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Mark Petzold: phosphorus is one of the main drivers of abs.

Mark Petzold: Before we start, I've done this presentation a few times, and normally I have some handouts.

Mark Petzold: So... Just want to talk terminology here real quick.

Mark Petzold: For phosphorus, there's a couple kinds of phosphorus.

Mark Petzold: phosphorus is called the limiting element.

Mark Petzold: Which means, in a lake, the less phosphorus you have.

Mark Petzold: The less growth you're gonna get.

Mark Petzold: The 9-element plan is based on total phosphorus, which is often called TP.

Mark Petzold: And... Phosphorus is an element.

Mark Petzold: And it recycles in the lake. It doesn't... really disappear.

Mark Petzold: Unless it gets locked into some sediment.

Mark Petzold: If you want to learn more about the history of phosphorus, which is actually quite interesting, you can read the book called The Devil's Element.

Mark Petzold: Very easy reading.

Mark Petzold: And very relatable to what's going on on Seneca.

Mark Petzold: And all the Finger Lakes.

Mark Petzold: Microcystis, It's the dominant species that cause the algal blooms on Seneca.

Mark Petzold: This is just some information about microcystis. It's been around for billions of years.

Mark Petzold: It does some... Really kind of amazing things.

Mark Petzold: But this is something to go back and just take a look at later. You can learn a little bit more about what

Mark Petzold: How microcystis works.

Mark Petzold: And then there are two pages in here of 90 projects. These come out of the 90 plan. This set here is more...

Mark Petzold: Tailored towards municipalities.

Mark Petzold: And then there are a whole... Bunch of projects for landscapes.

Mark Petzold: That are also documented in the 90 plan.

Mark Petzold: Alright, so... what we're gonna talk about tonight. Everyone is, I'm sure, familiar with HABs.

Mark Petzold: Potential toxins in our drinking water.

Mark Petzold: Can ruin our recreation and tourism.

Mark Petzold: It's hazardous to wildlife.

Mark Petzold: humans... dogs, right? You don't want your dogs to be in the water, when it's green.

Mark Petzold: The picture on the upper left is the visitor center on Seneca in 2024, September.

Mark Petzold: 2024 was the worst, year we've had for HABs. You could see the algae blooms from images from space.

Mark Petzold: In September.

Mark Petzold: So what we're going to talk about is four drivers of HABs.

Mark Petzold: Warming water, how the wind plays into it.

Mark Petzold: The muscles also are playing a part.

Mark Petzold: And then nutrients, specifically phosphorus.

Mark Petzold: And you're gonna hear me say phosphorus quite a bit in this presentation. It's the only factor

Mark Petzold: It's really controllable.

Mark Petzold: And we're gonna talk about the sources, a phosphorus.

Mark Petzold: They're documented in the 9E plan.

Mark Petzold: And then we're gonna talk some about the solutions

Mark Petzold: That the 9E plan, has in them.

Mark Petzold: These solutions... Many of them are targeted towards farming.

Mark Petzold: And there is state funding available to implement.

Mark Petzold: A lot of these... a lot of these solutions.

Seneca Lake Pure Waters Association: Mark, the pictures don't appear to be showing.

Mark Petzold: Not shown.

Seneca Lake Pure Waters Association: It's still the 9E, HABs, and phosphorus slide.

Mark Petzold: Does that change?

Seneca Lake Pure Waters Association: Still shows on my screen the same.

Mark Petzold: Shoot.

Mark Petzold: Okay.

Mark Petzold: Hang on.

Seneca Lake Pure Waters Association: Okay, we're now on rising lake temperatures, I see that.

Mark Petzold: Okay.

Mark Petzold: For some reason, when I... Did slideshow.

Mark Petzold: Okay.

Seneca Lake Pure Waters Association: Okay.

Mark Petzold: No, it's good.

Seneca Lake Pure Waters Association: It appears good now. Sorry, everyone.

Mark Petzold: So...

Mark Petzold: With HABs, Pure Waters has a program. We've been monitoring HABs for 7 years now. We have 82 zones around the lake, and about 80% coverage of those zones with volunteers.

Mark Petzold: There's an app that people report.

Mark Petzold: When they see a shoreline HAB, take pictures. We aggregate data, send it on to the DEC, who does a statewide database for HABs.

Mark Petzold: And... As you can kind of see from the data here.

Mark Petzold: There's... there's no real clear pattern, coming out.

Mark Petzold: as far as... Progression of things get worse, get better.

Mark Petzold: The only thing you kind of notice over... over the 7 years.

Mark Petzold: If you go back to July.

Mark Petzold: The first 4 years, we didn't see any HABs in July.

Mark Petzold: And now, the last 3 years, We have seen HABs.

Mark Petzold: And November was the first year

Mark Petzold: Last... in 2024, where we saw a halve in November.

Mark Petzold: So this, this is related to the lake warming earlier.

Mark Petzold: Cooling later, basically that the HAB season is extending.

Mark Petzold: So, one of the factors is a rising lake temperature. This is data from a buoy that sits off of Clarks Point at the north end of the lake.

