

Lake Ketchum Restoration

Snohomish County Council Update – April, 2024



Surface Water
Management

Before Restoration



Algae blooms can be toxic to people and pets who recreate in lakes



TOXIC ALGAE PRESENT

Lake unsafe for people and pets

Until further notice:

- **Do not swim or water ski.**
No nade ni riegue el esquí en el lago
- **Do not drink lake water.**
No beba el agua del lago
- **Keep pets and livestock away.**
Animales domésticos y ganado de la subsistencia lejos
- **Clean fish well and discard guts.**
Limpie los pescados bien y deseche la tripa
- **Avoid areas of scum when boating.**
Evite las áreas de la espuma cuando canotaje



The Cause is Too Much Phosphorus (1 tsp phosphorus = 30 lbs algae)



Ketchum phosphorus levels were 100 times higher than other county lakes and one of most polluted in the state

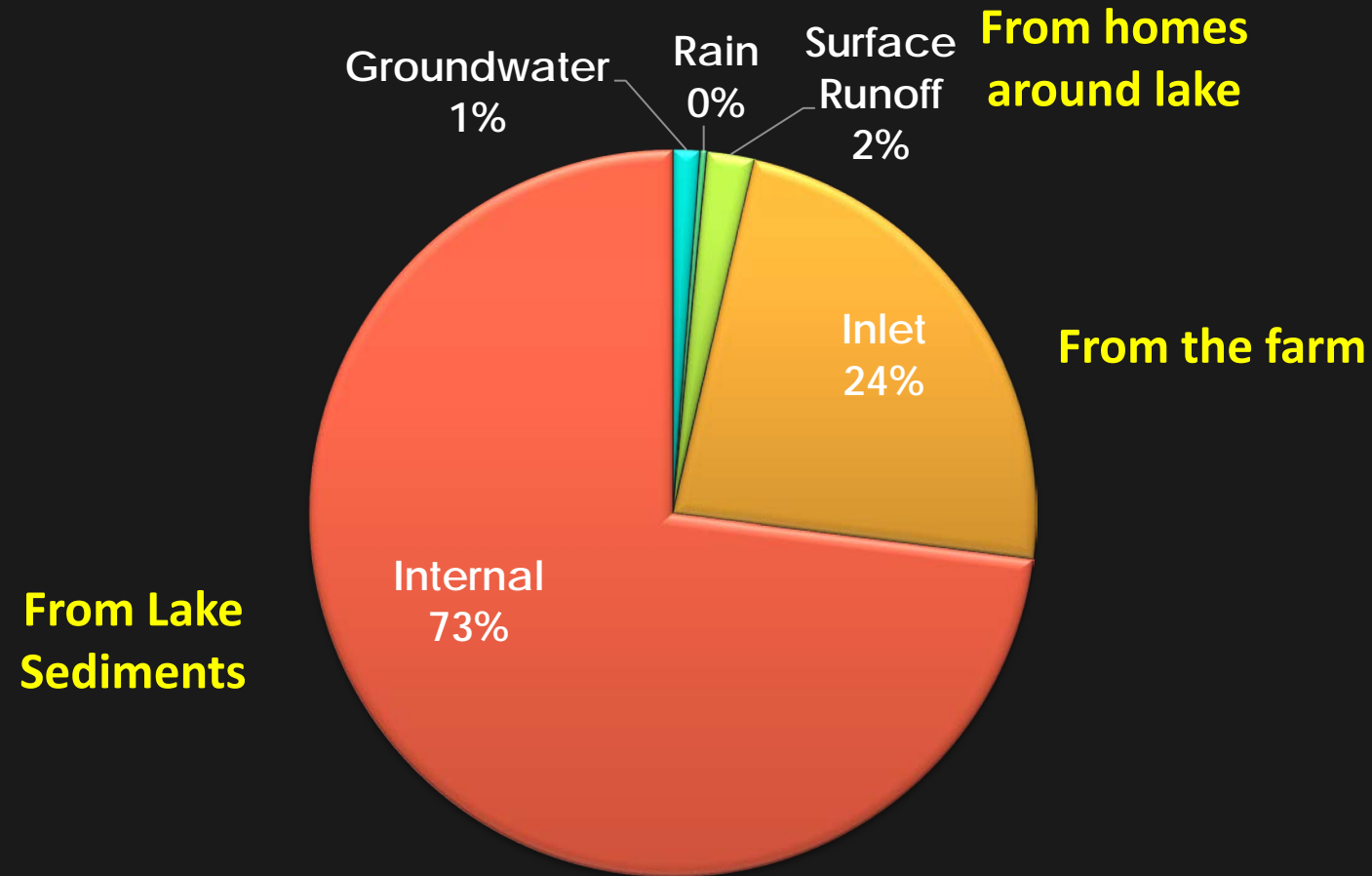
Summer phosphorus levels in lake bottom waters were similar to untreated wastewater

The main pollution source is the lake inlet (it drains a farm that had accepted chicken manure for years)

Decades of pollution were also stored up in lake bottom and recycled back into lake each summer

Source of Phosphorus Pollution

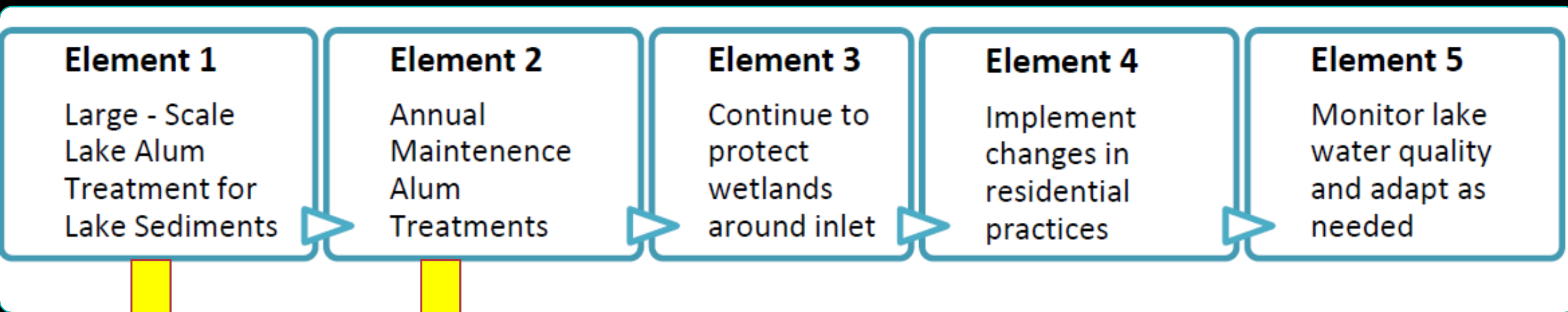
2010 - 2011



Annual Total = 623 kg

The 2012 Restoration Plan

Alum treatments work as it binds phosphorus in lake water and sediments so it can't be recycled back into the lake



Ongoing since 2016 – goal to bind phosphorus from inlet

Completed in 2014/2015 – goal to bind phosphorus in lake sediments

Restoration Goals:



