



Cyanobacteria! What can we do??

Water quality at Province Lake

July 27, 2024 Province Lake Association

Annual meeting

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Outline for today:

- Background information
- Province Lake is special...
- What can we do?
 - Homeowners
 - The lake association
 - Partners



Cyanotoxins

- Affect people, pets and wildlife
- Exposure through ingestion
 - Drinking water
 - Swimming
 - Food
- Exposure through inhalation
- Acute and chronic toxicity
- Documented symptoms:
 - Skin irritation
 - Eye and nose irritation
 - Fatigue
 - Fever
 - Nausea, vomiting, diarrhea
 - Tingling, numbness, seizures
 - Nervous system and organ failure
 - Death

When in doubt, stay out!

Short-term Actions: Bloom Response

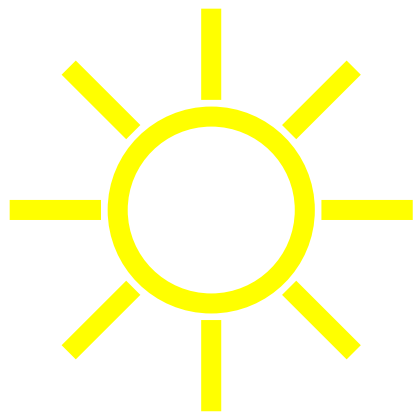
Goal: Protect yourself and others from immediate risk



- Perform a self risk assessment
- Report suspected blooms
- Spread the word about warnings
- Join email list to receive notifications

Report a bloom: <https://arcg.is/1e8Tfy>

More information: <https://www.des.nh.gov/water/healthy-swimming/harmful-algal-blooms>



What creates a bloom?

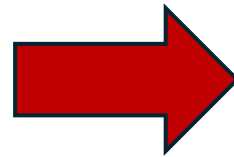
Sunlight + More Nutrients (P) + Warm Water

Cyanobacteria Bloom



Phosphorus feeds cyanobacteria

Too much phosphorus



Too many cyanobacteria (blooms)



Photo credit: Carol Wyman

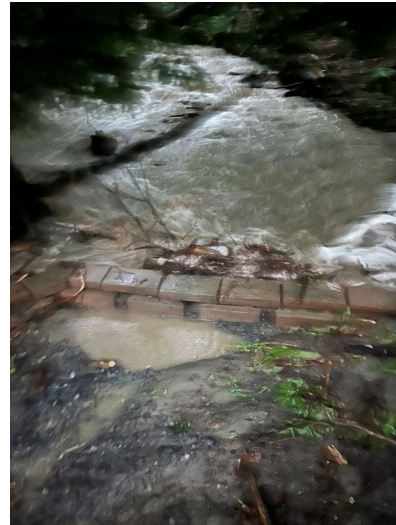
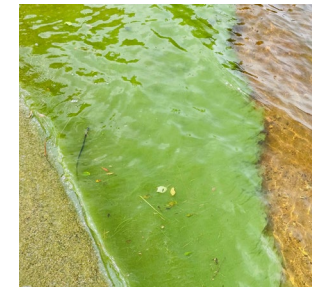
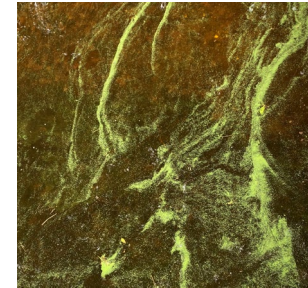


