

HALFMOON LAKE

DRAFT WATERSHED MANAGEMENT PLAN

November 15, 2024



Christine Bunyon, Project Manager
Evan Ma, Project Scientist II
Amelia Wallis, Project Scientist I
Forrest Bell, Principal Scientist
FB Environmental Associates

AGENDA

- 1. Introduction to Watershed Planning**
- 2. Review Current Water Data**
- 3. Pollutant Source Identification**
 - Watershed Survey, Shoreline Survey, Septic System Survey
- 4. Current Sources & Future Threats**
 - Build-out, water quality model
- 5. Water Quality Goals & Objectives**
- 6. Recommendations for Water Quality Improvement**
- 7. Next Steps / Q&A**



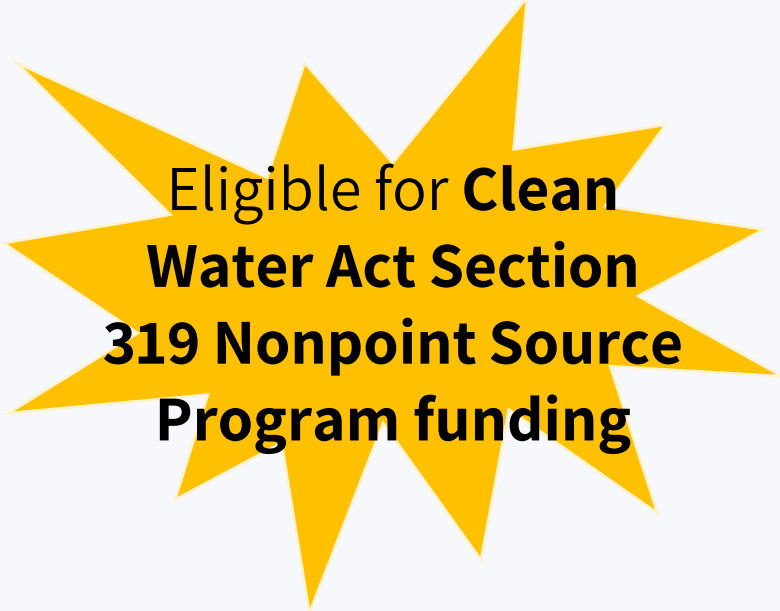
INTRODUCTION TO WATERSHED PLANNING

Introduction	Water Quality Summary	Pollutant Source Identification	Current Sources & Future Threats	Water Quality Goal	Recommendations	Next Steps
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WATERSHED PLANNING ELEMENTS