Mark Petzold: Hobart and William Smith maintains it.

Mark Petzold: And...

Mark Petzold: Over 30 years, our average temperature in the top 2 meters of water has risen by 10 degrees F.

Mark Petzold: And the blue... On the screen here, with the growth, So this is how cyanobacteria

Mark Petzold: Grows at the different temperatures.

Mark Petzold: So, in the wintertime, when the lake's 40 degrees,

Mark Petzold: It's... they're dormant. They're down in the sediment.

Mark Petzold: And then in the spring, as the water starts to warm up.

Mark Petzold: They start coming up the water column.

Mark Petzold: the warmer the water gets, the more growth they can do.

Mark Petzold: And when the water gets really warm, as you can see, up to, like, 86 degrees, that's their optimal growth.

Mark Petzold: Now, we generally don't have, water that warm.

Mark Petzold: But like I said, it's rising every year.

Mark Petzold: So that's a factor in the cyanobacteria's favor.

Seneca Lake Pure Waters Association: I don't think we're on the temperature slide. We're still on the...

Seneca Lake Pure Waters Association: Cute of water, 90... yeah, there we go.

Mark Petzold: Okay, I'm gonna, I'm gonna stay out of slideshow.

Seneca Lake Pure Waters Association: Yeah, it may not just be functioning. This is fine the way it is now.

Mark Petzold: Okay.

Mark Petzold: So...

Seneca Lake Pure Waters Association: I know.

Mark Petzold: I'll go back over this real quick, then. This is...

Mark Petzold: data from Hobart and William Smith.

Mark Petzold: Top 2 meters of the water.

Mark Petzold: The line's going up, that's the average temperature. It's gone up about 10 degrees F in 30 years.

Mark Petzold: So that's going to lead to more growth, as you can see from the blue scale on the right of the graph.

Mark Petzold: That's how cyanobacteria reacts to warming temperatures.

Mark Petzold: Alright, wind speed is another factor.

Mark Petzold: Typically they form when the wind speeds are low, less than 6 miles an hour.

Mark Petzold: This allows cyanobacteria to float up the surface. It can aggregate and push cyanobacteria to shorelines. There's more sunlight to deeper depths in the water.

Mark Petzold: Which is not, you know, benefit cyanobacteria.

Mark Petzold: We know that when the wind speeds get great, it breaks the colonies up, pushes cyanobacteria back down.

Mark Petzold: Reduces light, The water gets colder, you know, which leads to less growth.

Mark Petzold: In... in the cyanobacteria.

Mark Petzold: Now some, studies recently Are showing another...

Mark Petzold: Kind of side effect of the wind speed.

Mark Petzold: And that's the wave action.

Mark Petzold: We'll start disturbing the shoreline sediments.

Mark Petzold: And the shoreline sediments have phosphorus in them.

Mark Petzold: So there's something called Langmuir circulation, that if you've ever looked out at the lake.

Mark Petzold: And seeing, these foam trails.

Mark Petzold: It's mixing the water, vertically, In the water column.

Mark Petzold: So as the... as the waves disturb the sediments on the bottom, these Langmuir circulation kind of...

Mark Petzold: Moves them up into the top of the water column.

Mark Petzold: And that's where cyanobacteria are, too.

Mark Petzold: take... Take advantage of it once again.

Mark Petzold: Invasive muscles, So they've been around since the 90s, the zebra mussels.

Mark Petzold: Since then, there's another... Muscle called the quagga muscle.

Mark Petzold: From the same area, invasive species.

Mark Petzold: They now are 80-90% of the muscle population.

Mark Petzold: They can live in deeper water.

Mark Petzold: As they filter the water, they also remove phosphorus from the water.

Mark Petzold: And they store it.

Mark Petzold: They excrete phosphorus.

Mark Petzold: So you can kind of see the...

Mark Petzold: You know, once again, muscles are helping the cyanobacteria.

Mark Petzold: They remove... Plankton from the water column, which is a competitor.

Mark Petzold: They can detect and expel cyanobacteria.

Mark Petzold: So they're... they're changing... they have changed the lake.

Mark Petzold: In the Great Lakes, the mussels make up 90% of the biomass in the lake.

Mark Petzold: So that means 90% of everything living in the lake is a muscle.

Mark Petzold: And they're highly correlated.

Mark Petzold: for HABs in these, what are considered low-nutrient lakes.

Mark Petzold: In Owasco Lake, there was a study a few years ago

Mark Petzold: Where the average density of the muscle population was 5,000 per square meter.

Mark Petzold: So that is, A lot of muscles.

Mark Petzold: The Great Lakes estimate they have about 750 trillion Muscles in the Great Lakes.

Mark Petzold: Alright, so... so those are some of the factors that cause HABs.

Mark Petzold: A 9-element plan is an EPA framework, that New York State uses.

Mark Petzold: When you have a pollution issue, you do this 9-element plan, that identifies

Mark Petzold: The use of the watershed.

Mark Petzold: Identifies the sources of the pollution.

Mark Petzold: Sets reduction goals, and then outlines projects.

Mark Petzold: That you can do to improve water quality.