Decrease summer phosphorus to 40 micrograms/liter

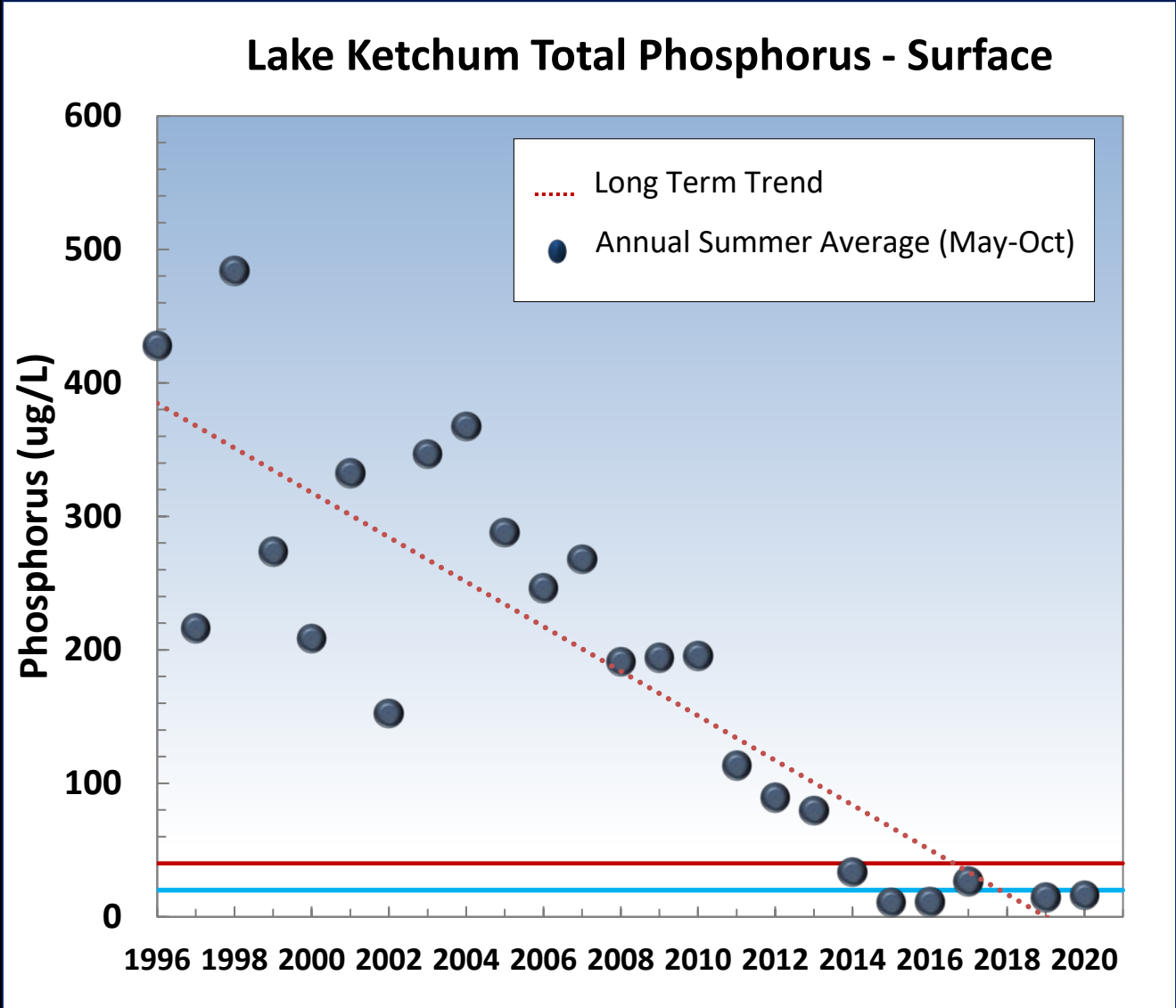


Reduce total phosphorus (TP) by 85%



Reduce algae blooms and toxic algae

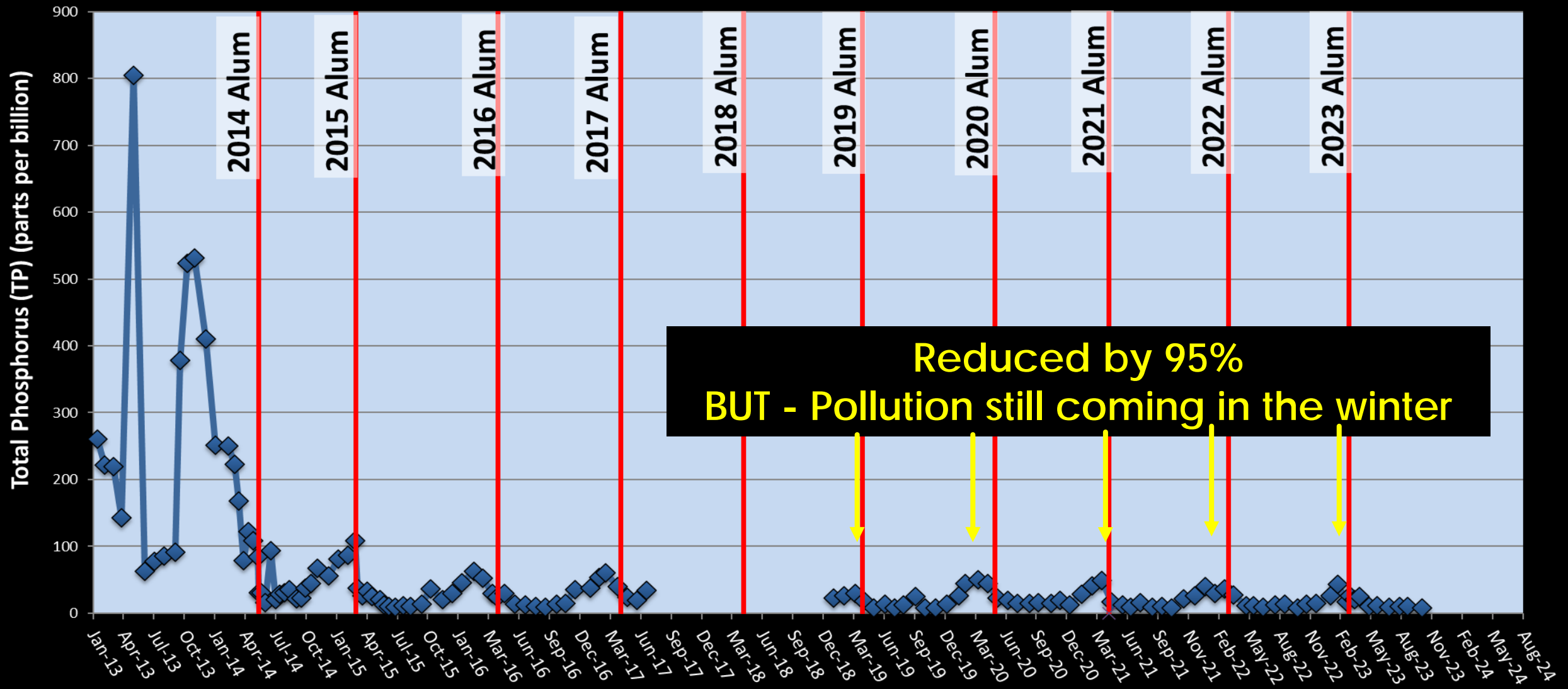
Goal - Decrease summer phosphorus to 40 micrograms/liter