EPA's Nine Elements

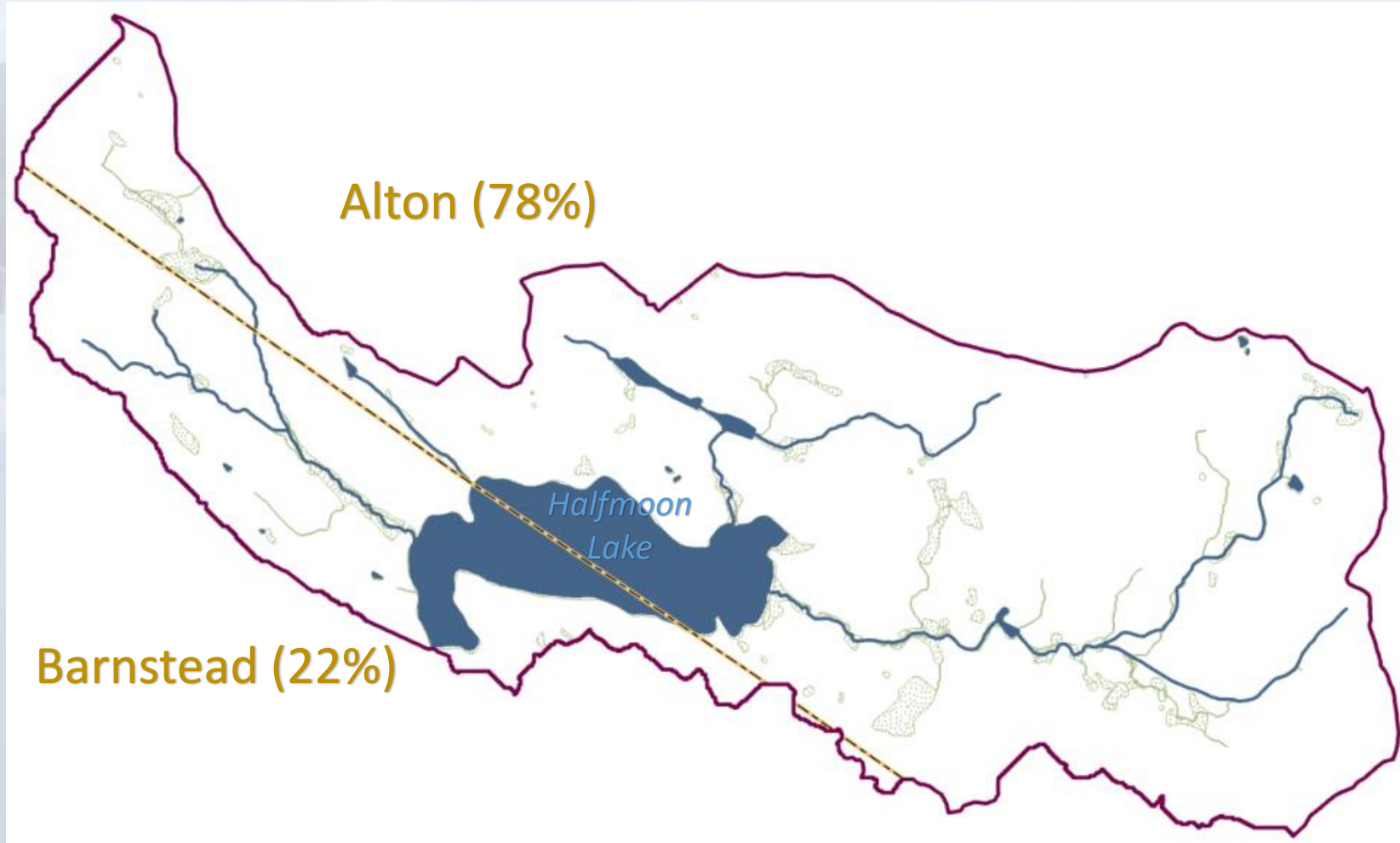
1. Identify causes & sources
2. Estimate P load reductions
3. Describe management measures
4. Estimate technical & financial assist. needed
5. Develop education and outreach plan
6. Develop P load reduction schedule
7. Describe measurable milestones
8. Develop a set of criteria to measure progress
9. Develop a monitoring plan