Mark Petzold: So, this was released in 2022.

Mark Petzold: Four organizations, Around Seneca and CUCA participated in it.

Mark Petzold: they used a... a tool, a USGS tool, called SWAT, Soil and water assessment tool.

Mark Petzold: To estimate how much phosphorus is coming into the lake.

Mark Petzold: And then it has target reductions for certain areas of the lake.

Mark Petzold: So now we'll look closer at what the 9E plan, identifies as the amount of phosphorus coming into the lake.

Mark Petzold: so, the sources of phosphorus are wastewater treatment plants, septic systems.

Mark Petzold: And then what they call non-point source phosphorus.

Mark Petzold: So that's phosphorus that you can't...

Mark Petzold: It's coming from a general area, you can't really pinpoint exactly where it's coming from.

Mark Petzold: So the... the 9E plan says, yearly, 305,000 pounds of phosphorus.

Mark Petzold: are entering Seneca Lake.

Mark Petzold: And... and of those, types, wastewater treatment plants are responsible for about 10%.

Mark Petzold: Septic system's about 1%.

Mark Petzold: And the rest of it is coming from... Farming, forests, viniculture, only 2%.

Mark Petzold: and developed land.

Mark Petzold: So, to take a closer look at

Mark Petzold: the wastewater treatment plants, you can... you can pull data from the EPA

Mark Petzold: As these plants, have to submit data every month, On their output.

Mark Petzold: That they're dumping into the lake, and there's 6 wastewater treatment plants.

Mark Petzold: on Seneca, they're putting in about 12,000 pounds.

Mark Petzold: Which is... About half of what the 11% estimate was.

Mark Petzold: So you can see Dundee and Catherine Valley, very low. Those are brand new plants in the last 3 years.

Mark Petzold: Geneva has done some updates.

Mark Petzold: And they're also... Almost half the population around the lake.

Mark Petzold: So they're doing pretty well.

Mark Petzold: The other 3 wastewater treatment plants,

Mark Petzold: I think Five Points has money to do upgrades.

Mark Petzold: So it's... the wastewater treatment plants, I guess, are basically in pretty good shape.

Mark Petzold: It's the non-point source.

Mark Petzold: Phosphorus that... that is the real problem on the lake.

Mark Petzold: So you can see this waterfall, this is Big Stream down behind Gulnora.

Mark Petzold: We're gonna talk in more detail about how much phosphorus

Mark Petzold: Just coming over that waterfall a little bit later.

Mark Petzold: But Seneca Lake, for the non-point source phosphorus, is estimated at 235,000 pounds.

Mark Petzold: And that's a year.

Mark Petzold: And... and now I want you to think about...

Mark Petzold: You know, how it exits the lake.

Mark Petzold: Right? The only way out is the Seneca River slash canal.

Mark Petzold: And... Approximately 5% of the water every year leaves the lake.

Mark Petzold: And that water is lake water.

Mark Petzold: Which our... our lake has been around 9 or 10 micrograms per liter.

Mark Petzold: of phosphorus.

Mark Petzold: Probably for 10 years now.

Mark Petzold: So that, that is leaving through the river.

Mark Petzold: what's coming in, at Bigstream,

Mark Petzold: Is in the order of 5, 6, 7, 800 micrograms per liter.

Mark Petzold: So the majority of the phosphorus that comes in every year

Mark Petzold: Is... is staying in the lake.

Mark Petzold: And it's not in the water column, because our numbers haven't been changing.

Mark Petzold: So that means it's in the sediment and the biomass.

Mark Petzold: But those are the phosphor sinks.

Mark Petzold: That, every year, are sucking up.

Mark Petzold: that phosphorus.

Mark Petzold: So the nutrient solutions that get talked about in the 90 plan come in 5 categories.

Mark Petzold: Hydrological resilience, and this is something like reconnecting the floodplain.

Mark Petzold: Actually, the Ian Smith, who's our...

Mark Petzold: watershed steward as part of SWIO.

Mark Petzold: is working on a project down in Watkins, To divert more water from the diversion canal.

Mark Petzold: Back into the wetlands down there.

Mark Petzold: And those are... those are great projects.

Mark Petzold: Can absorb a lot of phosphorus.

Mark Petzold: And they'll last for... for decades.

Mark Petzold: The next one is BMPs, they call them, Best Management Practices.

Mark Petzold: On working landscapes, so this is our... Projects aimed at farming.

Mark Petzold: AEM plans, Are part of this.

Mark Petzold: These were Cornell developed, they've been available for about 30 years now. Farmers can voluntarily enter into an AEM plan.

Mark Petzold: Which will have them do a project to do something to reduce phosphorus.

Mark Petzold: Buffers near streams are great absorbers of phosphorus.

Mark Petzold: So there, there's... I don't know, 20-some different projects that are targeted towards farming.

Mark Petzold: Wastewater management, we talked about. Local laws we're gonna talk about in a minute.

Mark Petzold: And then education and outreach, just to note that

Mark Petzold: you know, nutrients are not our only problem on the lake. We have PFAS coming in from the Army Depot.