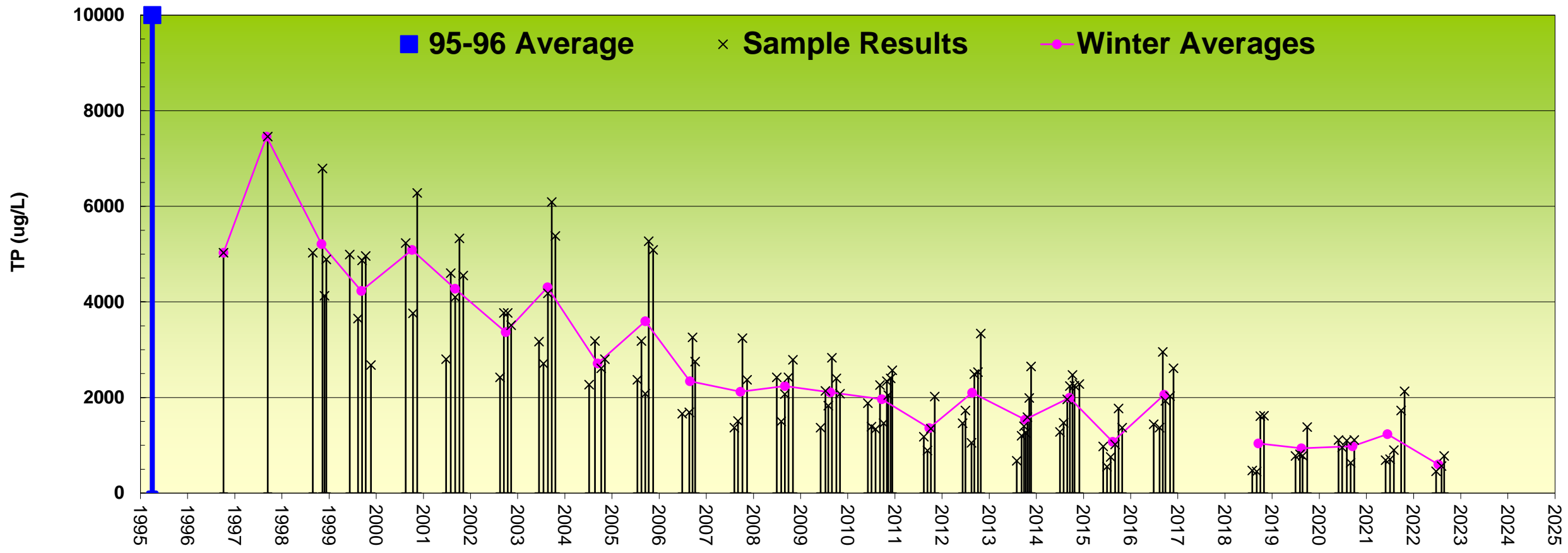
Summer average now 16 ug/L

Goal - Reduce Total Phosphorus by 85%

Upper Water Total Phosphorus

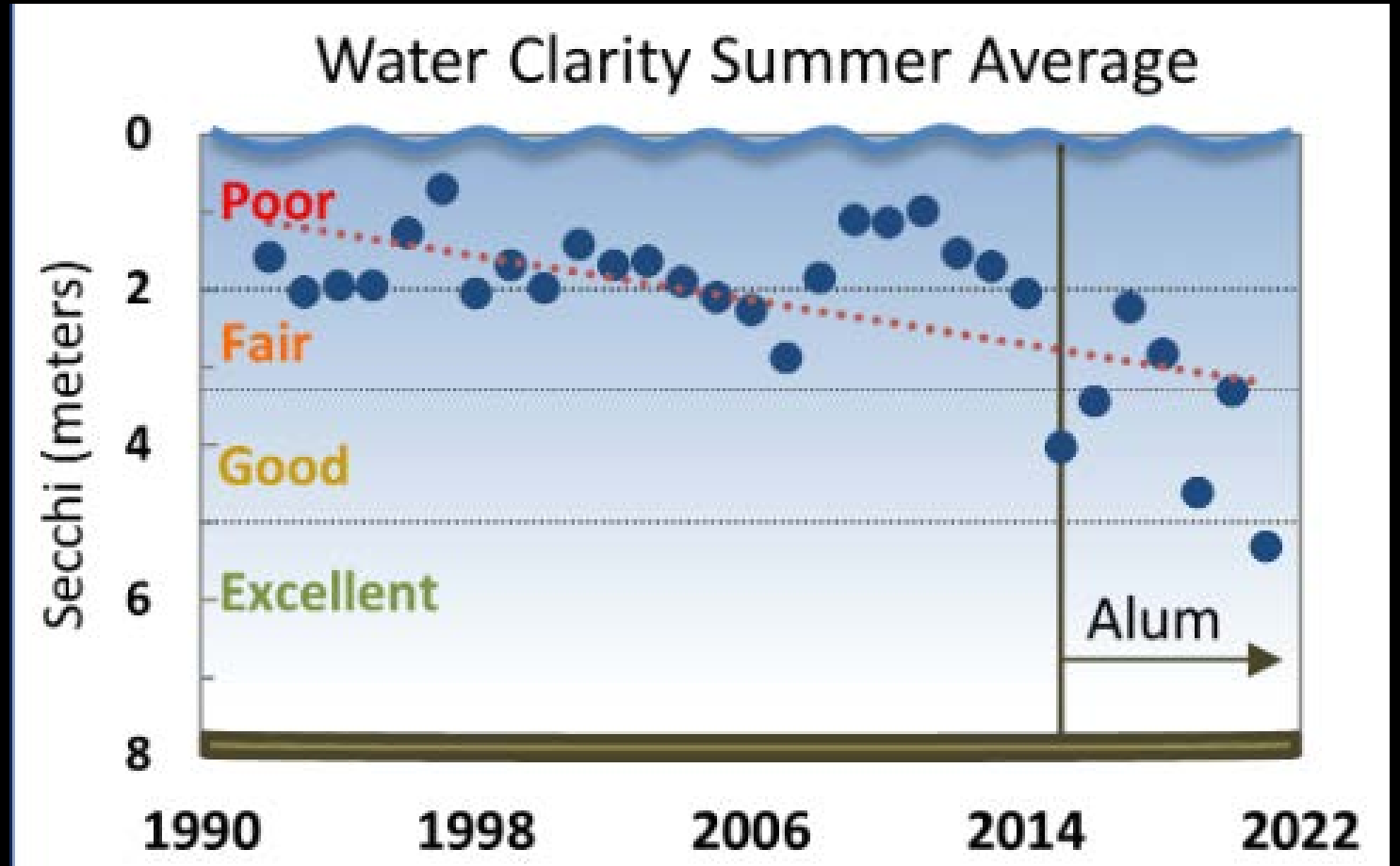


Total Phosphorus: 308th St NW -- stream as it leaves the farm



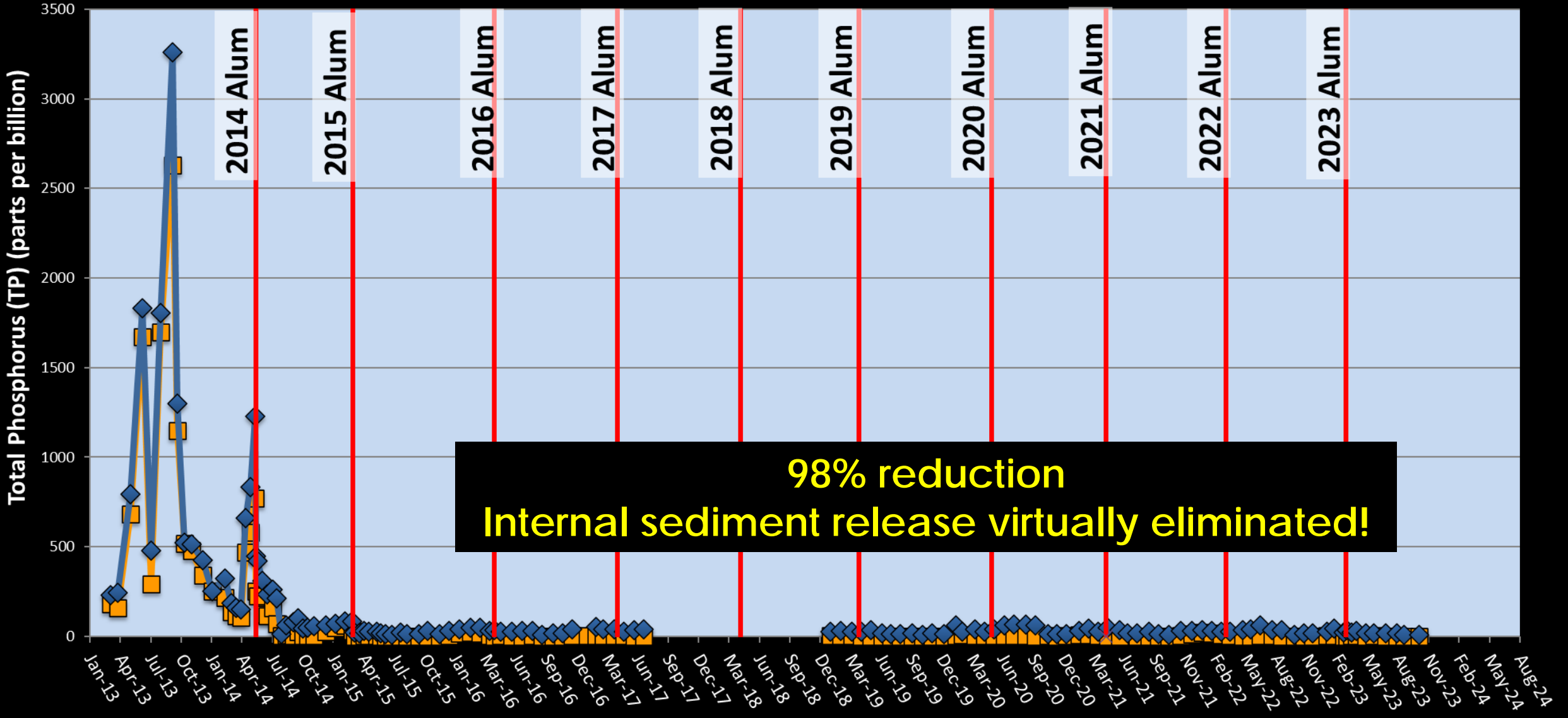
Inlet Phosphorus Concentrations Decreased, but Still High