Eligible for **Clean
Water Act Section
319 Nonpoint Source
Program funding**



HALFMOON LAKE



**Halfmoon Lake
Watershed
3,829 acres**

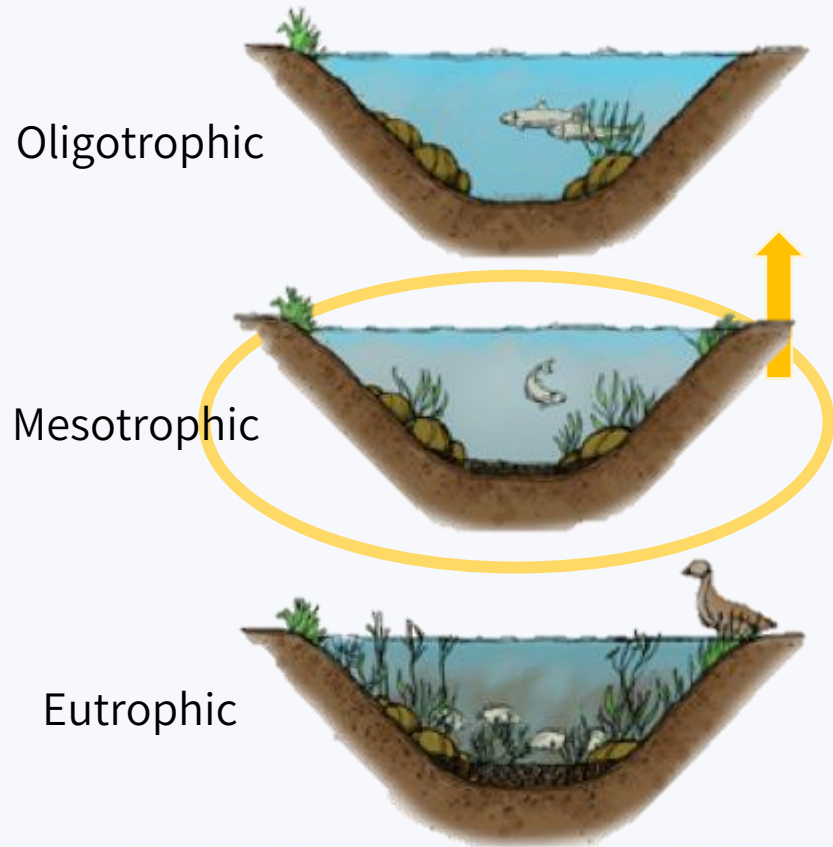
**Halfmoon Lake
289 acres**

**Wetlands
116 acres**

CURRENT WATER QUALITY OVERVIEW

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WATERBODY CLASSIFICATION

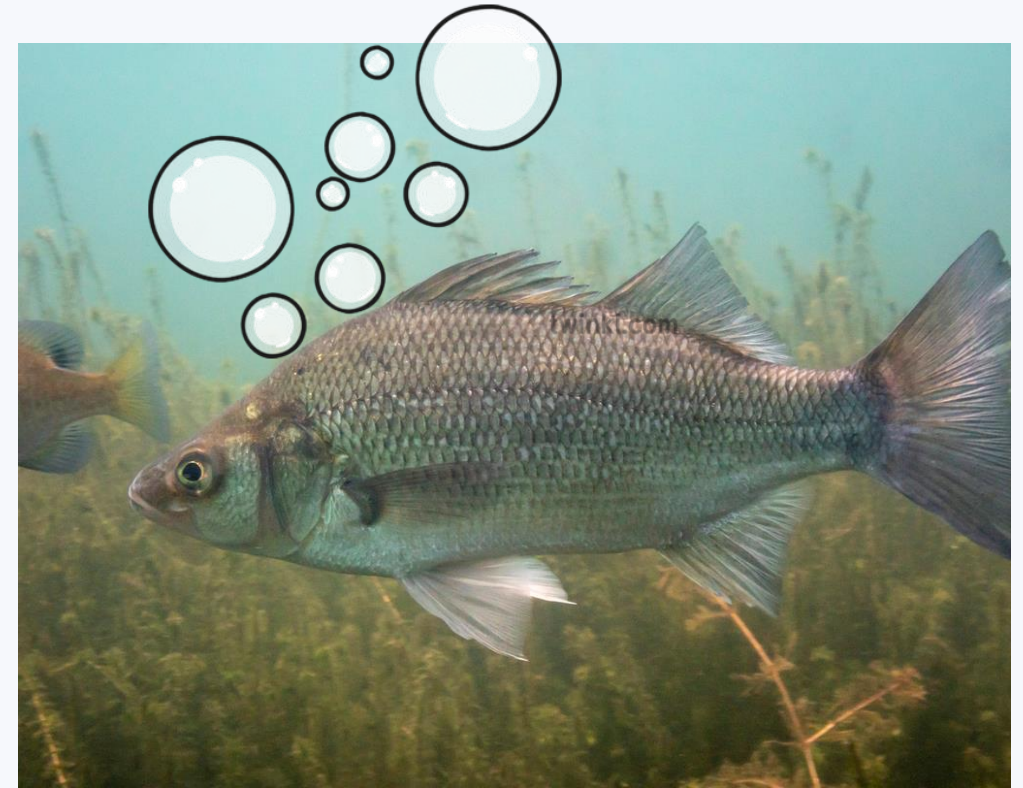


Halfmoon Lake is classified as a **mesotrophic** lake and the goal is for it to improve to mesotrophic-oligotrophic.



WATERBODY ASSESSMENT

Halfmoon Lake is listed on the 303(d)
NH List of Impaired Waters for
Primary Contact Recreation &
Aquatic Life Integrity due to the low
dissolved oxygen concentrations,
slightly acidic pH, and the occurrence
of cyanobacteria blooms