Mark Petzold: Wastewater treatment plants are putting PFAS in the lake.

Mark Petzold: Pesticides, are going in the lake, microplastics.

Mark Petzold: And salt reduction is... is also...

Mark Petzold: Something that has been focused on around the watershed to try to reduce the the salt being applied.

Mark Petzold: Salt's gonna run into the lake.

Mark Petzold: It's the most dense thing, so it's gonna head to the bottom of the lake.

Mark Petzold: And that could cause some problems.

Mark Petzold: Now, municipalities, can impact water quality.

Mark Petzold: Municipalities have the, set priorities, they have the budgets.

Mark Petzold: There are projects that they can be doing to help.

Mark Petzold: Reduced phosphorus, and like I said, those were documented in that first set of charts we took a quick look at.

Mark Petzold: Highway departments can help, right, when they... Dig out the ditches.

Mark Petzold: It's important to hydroseed afterwards to reduce erosion.

Mark Petzold: That's not always done.

Mark Petzold: Some of the counties have equipment that can be used to do that.

Mark Petzold: So kind of the message here is, you know, water quality is really...

Mark Petzold: A shared responsibility across all the municipal functions.

Mark Petzold: So, land use regulations. This is out of the 90 plan,

Mark Petzold: a group from Cornell went through all the local laws that

Mark Petzold: The 42 municipalities on the lake have.

Mark Petzold: You know, just looking at the... at the map, you can see Cucca Lake, Really has stronger regulations.

Mark Petzold: around their lake than Seneca Lake does.

Mark Petzold: So there is some room for improvement on the Seneca Lake side.

Mark Petzold: So, okay, so we... we have HABs, we know phosphorus is being dumped in the lake.

Mark Petzold: From multiple sources.

Mark Petzold: The state has... You know, a plan for doing all these projects.

Mark Petzold: To help reduce phosphorus.

Mark Petzold: But how do we know that it's really... working.

Mark Petzold: Right? How do we know progress is being made?

Mark Petzold: There's a couple ways of looking at this.

Mark Petzold: The 90 plans that are done, many of those have phosphor savings associated with them.

Mark Petzold: But there's a lot going on in the watershed.

Mark Petzold: Something you save by implementing the project in one area could be negated.

Mark Petzold: By actions in other areas.

Mark Petzold: the 9E plan, the SWOT model.

Mark Petzold: That allows you to run different scenarios.

Mark Petzold: And... One of the scenarios that they ran was...

Mark Petzold: Kind of the redistribution of rainfall.

Mark Petzold: climate change, Doesn't necessarily say we're gonna get more rain.

Mark Petzold: But it's gonna get redistributed with more coming in the spring.

Mark Petzold: In the fall, we've certainly seen that this year.

Mark Petzold: So those increased phosphorus coming into the lake due to the heavy storms,

Mark Petzold: That's gonna counteract any savings that we have going on with these 90 projects.

Mark Petzold: So how do we really know

Mark Petzold: If we're putting less phosphorus into the lake.

Mark Petzold: So the 98 plan talks about, calculating phosphorus loads, as a metric

Mark Petzold: And we're gonna talk about what that is.

Mark Petzold: Pure Waters last year started a streamflow project.

Mark Petzold: in conjunction with ESF and Syracuse.

Mark Petzold: And the objective here is to calculate phosphorus loads.

Mark Petzold: So we can see... how actuals...

Mark Petzold: you know, compare with estimates coming from the SWOP model.

Mark Petzold: And over time, hopefully we would see... a reduction.

Mark Petzold: As these projects get implemented.

Mark Petzold: So phosphorus loads, so you need two things to do that. You need the volume of water.

Mark Petzold: Entering the lake.

Mark Petzold: And you need the phosphorus concentration of that water.

Mark Petzold: So, what we do, this is how USGS, does their gauges.

Mark Petzold: You take a stream, you divide it up into segments.

Mark Petzold: Each segment has an area.

Mark Petzold: You know, depth times width.

Mark Petzold: And then you also measure the velocity of the water.

Mark Petzold: So that's gonna give you feet per second.

Mark Petzold: You multiply those three things together, and you get cubic feet per second.

Mark Petzold: Which is the discharge.

Mark Petzold: So, in the... in the graph, all the blue points, are...

Mark Petzold: points that I measured in the stream.

Mark Petzold: lacrosse.

Mark Petzold: Last year and some of this year.

Mark Petzold: You plot those.

Mark Petzold: And you add a... quadratic equation in Excel, a trend line, they call it.

Mark Petzold: And that now gives you a curve. They call this a flow curve.

Mark Petzold: So now on the curve, at any height of water.

Mark Petzold: You can get the... you can get the cubic feet of water.

Mark Petzold: And to get the height of the water, we use that black sensor that's in the picture,

Mark Petzold: It's installed in the stream.

Mark Petzold: And based off of water pressure.

Mark Petzold: You can determine what the height of the water is.

Mark Petzold: So now, every hour, we know the height of the water, and now we can calculate

Mark Petzold: Phosphorus across time.

Mark Petzold: So they'll just compute one point, so in the upper right corner with the square.