Photo credit: Ed Rippe



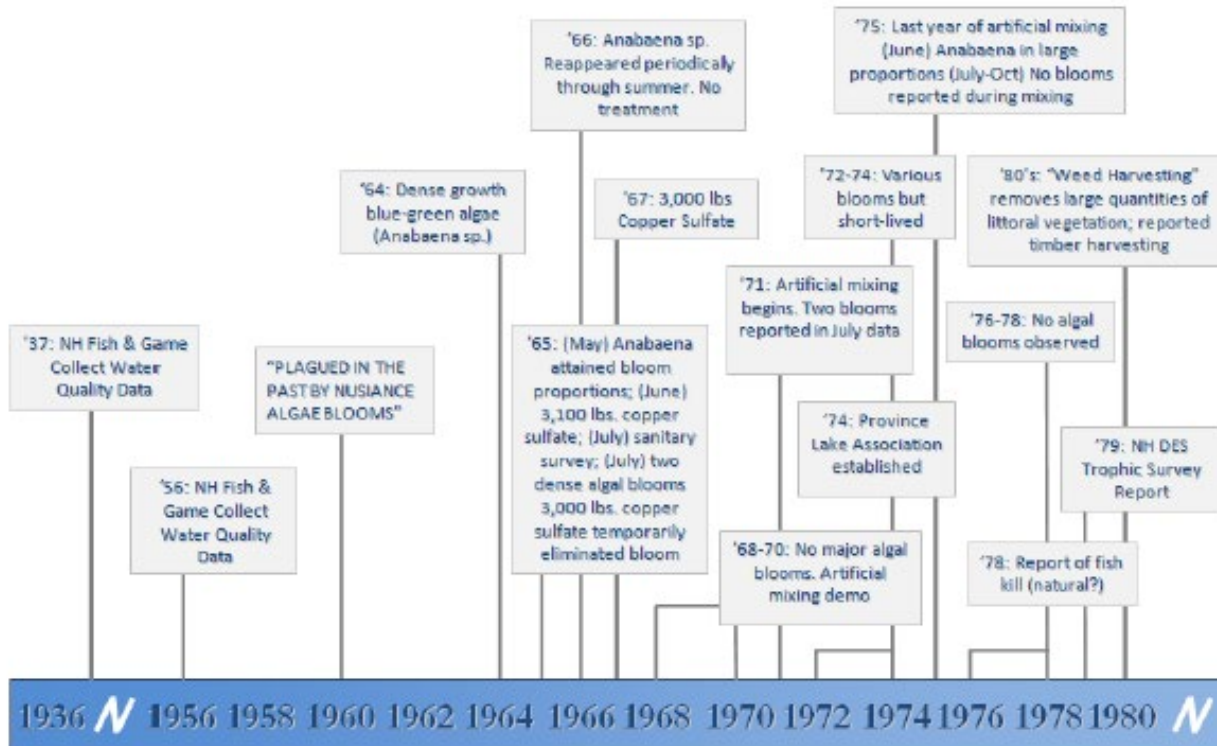
Outline for today:

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- **Province Lake is special...**
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Province Lake is special... in some challenging ways

- Frequent blooms
- Long history of cyanobacteria blooms



Warning	8/6/2018	8/16/2018	10	Ar
Warning	7/25/2019	7/31/2019	6	Ar
Alert	6/2/2021	**	**	
Alert	10/7/2021	**	**	
Alert	11/8/2021	**	**	
Alert	9/2/2022	**	**	
Warning	9/7/2022	9/21/2022	14	
Alert	10/3/2022	**	**	
Warning	10/6/2022	10/19/2022	13	
Alert	5/31/2023	6/1/2023	1	
Warning	6/1/2023	6/8/2023	7	
Warning	7/6/2023	8/31/2023	56	
Warning	9/7/2023	9/14/2023	7	
Alert	9/29/2023	10/4/2023	5	
Warning	10/4/2023	10/19/2023	15	

Province Lake Timeline (1936 to 2014)

Your watershed-based plan (2014)