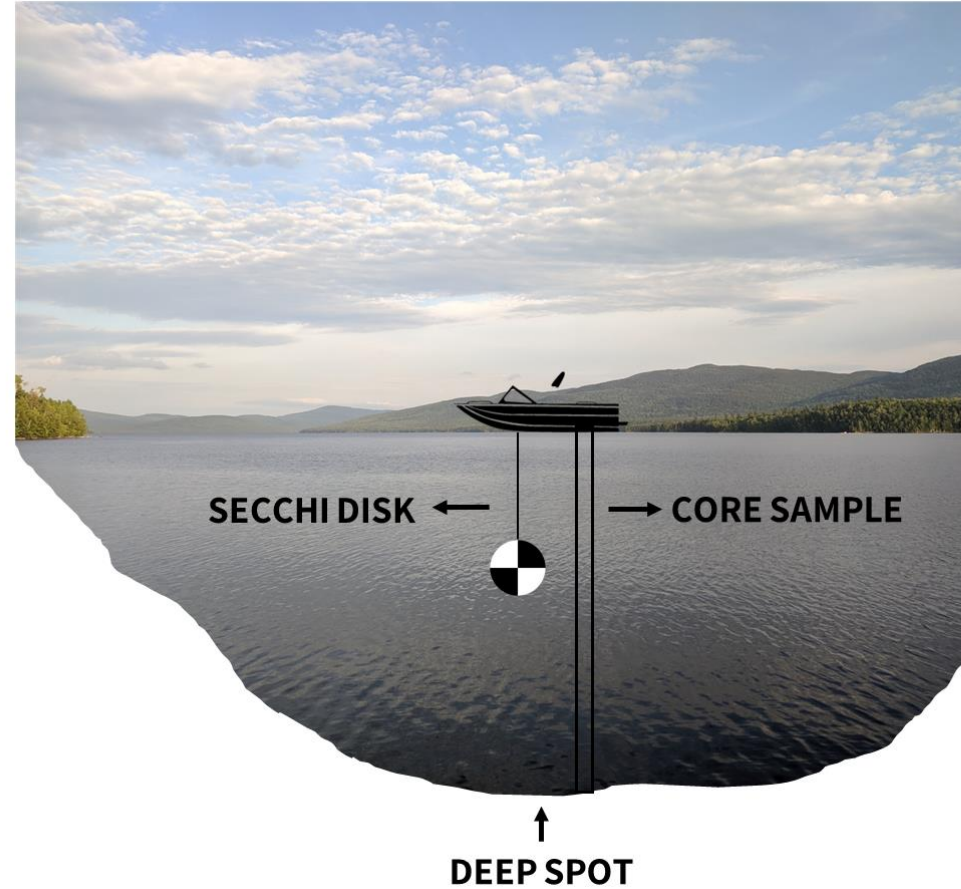
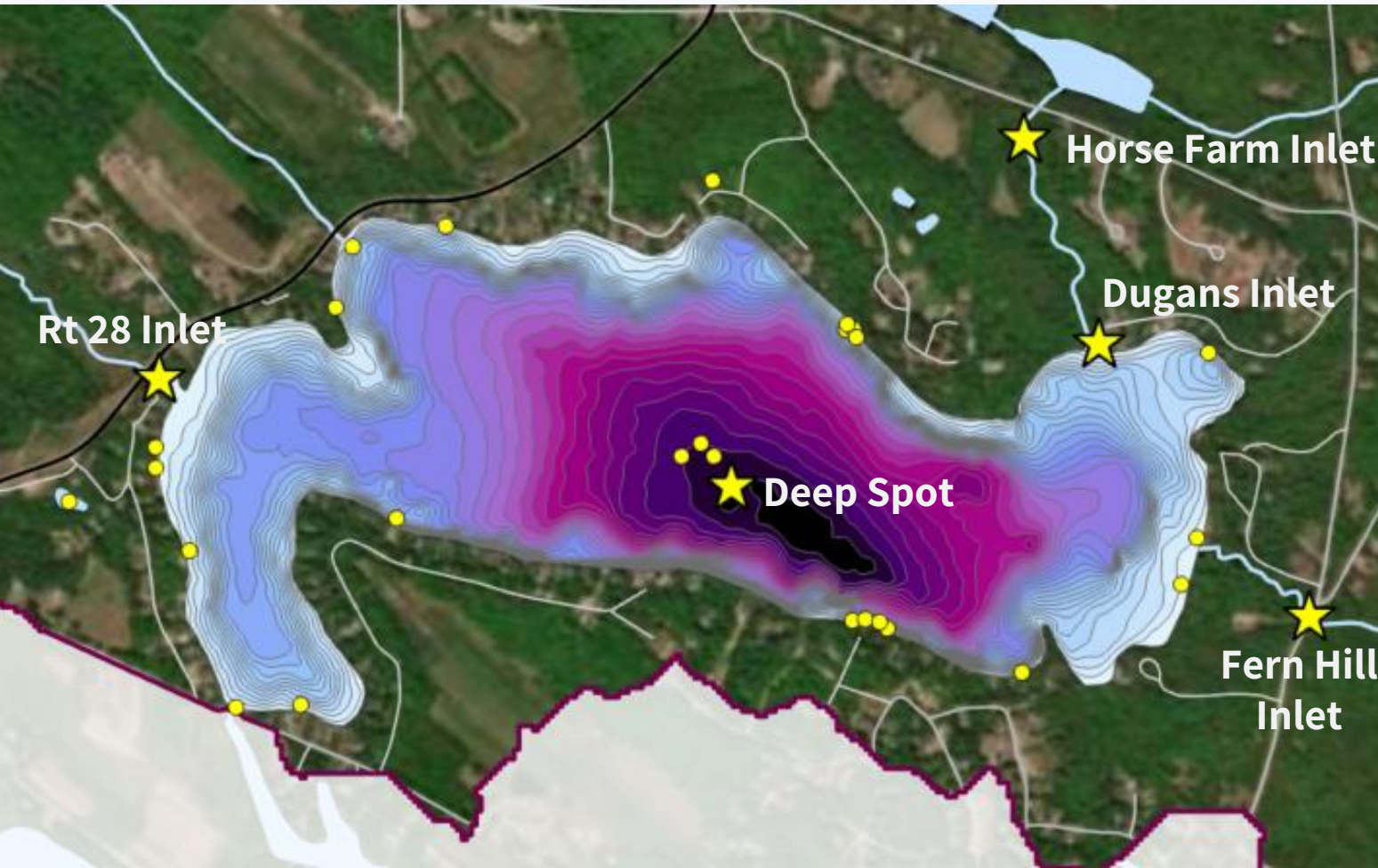


