerned about the upstream people. I’m inundated by water coming down the hill from people behind me that have a right of way and have clear cut and soaked me to death”

SEDIMENT LOADING



Some comments concerning docks at a IWWC meeting that exceed the 50 ft. zoning regulation.

“The lake is getting shallower and shallower. Lake people know that”

“One of the rationales for going farther out into the lake particularly in the North Bay is that the North Bay has silted in tremendously. I used to swim and water ski out there when I was a kid in the 50’s and there’s no way you could do that now.

SEDIMENT LOADING AND LAKE EUTROFICATION

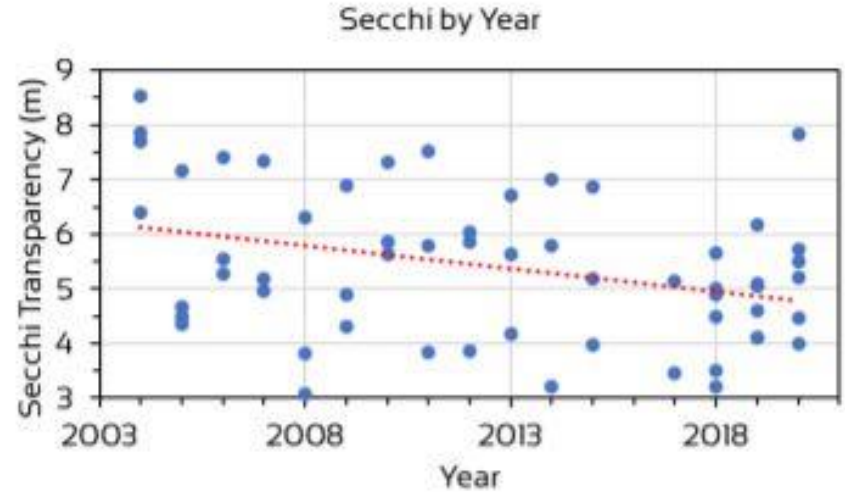


“All you do is look at Google earth and you can see the North Bay and see the propeller tracks going through the mud. The whole purpose of a mooring to a dock is to moor in water that can accommodate the draft of the boat being moored. Maybe 50 years ago a 50 t. dock got you to deep enough water but in that part of the lake it doesn’t today.”

East Twin Lake

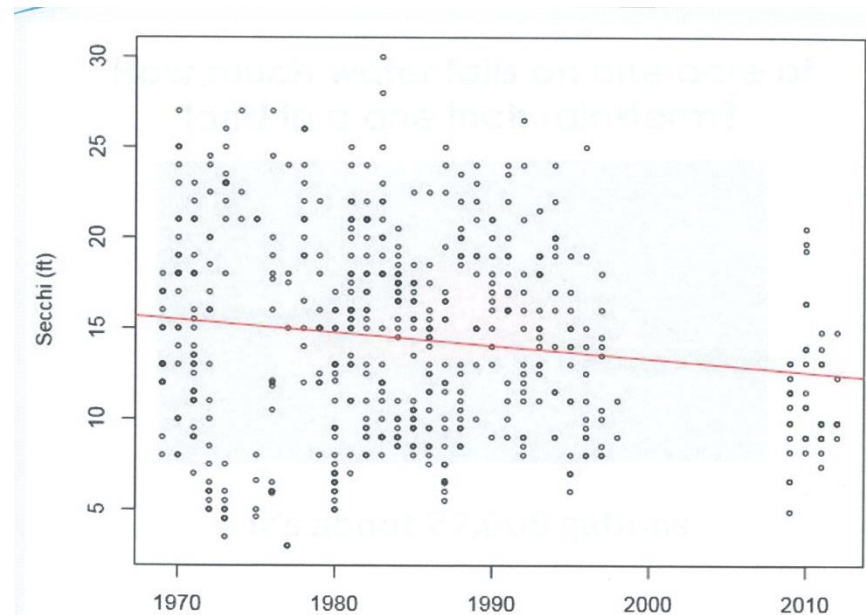
Decline in Secchi transparency

Secchi transparency is a measure of how much light is transmitted through the water column. The amount of light is influenced by a number of variables including the amounts of inorganic (sediment) and organic particulate matter. The more algae in the water, the less the Secchi transparency is.