October 2014

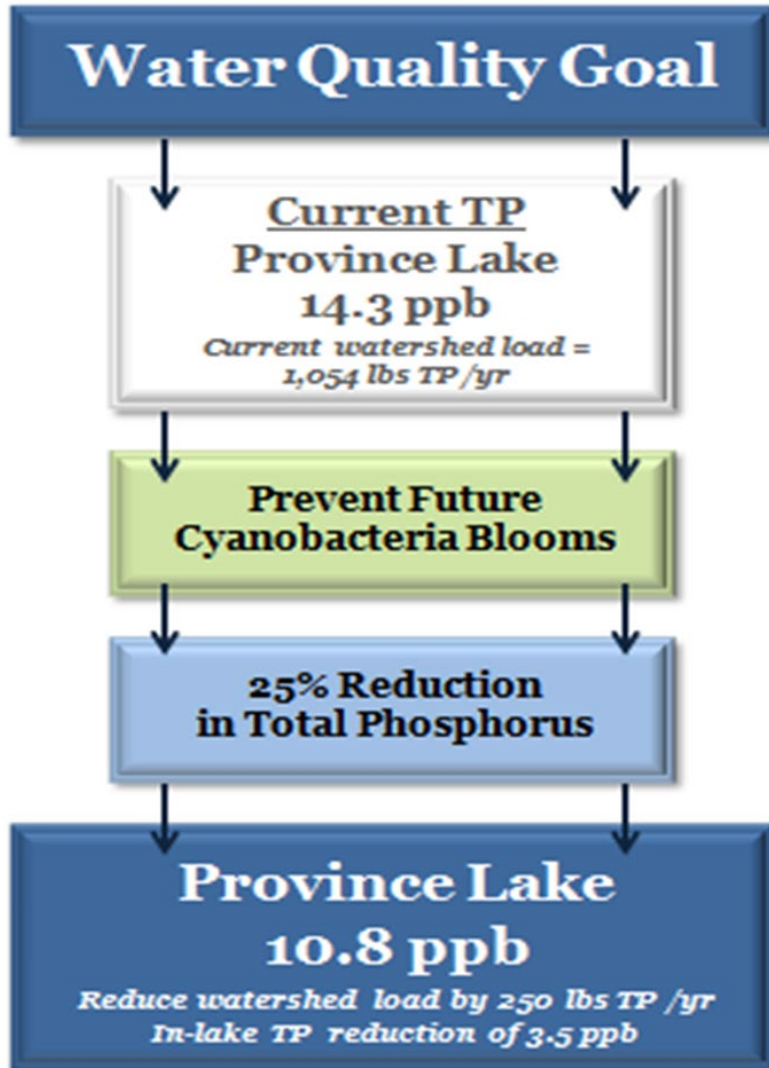
- A comprehensive, prioritized to-do list for how to restore Province Lake
- Identifies sources of nutrients and pollutants
- Describes specific actions to address nutrient sources
- Supports funding applications



UNIVERSITY OF NEW HAMPSHIRE
STORMWATER CENTER



Your watershed-based plan (2014)



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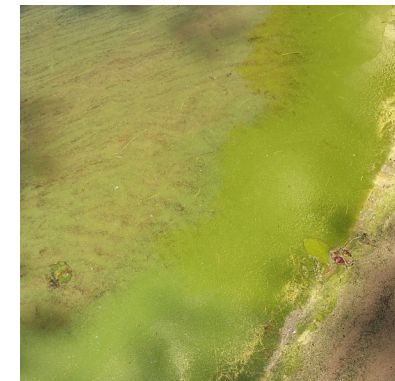
Province Lake is special... in some ways to celebrate!

- Track record of success
- Strong partnerships
- Received ~\$625,000 in grants from NHDES
- Have eliminated **143 pounds of phosphorus/year** into the lake

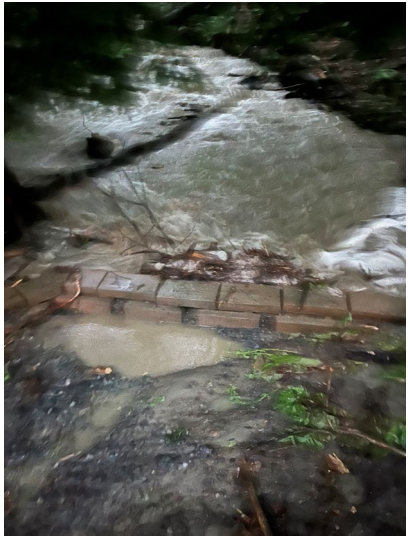


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Where does the phosphorus come from?



<i>Loads to Province Lake</i>	TP (kg/year)	TP (%)
<i>Atmospheric Deposition</i>	78	16%
<i>Internal Loading</i>	0	0%
<i>Waterfowl</i>	3.5	<1%
<i>Septic Systems</i>	81	17%
<i>Watershed Runoff</i>	315	66%
<i>Total Load To Province Lake</i>	478	100%



What can a homeowner do?