iNaturalist

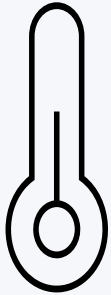


SAMPLING SITES

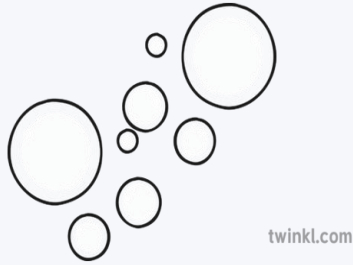
HALALTD (Halfmoon Lake Deep Spot)



PARAMETERS



Temperature profiles help determine the stratification status of a lake through the seasons.



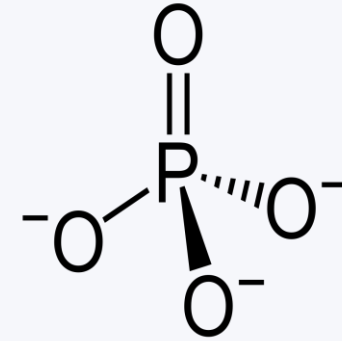
Dissolved Oxygen is a measure of the amount of oxygen dissolved in water. Low oxygen can directly kill or stress organisms and stimulate release of phosphorus from bottom sediments.



Secchi Disk Transparency is a vertical measure of the transparency of water.



Chlorophyll- a is the green pigment found in nearly all plants, including microscopic algae.



Phosphorus is a nutrient that stimulates the growth of algae and plants.



Chloride is a pollutant that impacts conductivity, salinity, water density, and algal communities.



CYANOBACTERIA



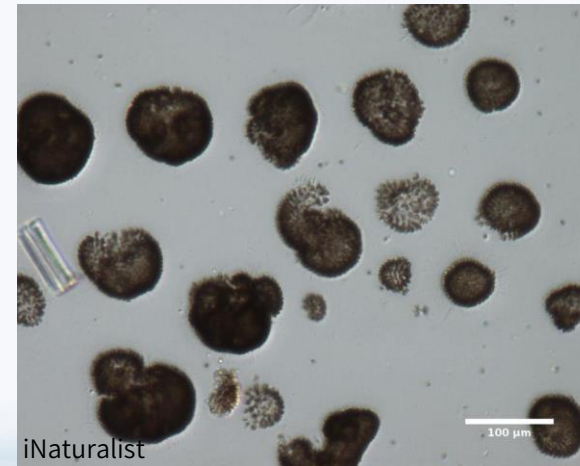
2011 (9 DAYS)
Oscillatoria/
Plankothrix



2018 (14 DAYS)
Oscillatoria/
Plankothrix



2019 (7 DAYS)
Dolichospermum



2024 (6 DAYS)
Dolichospermum
Woronichinia, and
Planktothrix



DEEP SPOT WATER QUALITY

GOOD

but keep monitoring and
improving watershed practices...
climate change

Parameter	Notes	Interpretation
Temperature	Seasonal stratification and mixing	Normal (climate change)
Dissolved Oxygen	Low DO at the bottom under summer stratification	Worry some for aquatic life and internal loading is possible
Secchi Disk Transparency	Better than most mesotrophic lakes	Great!
Total Phosphorus	On par for mesotrophic lakes	Normal and overall stable (important for DO and Cyanobacteria)
Chlorophyll-a	On par for mesotrophic lakes	Normal and overall stable
Chloride & Specific Conductivity	Below threshold but increasing	Fine, but significantly increasing
pH	Low end of threshold	Slightly acidic and stable
Cyanobacteria	History of four bloom advisories	Blooms are possible. When in doubt, stay out.