Water Clarity - related to algae in water

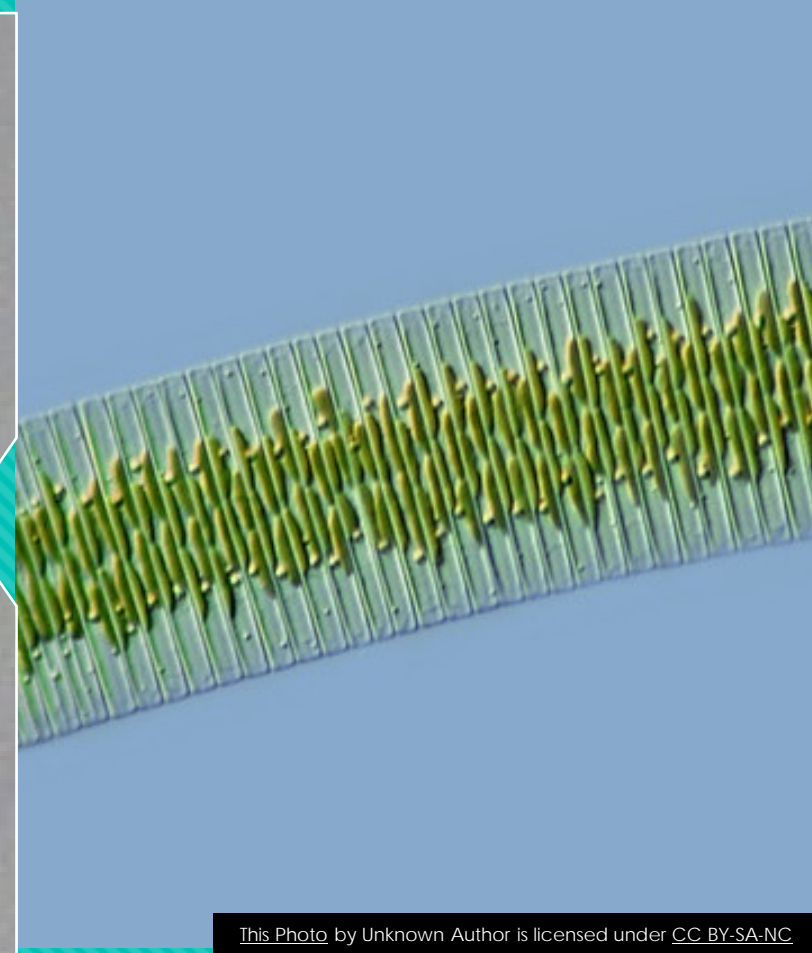


Average 6-foot increase in summer water clarity!

Bottom Total Phosphorus



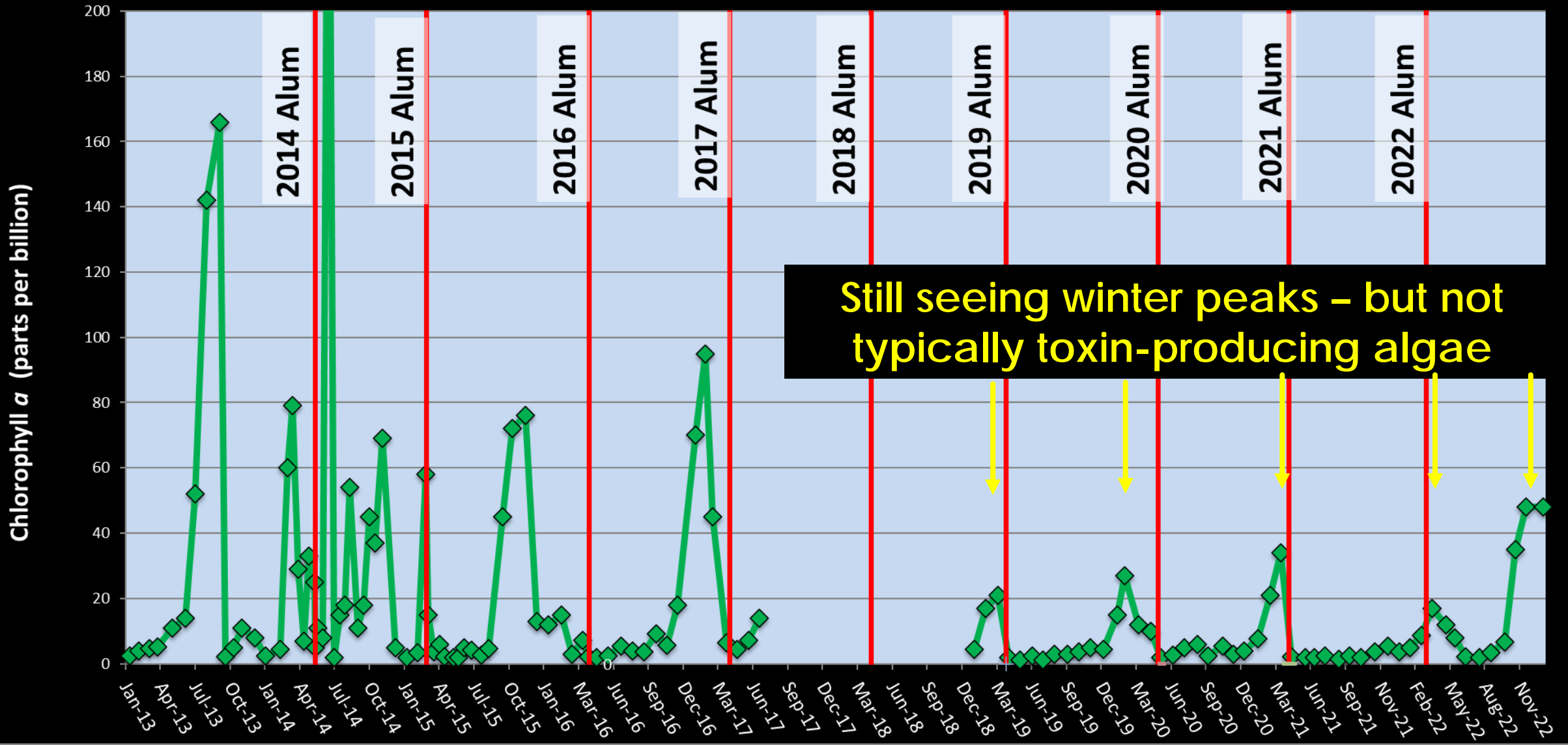
98% reduction
Internal sediment release virtually eliminated!