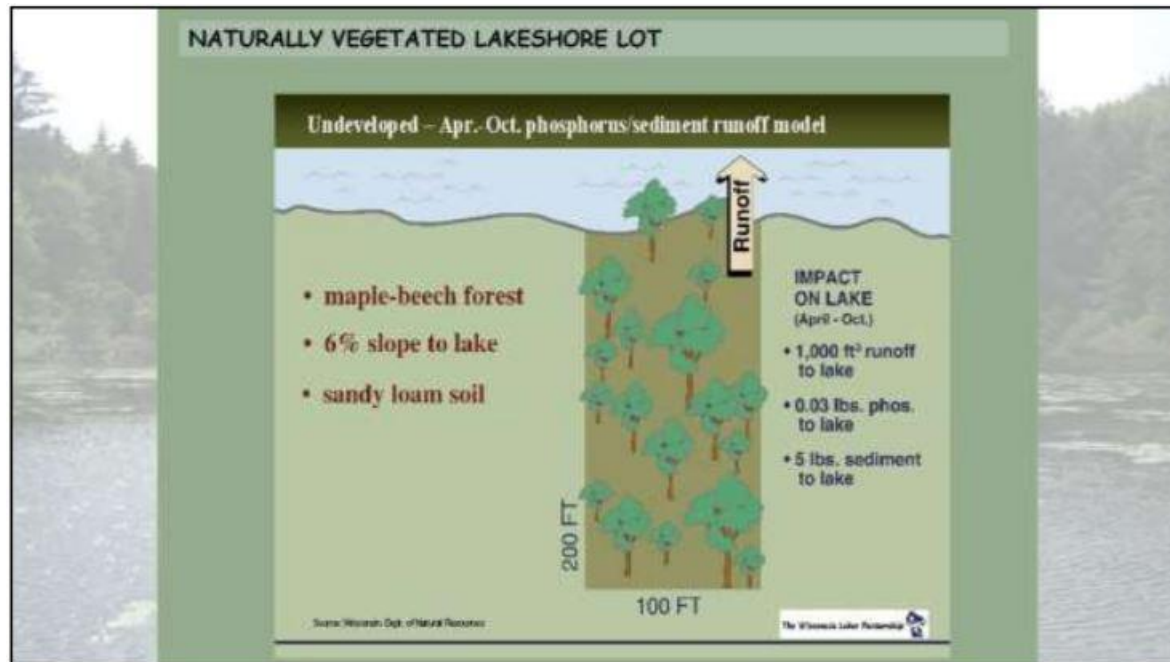
Lakeville Lake

Both East Twin Lake and Lakeville Lake have had significant changes in transparency over the years.