DEEP SPOT WATER QUALITY

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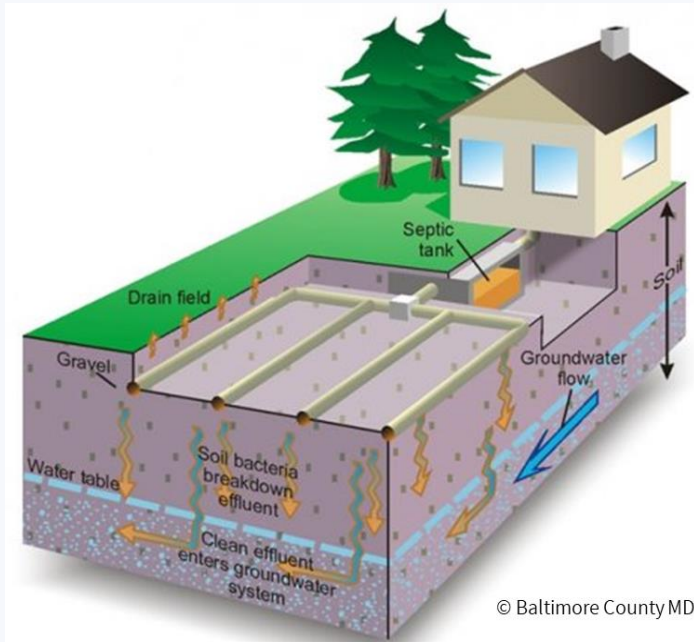
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POLLUTANT SOURCE IDENTIFICATION

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IDENTIFY THE PROBLEM

Nonpoint source pollution is pollution that enters the lake from diffuse sources throughout a watershed, such as **stormwater runoff**, seepage from **septic systems**, **fertilizer use**, and more.



WATERSHED SURVEY

Watershed surveys identify areas that are likely contributing ***disproportionate*** amounts of pollutants into surface waters



One of the major components of pollution is sediment, which contains a mixture of nutrients (like phosphorus) and inorganic and organic material that stimulate plant and algae growth.

WATERSHED SURVEY

- **19** total sites were identified
- **3** sites were chosen to apply for funding through the 319 – preproposal was selected, working on the full proposal now.



1



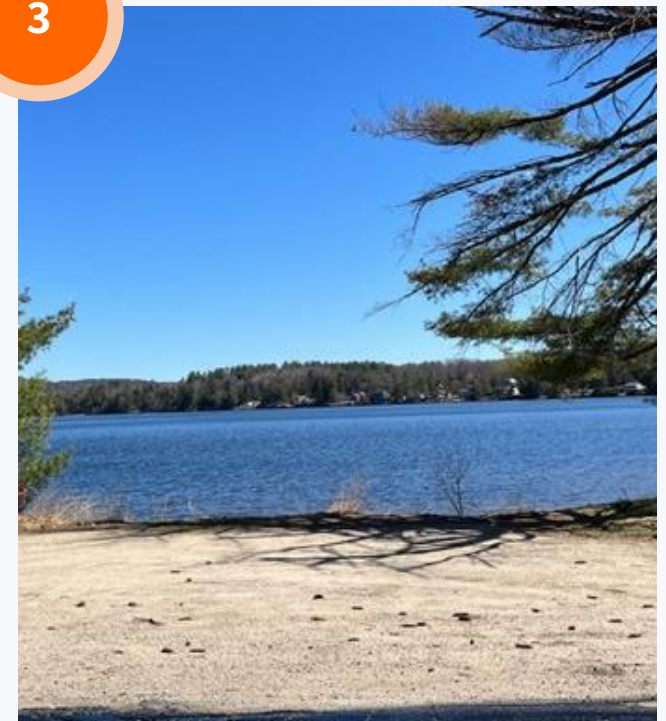
North Barnstead Road
Road shoulder leading to the boat ramp