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Goal - #2 - Reduce algae blooms and toxic algae

Lake Ketchum Chlorophyll-*a*

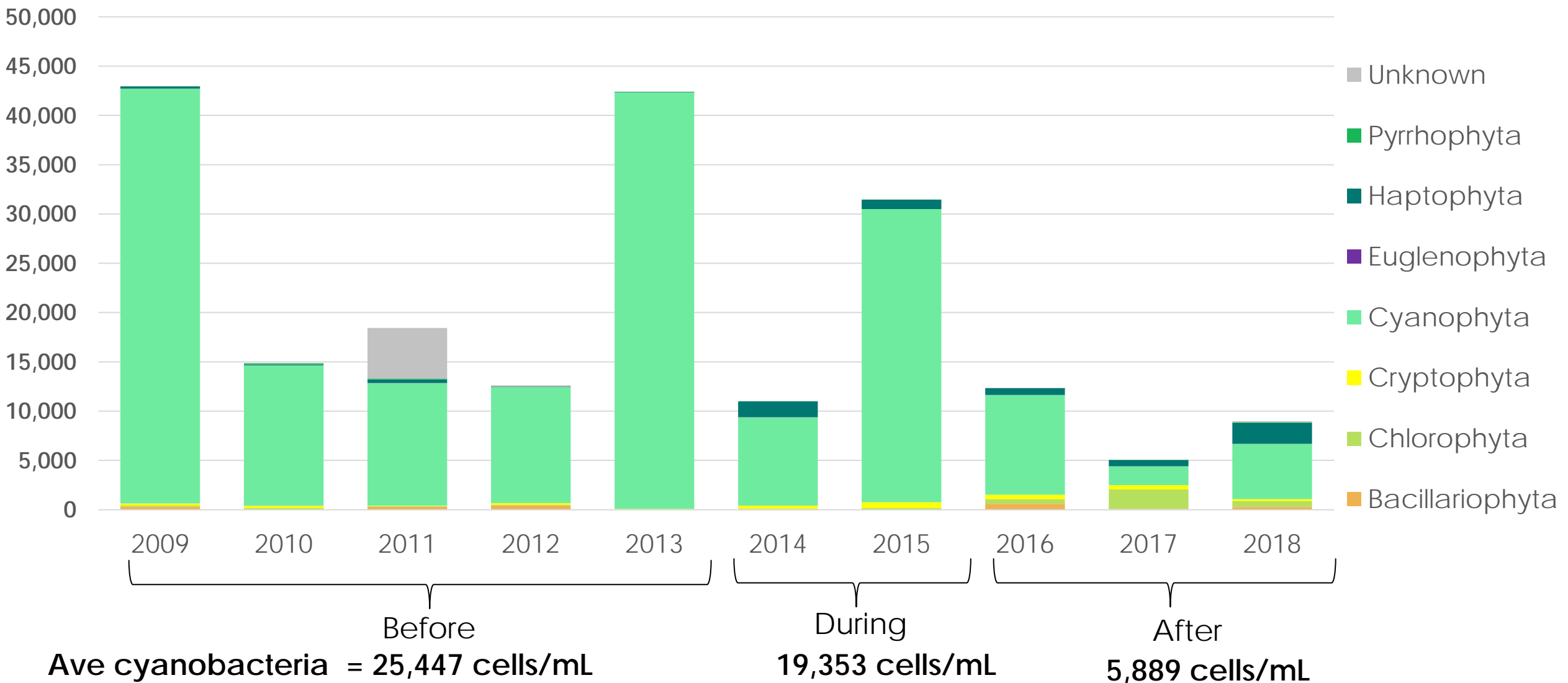


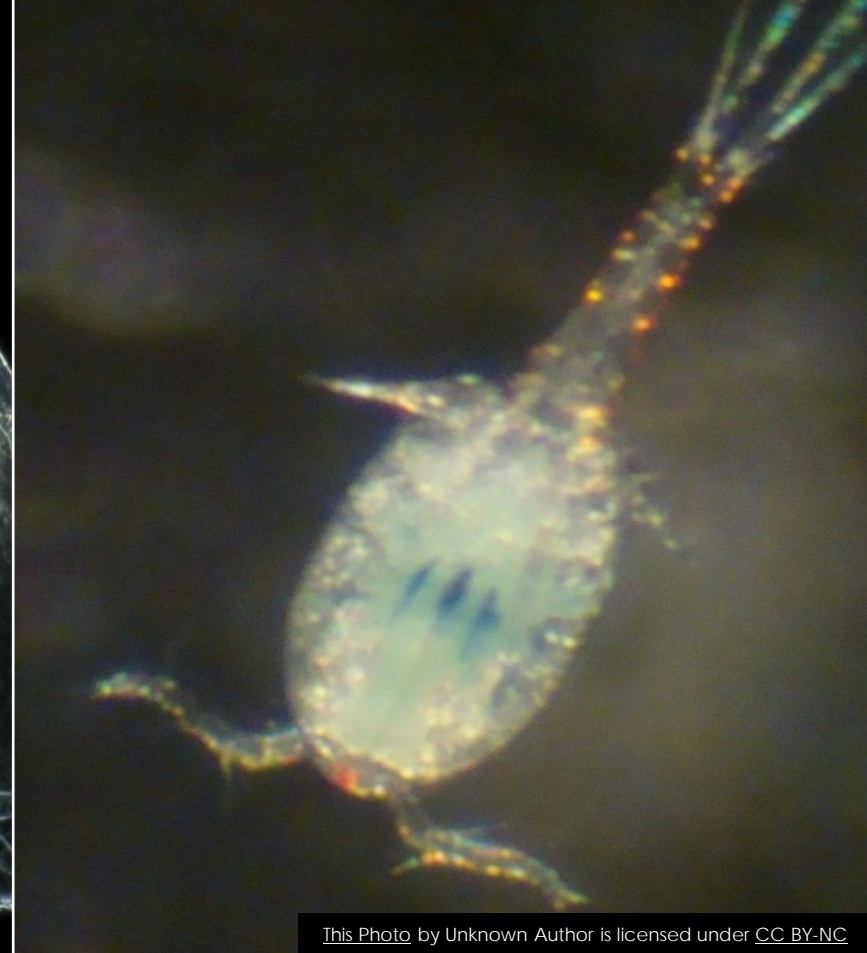
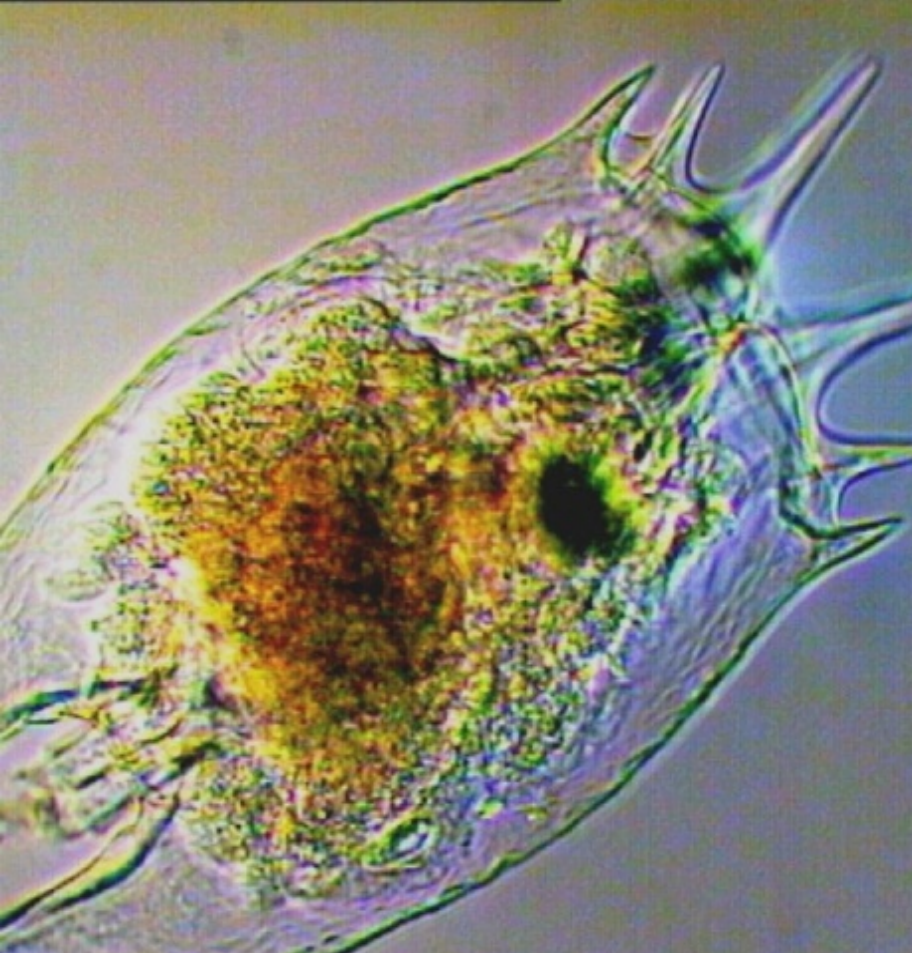
Significantly
reduced
toxic algae