Mark Petzold: That was last June.

Mark Petzold: Down on Big Stream.

Mark Petzold: The discharge was 1,100 cubic feet a second.

Mark Petzold: So you multiply by 3600 seconds to get discharge by hour.

Mark Petzold: And that's about 4 million cubic feet.

Mark Petzold: And if you multiply by 7.48, you get the number of gallons.

Mark Petzold: So that storm last year in one hour put 30 million gallons of water

Mark Petzold: Down Big Stream and into the lake.

Mark Petzold: So that's the volume part.

Mark Petzold: So we took a phosphorus sample.

Mark Petzold: And that came back at 770 micrograms per liter.

Mark Petzold: From the lab.

Mark Petzold: We use CSI over in Ithaca.

Mark Petzold: And also, Finger Lakes Institute, sometimes to do, to be the lab to process these samples.

Mark Petzold: So now the load is just the volume, the 30 million gallons times the concentration.

Mark Petzold: Times a conversion factor to get the pounds.

Mark Petzold: And that comes out to 192 pounds of phosphorus.

Mark Petzold: entered the lake at Big Stream.

Mark Petzold: In one hour.

Mark Petzold: So that's... That's how you do the calculations.

Mark Petzold: So now there's some other... other math to,

Mark Petzold: To figure this out on an hourly basis.

Mark Petzold: And... We'll have a... another webinar in the future to kind of go into those details.

Mark Petzold: but knowing the phosphorus loads.

Mark Petzold: like I said, is kind of key to understanding If you're getting any better.

Mark Petzold: If the projects that we're implementing are helping.

Mark Petzold: So, now, you know, what can you do?

Mark Petzold: There's a lake-friendly living program, which is a statewide kind of thing that Pure Waters participates in.

Mark Petzold: These are basically just tips for reducing your impact on the lake.

Mark Petzold: If you're gonna spread phosphorus on your yard.

Mark Petzold: get the zero... I'm sorry, fertilizer on your yard, get the zero phosphorus fertilizer.

Mark Petzold: Don't use pesticides on your yard.

Mark Petzold: If you have a septic system, make sure it's maintained.

Mark Petzold: You know, those... those types of things.

Mark Petzold: Lake Friendly Farming was a pilot program the town of Geneva did.

Mark Petzold: And this was to encourage farmers to join these AEM plans.

Mark Petzold: There's all kinds of educational information on our website, webinars we've been doing, articles, our water quality symposium.

Mark Petzold: We do have a HAB and lake-level, text alert system.

Mark Petzold: So, in the summertime here, as people start finding HABs.

Mark Petzold: We'll send out a text to people who register

Mark Petzold: To know that they're occurring on the lake that day, so you can be aware.

Mark Petzold: You can always join Pure Waters.

Mark Petzold: You don't need to join Pure Waters to get, like, the text alerts and things like that.

Mark Petzold: But we would like you to.

Mark Petzold: Elected officials... You know, stronger land use regulations.

Mark Petzold: That's something that people can be doing.

Mark Petzold: On Owasco Lake, They have these, watershed rules and regulations.

Mark Petzold: They come through the Department of Health.

Mark Petzold: They were established back in the 80s.

Mark Petzold: Skinny Atlas has some. I believe Canandaigo has some.

Mark Petzold: Seneca Lake does not have any watershed rules and regulations.

Mark Petzold: They could.

Mark Petzold: But they don't.

Mark Petzold: These are... I'm gonna tell you, these are kind of controversial. Owasco has tried to update their rules and regulations.

Mark Petzold: The Department of Health kind of balked at doing that.

Mark Petzold: City of Auburn, Town of Wasco sued the Department of Health.

Mark Petzold: the first... Ruling by the judge was in their favor.

Mark Petzold: So they're still hoping to push these new watershed rules and regulations through.

Mark Petzold: And I bring this up just because it's important, I think, to understand

Mark Petzold: what the other Finger Lakes are doing.

Mark Petzold: One of their rules and regulations that they want to enact are all farms, Over 7 acres.

Mark Petzold: have to have an AEM plan.

Mark Petzold: So, once again, today they're... they're voluntary.

Mark Petzold: This in a Wasco watershed would make them mandatory.

Mark Petzold: And that's... that's why this is so controversial, and there's lawsuits going on.

Mark Petzold: The county has water quality meetings.

Mark Petzold: The soil and Water Conservation Districts who do a lot of these 90 projects put out newsletters, where they talk about these projects.

Mark Petzold: Ann Smith, like I said, does projects and helps municipalities work their way through the

Mark Petzold: Grant process, and... Things that they need to do to implement some of these projects.

Mark Petzold: He's also the guy doing the Catherine Creek...

Mark Petzold: project. He's doing, also doing a project in Geneva right now.

Mark Petzold: to kind of make an area...

Mark Petzold: Into a, kind of a new park, and it has some, water quality features to it.

Mark Petzold: Just one thing, our Constitution was amended, right, a few years ago that says each person has a right to clean air and water in a healthy environment.

Mark Petzold: So, HABs, Right, they're projected to continue to get worse.

Mark Petzold: We have the right to do something about it.