2



Dalton Beach and accessway

3

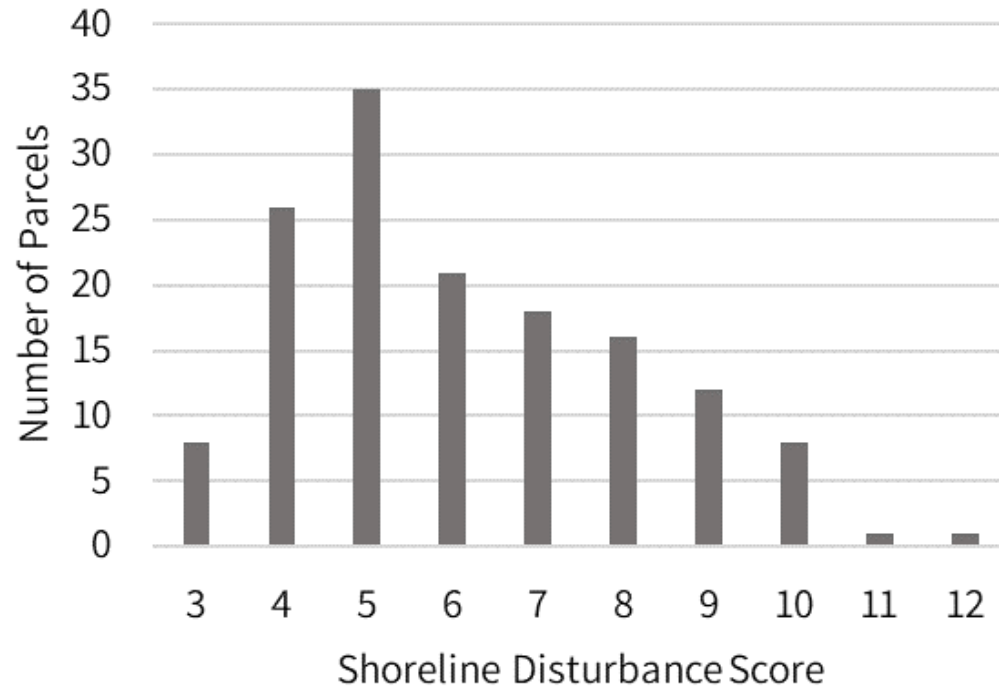


Route 28 boat launch

SHORELINE SURVEY



SHORELINE SURVEY



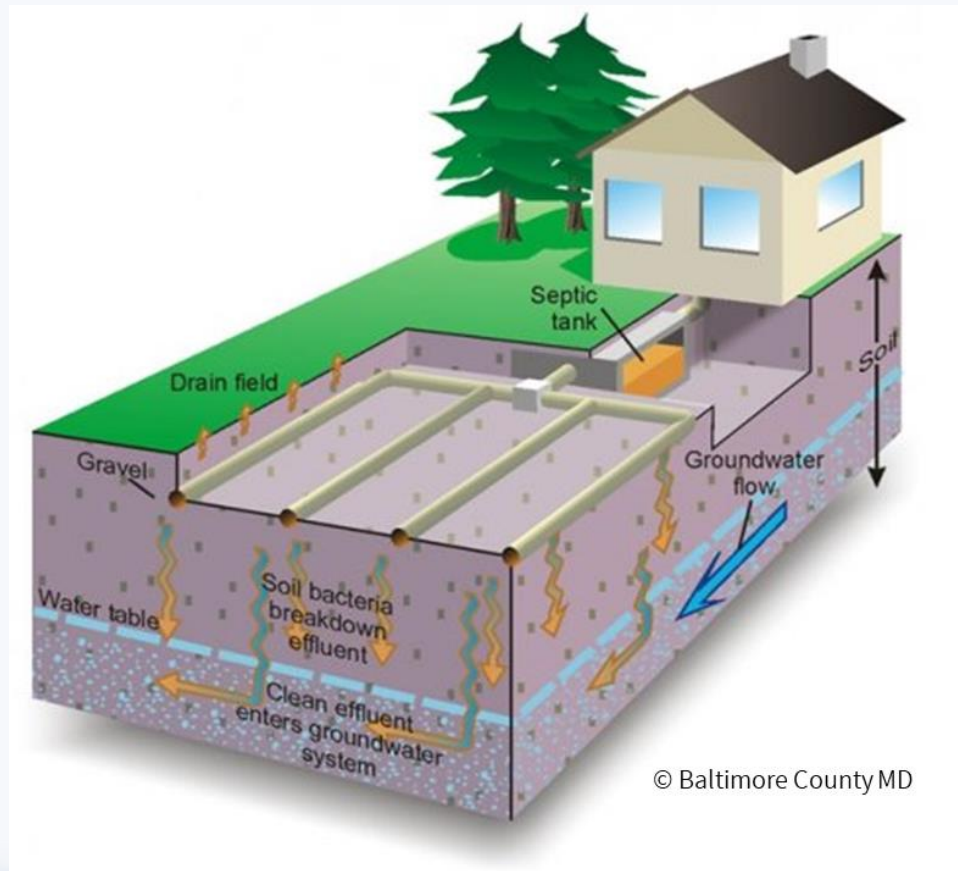
Histogram showing the number of parcels by Shoreline Disturbance Score. The possible range of Shoreline Disturbance Scores is 3-12.

QUESTIONS TO ASK YOURSELF

1. Do you have an adequate shoreline buffer?
2. Do you fertilize your lawn?
3. Do you have many trees on your property?
4. Do you live on a steep hill?
5. Do you have a beach?
6. Is your house very close to the water's edge?
7. Do you put salt down in the winter?