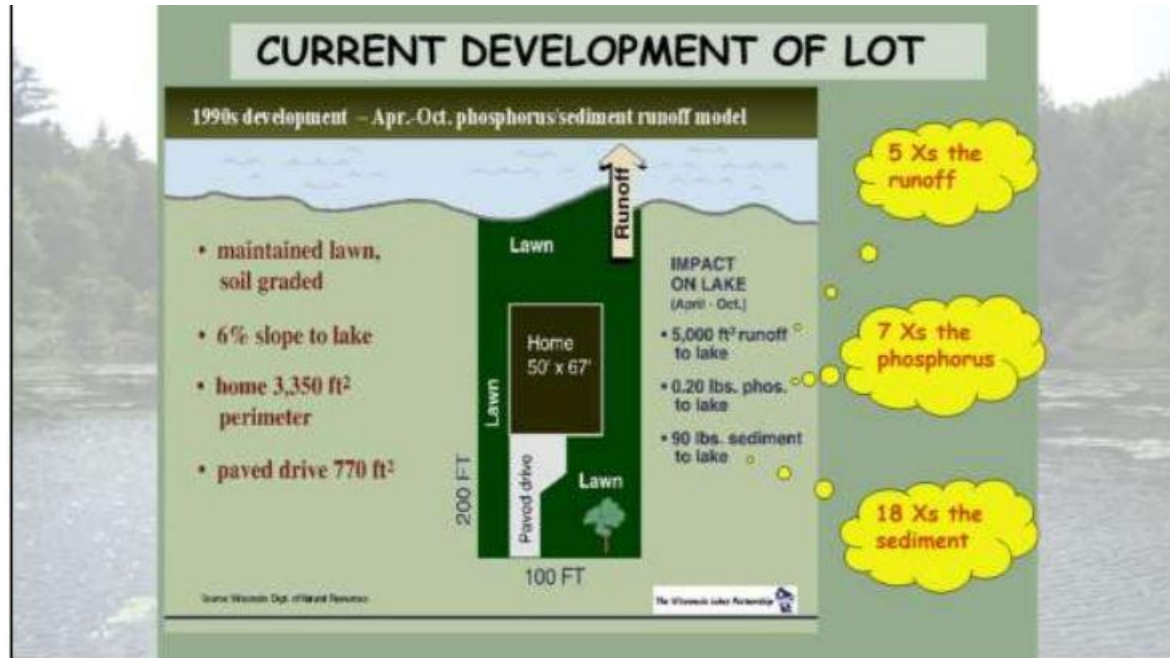


CONDUCTIVITY

Conductivity (specific conductance) is a measure of the water's ability to conduct an electric current.. It's an estimate for the concentration of total dissolved solids in the water. Lakes with high alkalinity often have high conductivity but the levels in the Salisbury lakes have been increasing since the early 1990's but have significantly increased since 2015. This indicates that there is an impact from land use activities. Road salt (NaCl) and road salt alternatives such as magnesium chloride may be also causing the increase in conductance. Kelsey Sudol of the Lake Waramaug Task Force has done research and published a study on their effects on aquatic ecosystems.

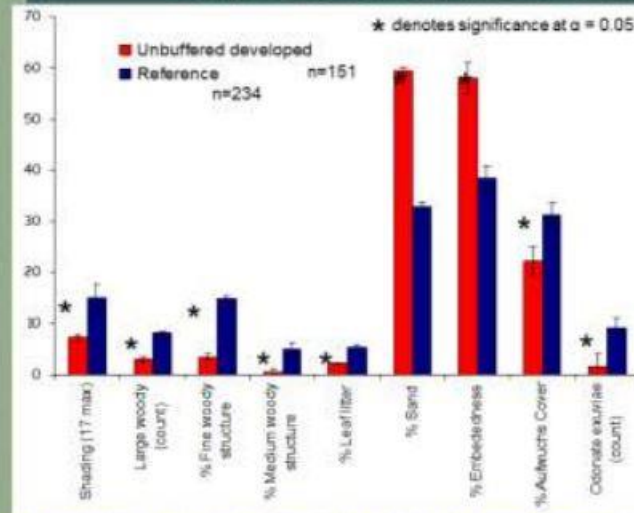


We spoke earlier of precipitation carrying pollutants across the land in a watershed. Even a fully forested, protected watershed allows water, phosphorus and sediment to reach the lake in small amounts. Lakes are adapted to, and need, those small inputs of phosphorus and sediment.



When we move to the lake, we tend to cut down all the trees and vegetation, put in a lawn all the way to the shore, and create impervious surface (where water can't seep into the ground) by building houses, garage and driveways. When we make those changes, we change what is running off the land and into the lake: there is 5x more runoff, 7x more phosphorus and 18x more sediment.

Removal of Lakeshore Vegetation Results in the Simplification of Littoral Habitat