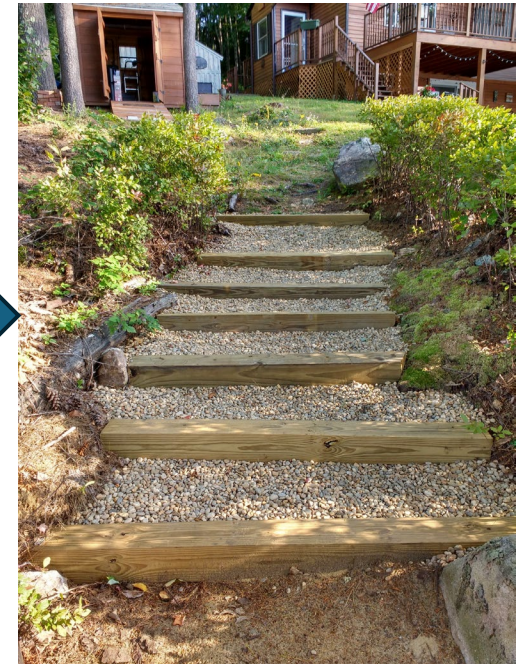
1. Reduce erosion
2. Vegetate your shoreline
3. Maintain your septic system
4. Be careful with fertilizer
5. Spread the word



¹ Webinar with additional details about actions that homeowners can take:
<https://www.youtube.com/watch?v=7idHxzK2rO0&list=PLzaaFQKgZ-FioCCxV22Mul9cG3H7qgFnG&index=2>

1. Homeowners: Reduce erosion

- Identify trouble spots: where does the water go?
- Replant bare areas
- Use mulch, pea gravel
- Install:
 - Rain barrels
 - Rain gardens
 - Permeable pavers
 - Infiltration steps or trench





1. PLA and partners: Fix sites with erosion

- Trouble spots are identified in your watershed plan:
 - Roads
 - Properties on tributaries
 - Undersized culverts
 - Roadside ditches

- Across the watershed, not just near the lake
- Good progress to date!



Photo credit: AWWA



Photo credit: AWWA

2. Homeowners: Vegetate shorelands

- Shorelines are the lake's last defense
- Can be done in ways that maintain viewshed and enjoyment
- Help water infiltrate:
 - Mulch or pea gravel
 - Deep rooted plants
 - No bare ground



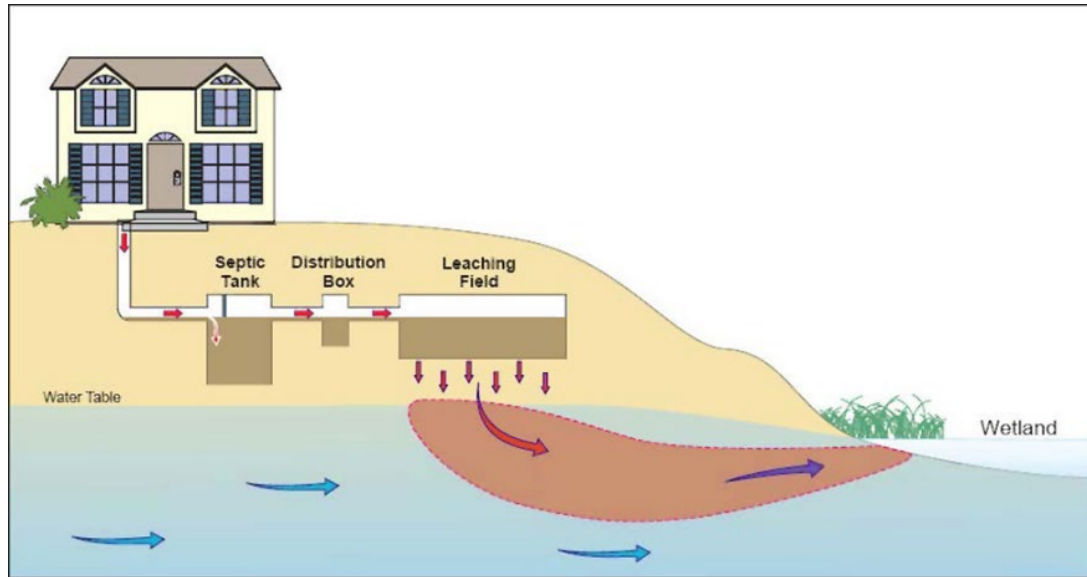
- Native plants:
 - Increase infiltration
 - Reduce nutrient runoff
 - Reduce ice damage
 - Reduce erosion/wake damage
 - Eliminate the need for fertilizer
 - Support biodiversity