YEAR	WEEKS POSTED	# OF WEEKS TOXIC*	MICROCYSTIN – LIVER TOXIN (MG/L)	ANATOXIN – NEUROTOXIN (MG/L)
2008	11	8	1.5 - 309	0.3 – 12.9
2009	21	0	0.06 - 0.29	-
2010	22	11	0.05 - 329	0.04
2011	25	8	0.06 -551	0.02 - 0.03
2012	15	5	0.07 - 417	0.02 - 0.06
2013	19	12	0.06 - 539	0.66
2014	15	7	16.1 - 675	-
2020	4	0	0.44	-

2020 Alum Treatment Delayed

Algal Cell Counts (cells/mL)– June through Sept Average



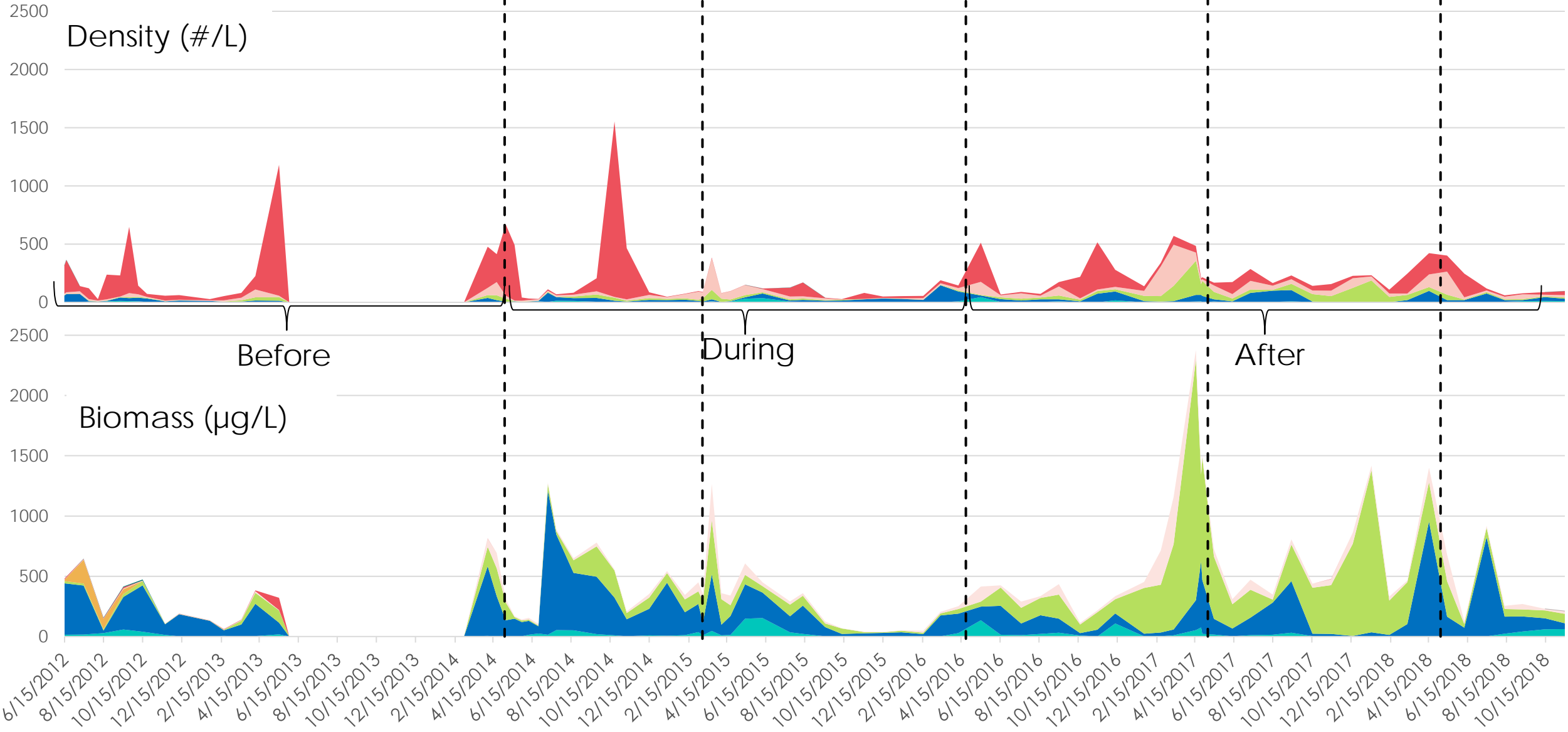


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Other Impacts: Zooplankton

Zooplankton

■ Calanoid Copepods ■ Cladocerans ■ Cyclopoid Copepods ■ Dipteran ■ Nauplii ■ Rotifers ■ Unknown