Mark Petzold: basically, just in general, water quality awareness really needs to be an integral part of our Seneca Lake community. Like I said, we have 42 municipalities.

Mark Petzold: They all need to be thinking.

Mark Petzold: About what their part is in water quality.

Mark Petzold: It's not just the lakefront.

Mark Petzold: It goes through the entire watershed. It takes everyone.

Mark Petzold: You know, to join, to come together, to, you know, to make some changes.

Mark Petzold: So that's it. Any questions?

Seneca Lake Pure Waters Association: Yes, we have a few.

Seneca Lake Pure Waters Association: I'll start off with a question from Michael Fitzgerald from the Finger Lakes Times.

Seneca Lake Pure Waters Association: Do I understand correctly that a big part of the Habs problem is caused by phosphorus that is in the lake already, in the lake bottom sediment, for example? Could we get some more comment? Could we hear more about the phosphorus that's already trapped in the lake?

Mark Petzold: Yes, there's a lot of phosphorus in the lake, in the sediment, we're often called low-phosphorus lakes.

Mark Petzold: I call this a low phosphorus water column.

Mark Petzold: But a high phosphorus lake.

Mark Petzold: there's been research done on Skinny Atlas in 2018,

Mark Petzold: the Jefferson Project, which was the...

Mark Petzold: RPI, IBM consortium that did a lot of work on Lake George as far as putting instrumentation into the lake to understand what's going on.

Mark Petzold: They did the same thing.

Mark Petzold: on Skinny Atlas Lake, And in 2018, what they found was...

Mark Petzold: When there were... waves... Generated either by the winds, or there's an internal wave in lakes called a seish.

Mark Petzold: that's... that's stirred up the sediment, and then, like I said on the one chart, the Langmere circulation

Mark Petzold: move the phosphorus up into the water column.

Mark Petzold: And then, a calm day, 8 times that those 3 things happened.

Mark Petzold: And they were able to detect it because they had sensors like Doppler, radar sensors to

Mark Petzold: To understand where the currents are in the wave action.

Mark Petzold: 8 times, That sequence happened, there were 8 halves.

Mark Petzold: So... Yes, the phosphoruses in the sediment definitely plays a role, in... In HAD formation.

Mark Petzold: That doesn't mean that that sequence that they detected and Skinny Atlas.

Mark Petzold: is the only way that HABs can happen.

Mark Petzold: But it was a good piece, a good study.

Mark Petzold: to show one way that they are occurring.

Mark Petzold: And... and like I said, We don't lose very much sediment.

Mark Petzold: Or, I'm sorry, phosphorus through the... The canal every year.

Mark Petzold: Less than 5% of what comes in.

Mark Petzold: And it's being stored in the biomass. There's some studies that say the... muscles...

Mark Petzold: As they live and die, Drive the phosphorus cycle.

Mark Petzold: Because there's so many... So many muscles in the lake.

Mark Petzold: If there's a large die-off, The phosphorus that they have stored in their bodies.

Mark Petzold: Right? Their soft parts are gonna decay.

Mark Petzold: And that phosphorus is going to get re-released.

Mark Petzold: So, there's a lot of chemistry going on for all this to happen,

Mark Petzold: But there have been studies on the Great Lakes that say

Mark Petzold: The muscles are controlling the phosphorus cycle.

Mark Petzold: not everybody, I think, agrees with that. Like I said, we still have...

Mark Petzold: You know, a lot of phosphorus coming in, from the streams.

Mark Petzold: But definitely the sediment is involved.

Seneca Lake Pure Waters Association: Great. Speaking of zebra mussels, we have another question from, Lynn. I understand that zebra mussels filtered all plankton Bt cyanobacteria and excreted it as a pseudofeces. Is this true, and do quagga mussels have the same aversion to cyanobacteria?

Mark Petzold: Yeah, I believe the answer is yes for quagga mussels.

Mark Petzold: And yeah, they, pseudofeces is an output.

Mark Petzold: Of the muscles.

Mark Petzold: Gotcha. And there's phosphorus in that pseudofeces.

Seneca Lake Pure Waters Association: From Pam, there is some discussion very recently regarding floating solar panels on bodies of water. Are there studies to predict

the impact on HABs and or cause other problems? Did the extreme low water level last fall impact the HAB appearance in November?

Seneca Lake Pure Waters Association: So, kind of a two-parter.

Mark Petzold: Yeah, as far as floating solar panels, that's... that's something new. I haven't heard of that.

Mark Petzold: But I... I don't know what to say about that.

Mark Petzold: Is, what was the second part of the question?

Seneca Lake Pure Waters Association: Do you... did extreme low water level last fall impact have appearance in November?

Mark Petzold: Once again, that's, that's a hard, hard question to answer.

Mark Petzold: You know, when you go back to the factors,

Mark Petzold: Low, low water,

Mark Petzold: I mean, we had the drought last year, so during the summer, we didn't have a lot of nutrients coming into the lake.

Mark Petzold: Whereas back in 2024, If you remember, in July, we had a big storm from

Mark Petzold: One of the hurricanes.