Shoreland native plants list: <https://nhlakes.org/wp-content/uploads/native-shoreland-plants.pdf>

Design concepts: <https://nhlakes.org/wp-content/uploads/Landscaping-at-the-Waters-Edge.pdf>

3. Homeowners: Upgrade/maintain septic system

- Inspect/pump at least every 3 years



- Prevents harmful bacteria that makes people sick
- Modern systems that are well-maintained effectively filter the phosphorus that drives cyanobacteria blooms and weed growth

3. Lake Associations: Facilitate septic maintenance

- Educate homeowners about the need
- Coordinate local pump-out days
- Pass local regulations requiring modern systems and/or regular maintenance¹



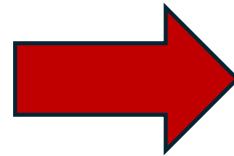
Photo credit: AWWA

¹ Webinar recording with more information and case studies:

https://www.youtube.com/watch?v=OPQJfFF_NsE&list=PLzaaFQKgZ-FioCCxV22Mul9cG3H7qgFnG&index=8

4. Be careful with fertilizer

Too much phosphorus



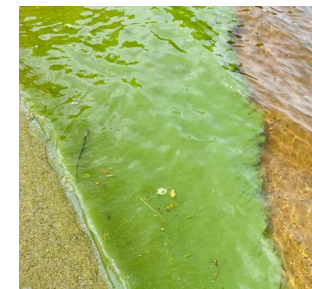
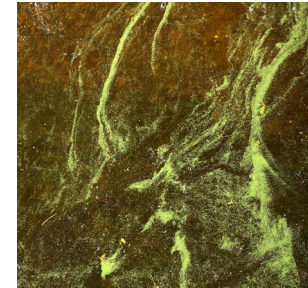
Too many cyanobacteria (blooms)



Photo credit: Carol Wyman



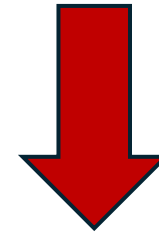
Photo credit: Ed Rippe



4. Be careful with fertilizer

- Ask if you need to fertilize
 - Soil test
- Pick the right use
- N – P – K
- Measure to apply the right amount
- Apply in May or September
- Use targeted application areas
- Don't apply before a rainstorm
- Avoid application within 25' of the lake
- [AWWA Fertilizer Pledge](#)

Too much phosphorus



Too many cyanobacteria
(blooms)



5. Spread the word

- What homeowners do affects water quality (and property values)
 - Shoreland vegetation
 - Stormwater runoff
 - Fertilizer use
 - Septic maintenance
- The risks of cyanobacteria blooms
 - How to ID & report: <https://arcg.is/1e8Tfy>



What can a homeowner do?

1. Reduce erosion
2. Vegetate your shoreline
3. Maintain your septic system
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What can a lake association do?