Other Biological Impacts – Native Aquatic Plants



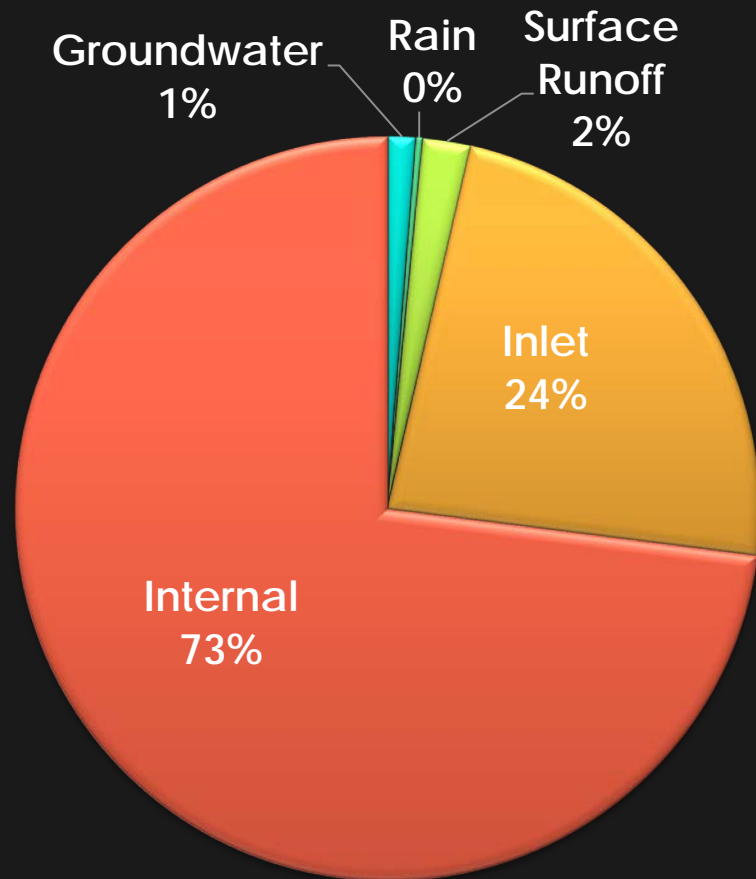


Other Biological Impact: Lake Residents



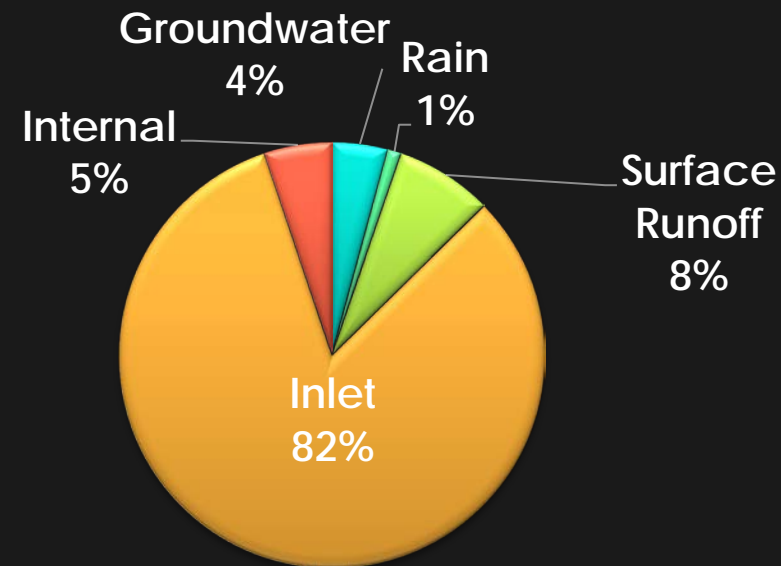
Source of Phosphorus Pollution

2010 - 2011



Annual Total = 623 kg

2023



Annual Estimated Total = 177 kg

The 2012 Restoration Plan Elements 3 & 4 – Steps to Prevent phosphorus pollution

Element 1

Large - Scale
Lake Alum
Treatment for
Lake Sediments

Element 2

Annual
Maintenance
Alum
Treatments

Element 3

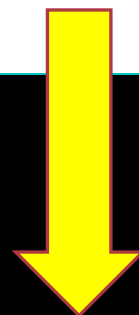
Continue to
protect
wetlands
around inlet

Element 4

Implement
changes in
residential
practices

Element 5

Monitor lake
water quality
and adapt as
needed



LakeWise Outreach Program
Relying on Critical Areas Regulations

LakeWise Property Certification

- Checklist of small actions prevent pollution
- Completely Voluntary
- Shoreline & Upland landowners (anyone whose property drains to lake)



FREE LakeWise Site Visits



Clear Choices Checklist

By taking these voluntary actions, you can protect the health of your lake and have your property LakeWise certified.



Lawns and yards

- Avoid fertilizer. If you do fertilize, apply phosphorus-free products.
By initialing, I agree to perform this practice. JM
- Attend a FREE natural lawn care workshop. Date attended: 4/14/2016
- Scoop pet waste, bag it and place it in the trash.
By initialing, I agree to perform this practice. JM
- Divert roof and driveway runoff into stable, vegetated areas.
No downspouts or drains directly into lake, stream or ditch.
- Fix eroding areas in yard, driveway and parking areas.
- Cover bare soil areas with mulch or plants.

Septic systems

- Have inspection by licensed provider within the past three years.
Documentation showing date of inspection/pumping is required. Date inspected: 8/6/2016
- Have inspections every 3 years.
By initialing, I agree to perform this practice. JM
- Attend a FREE septic care workshop. Date attended: 7/12/2016

Healthy Shoreline Checklist

Shoreline properties can also obtain a "healthy shore" certification.



- Maintain existing natural shorelines.
By initialing, I agree to perform this practice. JM
- Re-establish shoreline vegetation by replacing some lawn with other plants such as shrubs, perennials and trees.



Educational Workshops on Septic System & Natural Yard Care

FREE Septic Care Workshop

Up to \$200 in Rebates



It's great living here. Don't let your septic system spoil it unknowingly.

Attend a free natural lawn care wo

Come to a free workshop and discover the natural way to:

- Grow beautiful and easy-to-care-for lawns
- Keep your children, pets, and lake safe
- Manage moss, weeds, moles, and other pests



Free! Register today! Visit www.lakewise.org, call 425-388-3204 or email lakes@snoco.org.

Seven Lakes Area:	or	Lake Stevens:
Wed., May 2		Thurs., May 3
6:30 - 8:30 p.m.		6:30 - 8:30 p.m.
Lake Goodwin Community Club 17323 42nd Ave NW, Stanwood		Cavelero Mid High School 8220 24th St SE, Lake Stevens



healthy lawns, healthy lakes, healthy people



LakeWise Community Events



Lake Ketchikan Celebration BBQ

Join Your Neighbors
Saturday, June 10
12:00 - 5:00 p.m.
Lot 19 (NW side of road)