Mark Petzold: the dumped... A lot of nutrients into the lake.

Mark Petzold: You know, kind of later in the year.

Mark Petzold: And that may have contributed.

Mark Petzold: but as far as the low water level, I don't really know how that would

Mark Petzold: have impacted HAB formation one way or another.

Seneca Lake Pure Waters Association: Gotcha.

Seneca Lake Pure Waters Association: And a bit of a question for myself, actually. I've been going around the watershed talking to local municipalities, local lawmakers, and I've been asked, why is it so complicated to try to predict

Seneca Lake Pure Waters Association: Habs for a given season, and why is modeling it such a tricky thing?

Mark Petzold: it's the factors, how things interact, right? Every year, The factors are different.

Mark Petzold: Right, normally when you're... you're trying to...

Mark Petzold: Get to the root cause of a problem, you want to get a repeatable situation.

Mark Petzold: You know, like I said, the factors change.

Mark Petzold: change every year.

Mark Petzold: 2024, we had low wind.

Mark Petzold: You know, in the September timeframe.

Mark Petzold: And that definitely contributed.

Mark Petzold: You know, to the... the haves we had then, right? We didn't have any of those high winds to break... to break the haves up, so they just kept... they just kept going.

Mark Petzold: And, and you can't...

Mark Petzold: you know, you can't predict the wind. I mean, that's why when you go back to that first

Mark Petzold: You know, that first chart, I mean, the only... the only controllable factor we have is the nutrient runoff.

Mark Petzold: Is controlling that.

Mark Petzold: And... I mean, and that's a really hard thing.

Mark Petzold: So, when you have... You know, 30 million gallons coming down a stream in an hour.

Mark Petzold: And you think about, okay, now.

Mark Petzold: What are the projects you need to slow that water down?

Mark Petzold: It's, it's really quite daunting.

Mark Petzold: I mean, retention ponds, normally, right, they're meant to hold water.

Mark Petzold: They're normally a large retention pond's a million gallons.

Mark Petzold: Well, in one hour, you just filled up 30 retention ponds.

Mark Petzold: And that was... and that was just one hour.

Mark Petzold: You know, that storm lasted... You know, for 2 days.

Mark Petzold: So it's just really hard to control. The DEC is doing some work to try to

Mark Petzold: From satellites to try to help predict

Mark Petzold: when HABs might be showing up through chlorophyll A,

Mark Petzold: Certain bandwidths of light that they can detect.

Mark Petzold: You know, as... as that starts growing, and that's a... an indicator of HABs.

Seneca Lake Pure Waters Association: Gotcha. Because the hams we have here... oh, sorry, go on.

Mark Petzold: It's extremely complicated. I mean, up on the street lakes.

Mark Petzold: you know, Lake Erie, I mean, they've invested

Mark Petzold: a lot more money in research than they have in the Finger Lakes.

Mark Petzold: And, you know, they had a group that was working on making projections,

Mark Petzold: But that's, right, projections are just, hey, they're coming. It's not, what are we gonna do about it?

Seneca Lake Pure Waters Association: you know.

Mark Petzold: Gonna come regardless.

Seneca Lake Pure Waters Association: Yeah.

Mark Petzold: There are, you know, solutions for small ponds and things like that to help

Mark Petzold: aerate them and do things, but, you know, on the scale of Seneca, I mean, there's no...

Mark Petzold: There's no solutions right now.

Seneca Lake Pure Waters Association: Yeah. I feel it's worth noting that the haves that we do have are actually native bacteria that have been growing here for thousands, if not millions of years.

Mark Petzold: It's just that.

Seneca Lake Pure Waters Association: That certain conditions are letting them grow.

Seneca Lake Pure Waters Association: completely out of control, and this is also something that is not unique to Seneca Lake, necessarily, or even New York State. Like, HABs are a problem in China, Australia, across the globe, really. This is not, we have a unique set of the bacteria here in Seneca Lake, but

Seneca Lake Pure Waters Association: It is not necessarily a problem that is unique to lake communities across the globe.

Mark Petzold: Yeah, if you... if you read that book, The Devil's Element, I talked about on the... one of the first slides.

Mark Petzold: It goes into that in spades.

Mark Petzold: you know, it talks about Lake Erie, it talks about Lake Okeechobee,

Mark Petzold: I mean, HABs are everywhere, and I forget what the percentage is, like, 3% of the water

Mark Petzold: on Earth is freshwater.

Mark Petzold: I think somewhere in that range, I think.

Mark Petzold: And... I mean, HABs are everywhere.

Mark Petzold: That's fresh water.

Seneca Lake Pure Waters Association: We have another question from Anne. Can you comment on whether the heated water from Greenwich is, increasing the HAB growth?

Mark Petzold: It's not... not a... not lake-wide, for sure.

Mark Petzold: The amount of heat that comes in is quickly absorbed by the lake.

Mark Petzold: It could have some local impact.

Mark Petzold: You know, down close to the power plant.

Mark Petzold: But as far as, an energy source that...

Mark Petzold: you know, is causing lake-wide problems. That's not the case.