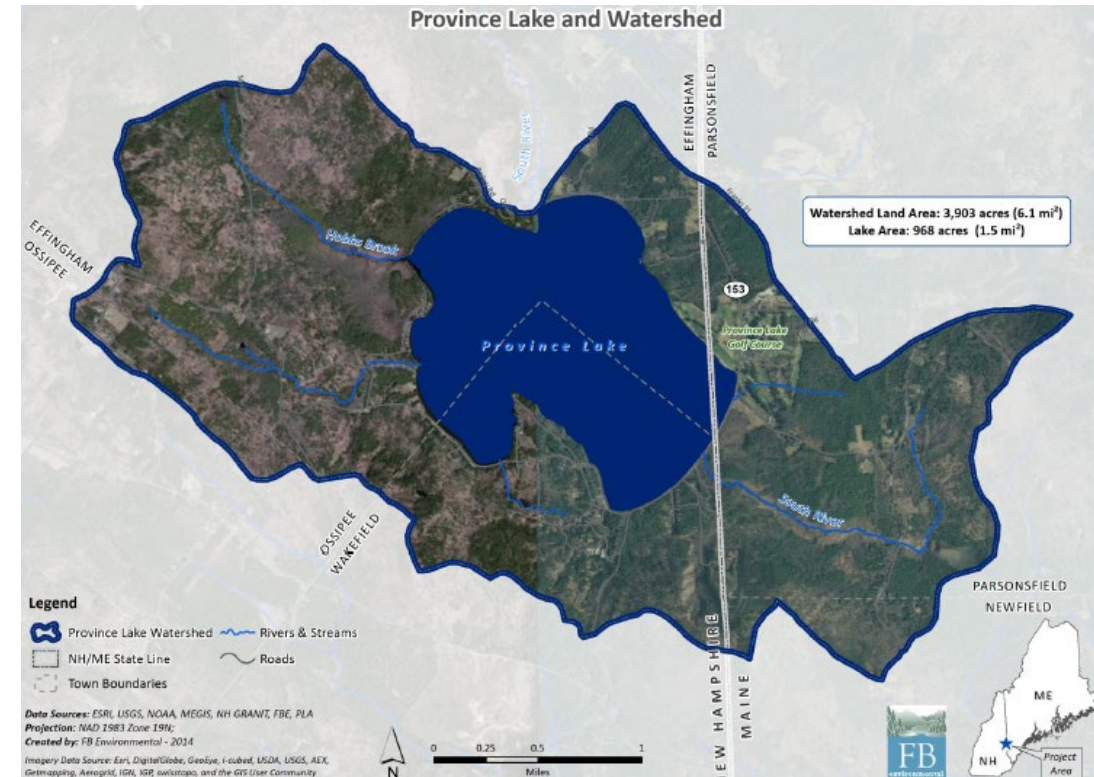
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2. Vegetate your shoreline
3. Maintain your septic system
4. Be careful with fertilizer
5. Spread the word
6. Protect upstream land
7. Continue what you have started



Photo credit: PLA

6. Conserve upstream land

- More construction -> more phosphorus into the lake
- Development can contribute 10x more phosphorus than undeveloped land
- 886 new homes by 2060 = 72% **more** Phosphorus in Province Lake
 - 2014 goal was a 25% **reduction** in Phosphorus



7. Continue the great work you have started

- Maintain existing erosion control projects
- Coordinate with the towns, AWWA, DOT, and others
- Report suspected blooms when you see one
- Keep applying for funding!



Photo credit: AWWA



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Resources to help

- AWWA: technical assistance, Youth Conservation Corps, watershed planning/project management, and more



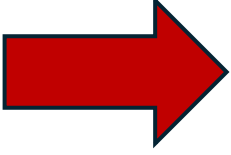
Photo credit: AWWA

- NHDES/EPA implementation grants

- Do-it-yourself (DIY) step-by-step guides:
<https://www4.des.state.nh.us/SoakNH/resources-2/diy-fact-sheets/>
- NH LAKES LakeSmart library:
<https://nhlakes.org/lakesmart/>



Remember Why:

• Too much phosphorus  Too many cyanobacteria (blooms)

• The same actions have other benefits too, e.g.:

- Protecting fish and wildlife habitat
- Reducing chloride (road salt) pollution

• Protecting water quality protects recreation and property values



Key Takeaways

- Land use choices by each of us affect water quality
 - Vegetate shorelines
 - Reduce erosion
 - Be smart about fertilizer
 - Maintain septic systems
- Nutrient reduction work is slow, but necessary. You won't see a reduction in blooms right away.
- No one quick, easy, cheap, effective solution to eliminate blooms, **BUT...**
- ...Lots of programs exist to help, and you have already made progress!



Photo credit: PLA

History of Water Quality Protection Projects on Province Lake

2012 – Development of Province Lake Watershed Management Plan.....	\$161K
2015 – Implementation Phase 1: High Priority Projects & Local Capacity.....	\$203K
2016 – Implementation Phase 2: Septic Systems, Golf Course, Campground, Shoreline & Roads.....	\$178K
2021 - Implementation Phase 3: Septic Systems, residential stormwater, & Bonnyman Shoreline Stabilization.....	\$82K
Total.....	\$625K

Results

- 12 Septic Systems Replaced
- 22 YCC Stormwater Projects
- 4 Engineered Road Projects
- **143 lbs/year reduction of Phosphorus**

Project Partners



Thank you!

Questions?



Photo credit: AWWA

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