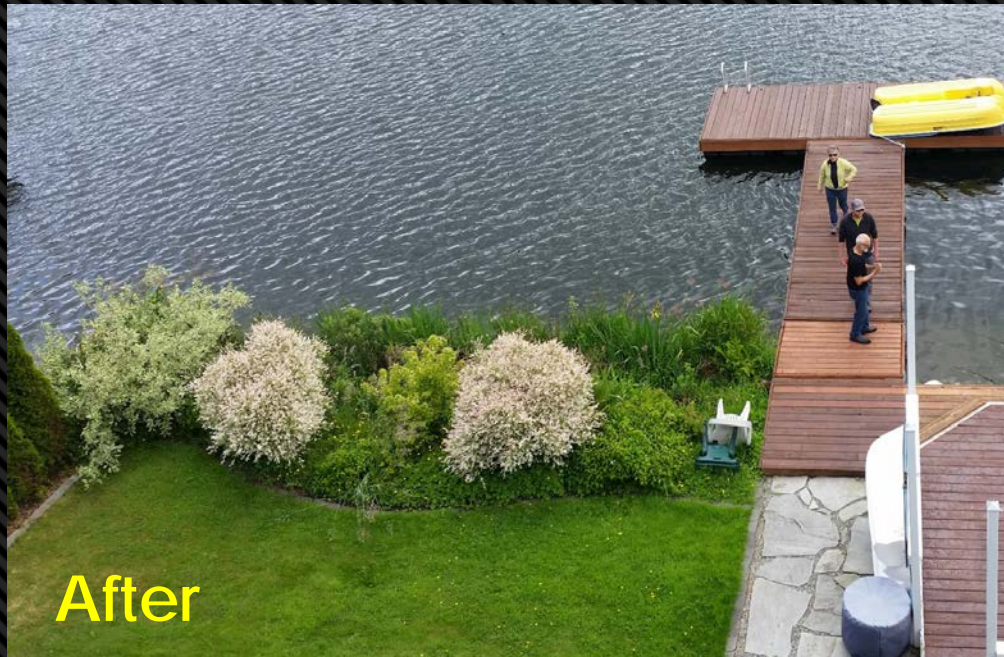
KSIC
Ketchikan
Improvement
Club



Shoreline Restoration



Before

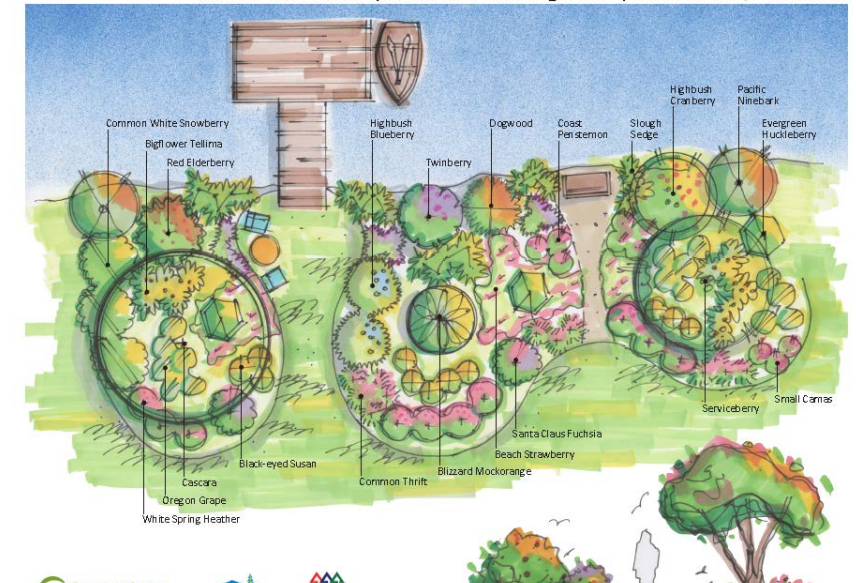


After

B Small to Medium Shrubs

SCIENTIFIC NAME COMMON NAME	ZONE				NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
	1	2	3	D or E		Sun	Partial	Shade	Height	Width		
<i>Mahonia aquifolium</i> Tall Oregon grape		2	3	E					6' - 10'	5'	March to April	Yellow flowers attract hummingbirds/pollinators; dark-green and glossy leaflets which look and feel like holly; clusters of blue-berries.
<i>Mahonia aquifolium</i> "Compact" Compact Oregon grape		2	3	E					2' - 4'	3' - 4'	March to April	Compact form of tall Oregon grape species; yellow flowers; clusters of blue-berries.
<i>Mahonia nervosa</i> Longleaf or Low Oregon grape		2	3	E					15" - 20"	2' - 3'	April to May	Lowest of the Oregon grape shrubs; slowly forms ground-cover; dark-green glossy leaf with up to 15 leaflets; can turn mahogany in winter sun.
<i>Mahonia repens</i> Creeping mahonia			3	E					2' - 3'	3' spreading	April to May	Low, slow-growing, tidy shrub; leaves have 5 to 7 leaflets that are blue-green with dull surface; native to eastern WA.
<i>Myrica gale</i> Sweet gale	1			D					4' - 6'	4' - 6'	May to June	Attractive leaves emit sweet scent when rubbed; commonly found on lake shorelines.
<i>Philadelphus lewisii</i> Mockorange	1	2	3	D					5' - 10'	5' - 10'	June to July	Fragrant white flowers; attracts butterflies and bees; grows in moist, well-drained to dry rocky soils. A compact variety ("Blizzard") is available.
<i>Physocarpus opulifolius</i> Common ninebark	1	2		D					4' - 10'	3' - 8'	May to June	White flower; similar needs as native ninebark; select cultivars by mature size and for chartreuse, green or bronze colored leaves.

LakeWise Healthy Shores Planting Plan | Pollinator/ Wildlife



Lake Ketchum Participation

- 46 households attend septic and/or lawn care workshops
- 29 LakeWise site visits
- 18 Properties LakeWise certified
- 8 Shoreline Properties "Healthy Shore Certified"



Restoration Successful So far. . . .





- 90% reduction in phosphorus, 6 ft increase in water clarity & no toxic blooms above state guidelines
- Lake Health Rating change from “Poor” to “Good”
- Results published in scientific journal
- Project awarded “Best in State” gold award by American Council of Engineering Companies

But without annual treatments blooms will return as inlet is still causing majority of ongoing pollution

Lake Ketchum 2023 Health Report

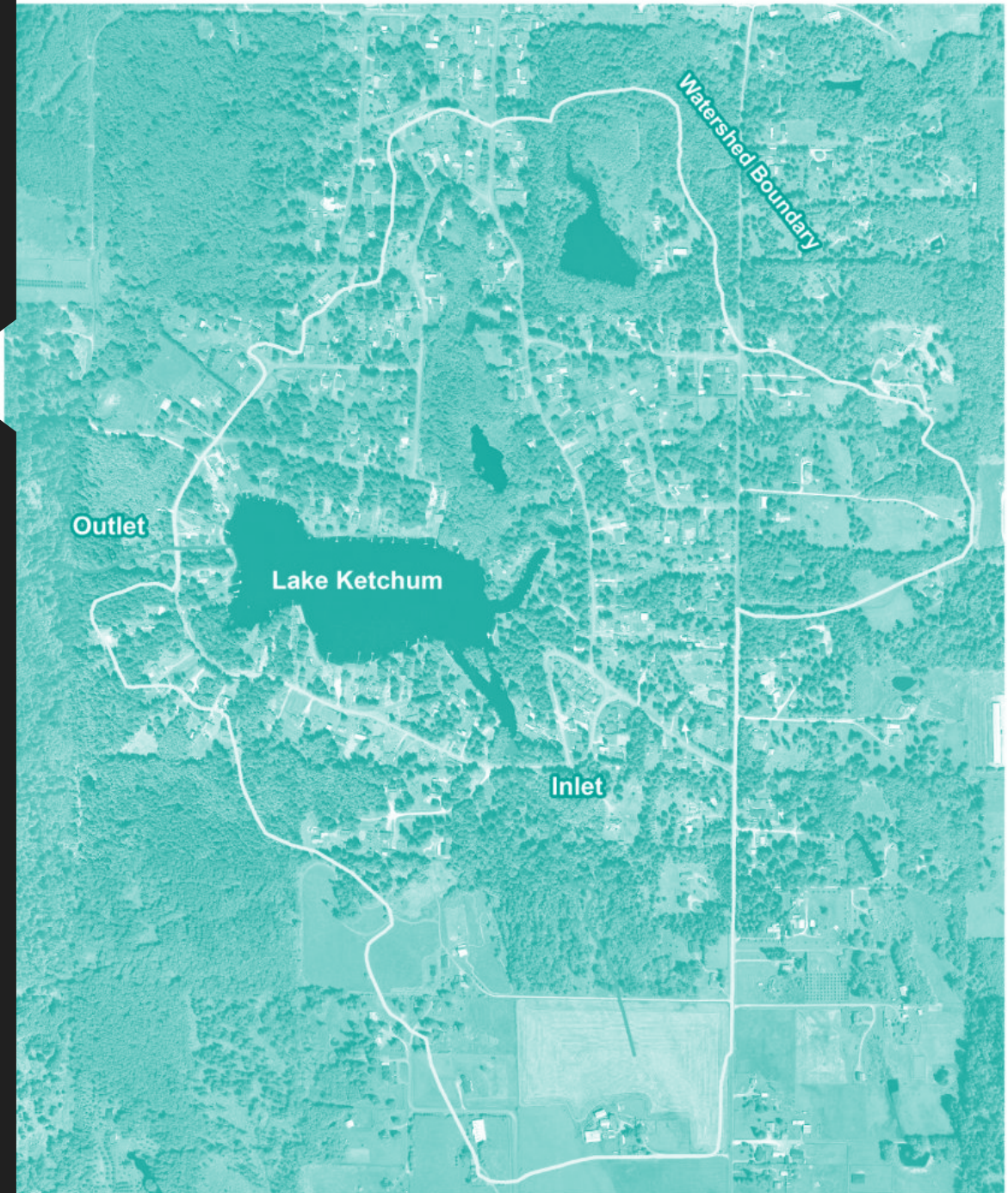
Lake Health = GOOD

The lake health is currently good as alum treatments keep phosphorus and algae low. Yet, the lake is at risk from the effects of past pollution.

Health Indicators	Poor	Fair	Good	Excellent	Details
 Water Clarity <i>Visibility in water</i>					Good – Average clarity is 12.1 feet deep and varies with the amount of algae.
 Phosphorus <i>Keeping it low prevents algae</i>					Good – Phosphorus levels are moderate as a result of ongoing alum treatments.
 Algae <i>Problematic if too much</i>					Good – Algae levels are moderate. The lake has occasional toxic algae blooms since restoration.
 Shorelines <i>Shoreline plants protect the lake</i>					Fair – Only a third of the lake shoreline has trees and shrubs rather than lawns.

Next Steps

- Continue:
 - Small annual treatments
 - LakeWise Adoption
- Develop relationship with new landowner on farm



Learn more at
www.snohomishcounty.gov/2451



Surface Water
Management