Seneca Lake Pure Waters Association: Another question, will solar farms generate more phosphorus and runoff?

Mark Petzold: No, I don't, I don't believe so. Solar farms are not spreading

Mark Petzold: Manure, solar farms are not spreading phosphorus.

Mark Petzold: So, somehow, I don't believe that'll... Add any additional.

Seneca Lake Pure Waters Association: Question for me, actually. So you spoke a lot about the muscle situation and the growing idea that the muscle life cycle is one of the primary driving forces of phosphorus, and therefore HABs.

Seneca Lake Pure Waters Association: what are some muscle solutions, potentially, that are out there? Are there any muscle solutions out there that might actually have some...

Seneca Lake Pure Waters Association: Possibility in reducing their numbers.

Mark Petzold: None that I'm aware of.

Mark Petzold: Right? I mean, nobody's ever come up with a solution for

Mark Petzold: Muscles in a lake this size.

Seneca Lake Pure Waters Association: I've heard the gobi... another invasive species in the lake, the goby, actually eats them.

Mark Petzold: It does, I've seen research that talk about

Mark Petzold: They won't be able to make a difference.

Seneca Lake Pure Waters Association: Okay.

Mark Petzold: I, I, you know, I mean, I've seen some things kind of both ways.

Mark Petzold: But I wouldn't... I wouldn't rely on the Gobi to... to save the day.

Seneca Lake Pure Waters Association: Gotcha.

Seneca Lake Pure Waters Association: So...

Seneca Lake Pure Waters Association: What do you think are the most actionable items, the things that we have, control over the most of right now that we can do that'll have a positive benefit on this problem?

Mark Petzold: Reducing phosphorus.

Mark Petzold: I mean, that's... like I said, that's the only controllable factor that...

Mark Petzold: That we can... we can do something about.

Mark Petzold: And to do something about it, right, means... We need communities, municipalities, we need to reduce...

Mark Petzold: The non-point source phosphorus.

Mark Petzold: like I said, the wastewater treatment plants are doing a pretty good job.

Mark Petzold: I mean, I go around, right, I'm measuring flow in 10 streams around the lake, taking phosphorus samples.

Mark Petzold: You know, there are storms where the water is just chocolate brown.

Mark Petzold: A lot of... a lot of soil, which phosphorus will attach to soil particles.

Mark Petzold: Coming down the streams.

Mark Petzold: So, the key is, To slow that water down.

Mark Petzold: You know, let the soil drop out of it.

Mark Petzold: Stop it before it gets into the stream.

Mark Petzold: Right? The riparian buffers.

Mark Petzold: You know, around stream edges and... or stream edges.

Mark Petzold: It's probably the second most important

Mark Petzold: BMP that could be done

Mark Petzold: On top of the AAM plan.

Mark Petzold: And it's a hard thing, right? Because to do that, you know, farmers have to take land out of production.

Mark Petzold: And that affects their bottom line.

Mark Petzold: So that's... that's the tightrope.

Mark Petzold: You know, that needs to be walked.

Mark Petzold: There was a program a few years ago that was going to compensate farmers for putting buffers in.

Mark Petzold: But it didn't go anywhere, because the farmers didn't feel... They were being adequately compensated.

Mark Petzold: So the solutions are there, it's just, you know, is the will and the watershed there?

Mark Petzold: To get these things implemented.

Seneca Lake Pure Waters Association: Gotcha.

Seneca Lake Pure Waters Association: And that's a big part of what we're trying to do at Seneca Lake Pure Waters. We're trying to foster a sense of community and foster,

Seneca Lake Pure Waters Association: responsibility for maintaining the lake that everyone... 100,000 people depend on for drinking water. It's not just necessarily the properties around the lake itself.

Seneca Lake Pure Waters Association: And, the lake itself is the driving force for much of the local economy. So, without the lake, property values will go down, taxes will go up.

Seneca Lake Pure Waters Association: Job opportunities will go down, your health will be impacted, so this is why we focus on things like that here, so that we can try and make a difference and benefit everyone.

Mark Petzold: Nope.

Seneca Lake Pure Waters Association: I just wanted, I think we're good, unless anyone has any last-second questions.

Seneca Lake Pure Waters Association: I just want to thank everyone here for attending. We are going to put this up on our YouTube and also on our website, so if you want someone else to check it out, please recommend to them to check it out.

Seneca Lake Pure Waters Association: I would also say check out our website, SenecaLake.org, and...

Seneca Lake Pure Waters Association: If you're not a member, please become one. We do incredibly important work, and sometimes it's a struggle to find the money or the manpower, so if you're willing to donate your time or energy or both, we would love to have you on board.

Seneca Lake Pure Waters Association: Mark, thank you so much for giving this talk this evening. Our next deep dive is scheduled for July 23rd. We will be talking about the Seneca drums with, Professor Jed Sparks of Cornell University.

Steve Bromka: Great job, Mark.

Steve Bromka: Thanks.

Mark Petzold: Thanks, Steve.

Seneca Lake Pure Waters Association: Alright, it looks like we don't have any more questions, so I'm gonna call it there. Thank you again, everyone, for attending.