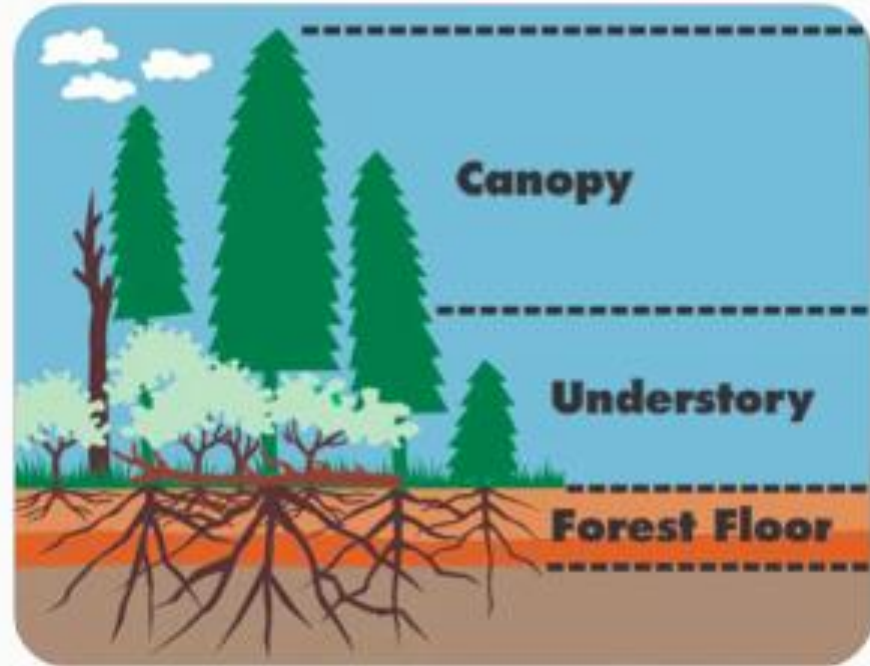
Statistically significant changes from the reference condition were found across all parameters

http://www.amr.state.vt.us/dec/water/lakes/docs/lp_Exam-Shorelines-Littorally-Spring-2009.pdf

Here blue bars represent conditions at the undisturbed natural shoreline (reference condition), the red represents the disturbed shoreline. What they found was that across the board, for every habitat and biological parameter measured, there was a statistically significant difference from the reference condition. Along developed shores, there was significantly less woody debris of all sizes, less leaf litter and less shading – all connected to the loss of trees along the shoreline. The amount of sand increased, as did the embeddedness of the smaller rocks. There was less aufwuchs and evidence that Odonates (dragonflies and damselflies) were less abundant.

THE VALUE OF UNDERSTORY VEGETATION

- The tree canopy intercepts raindrops.
- The understory reduces the impact on the soil.
- Branches and leaf litter create a duff layer.
- Root systems hold soil, let water soak in, filter pollutants and replenish groundwater.



Understory vegetation includes small trees, shrubs, grasses, mosses etc.. Maintaining a healthy understory is vital for sustaining natural ecosystems. The understory plays a key role in slowing and intercepting surface run-off after rain which otherwise would contribute to erosion, siltation and declines in water quality



An example of a well vegetated residential shoreline

A PERFECT STORM FOR LAKE EUTROPHICATION



The thing that adversely affects lakes the most is degraded lakeshore habitat. Grass lawns negatively impact a lake by not slowing and infiltrating runoff to keep harmful sediment and nutrients out of the lake. The Wisconsin DNR estimates that “unbuffered developed sites contribute 5 times more runoff, 7 times more phosphorus and 18 times more sediment to the lake than naturally forested sites.



A lake is a depression in the landscape that holds water



Lakes are considered temporary features in the landscape

DEATH BY A THOUSAND CUTS

Lakes face many different problems that would not necessarily be fatal on their own, but they can combine to create major declines in ecosystem condition. Lakes do not have infinite ability to adapt and we don't know what the tipping point would be.

The major stressors for lakes are:

- 1- Stormwater runoff with sediment loading and nutrient loading
- 2- Loss of lakeshore habitat

As the science of wetlands and watercourses evolved, so did the knowledge that activities adjacent to these resources could negatively impact them.

A Upland Review area is **NOT a prohibitory setback or ecological buffer**. It is a review of proposed activities to ensure that Best Management Practices are being implemented that will help to protect the health and viability of our inland wetlands and watercourse resources.

Expanding the URA will help to meet the goals of:

- 1- Increased stormwater detention
- 2- Increased water infiltration
- 3- Decreased sediment loading
- 4- Decreased nutrient loading
- 5- Increased public awareness
- 6- Increased water quality protection



***"TREAT THE EARTH WELL; IT WAS NOT GIVEN TO YOU
BY YOUR PARENTS, IT WAS LOANED TO YOU BY YOUR
CHILDREN."***

- Ancient Indian Proverb