SEPTIC SYSTEM INVENTORY



Septic system average lifespan = **25 years**

97 of the 161 houses (60%) within 300 ft of Halfmoon Lake are likely older than 25 years. Most homes were built in the **mid 1900s**.

State records were found for only **13** septic system replacements in the past 25 years (not including new houses).



CURRENT SOURCES & FUTURE THREATS

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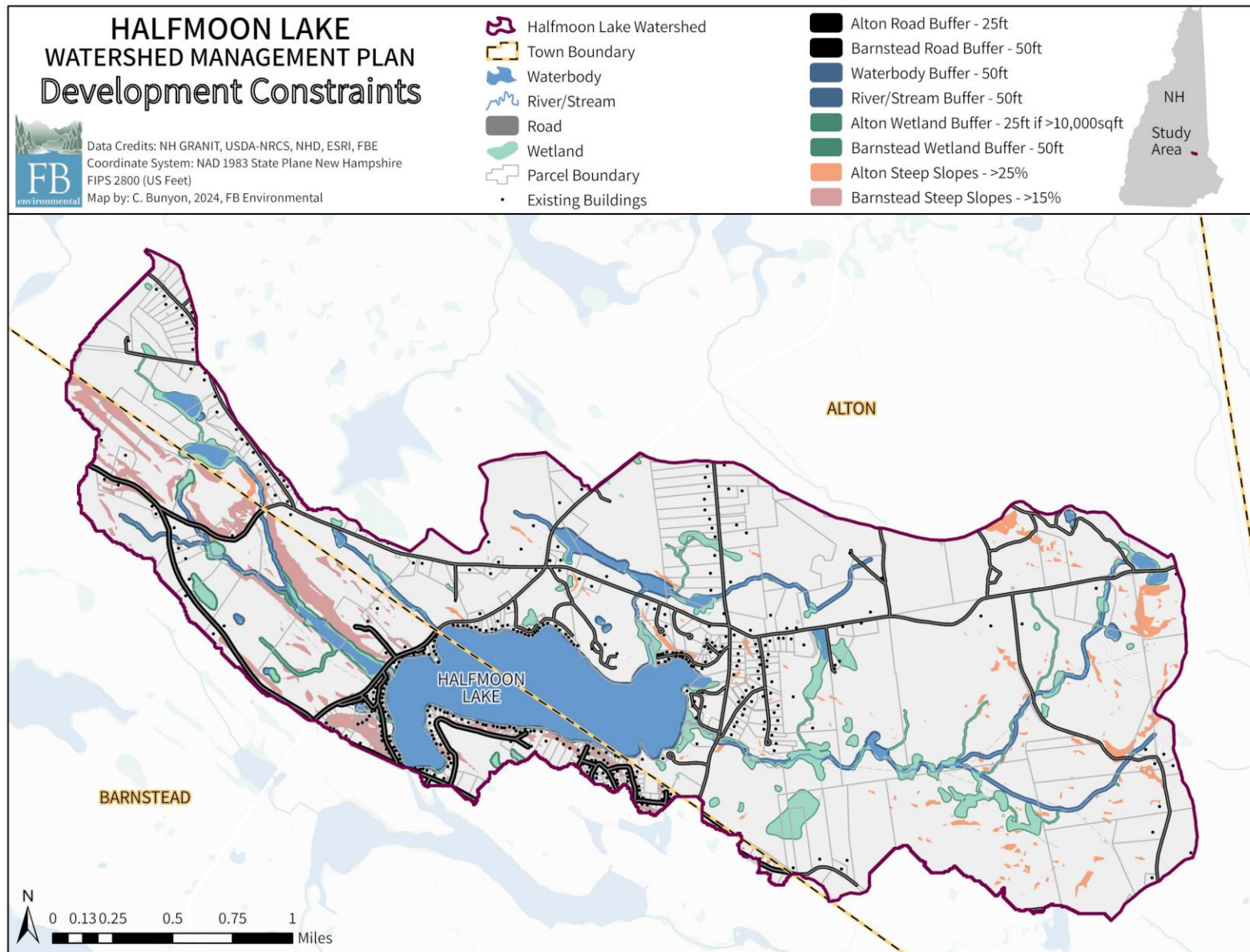
BUILD-OUT ANALYSIS

“Full Build-out” is a theoretical condition which represents the period when all “developable” land has been developed to the maximum conditions permitted by local ordinances.

Accounts for:

- Current zoning, lot sizes, & setbacks
- Existing Buildings
- Conserved Land
- Conservation Districts
- Water, Wetlands
- Hydric Soils
- Steep Slopes

2,701 buildable acres in the watershed (79%)



BUILD-OUT ANALYSIS

EXISTING BUILDINGS

Total: 416

Alton: 231

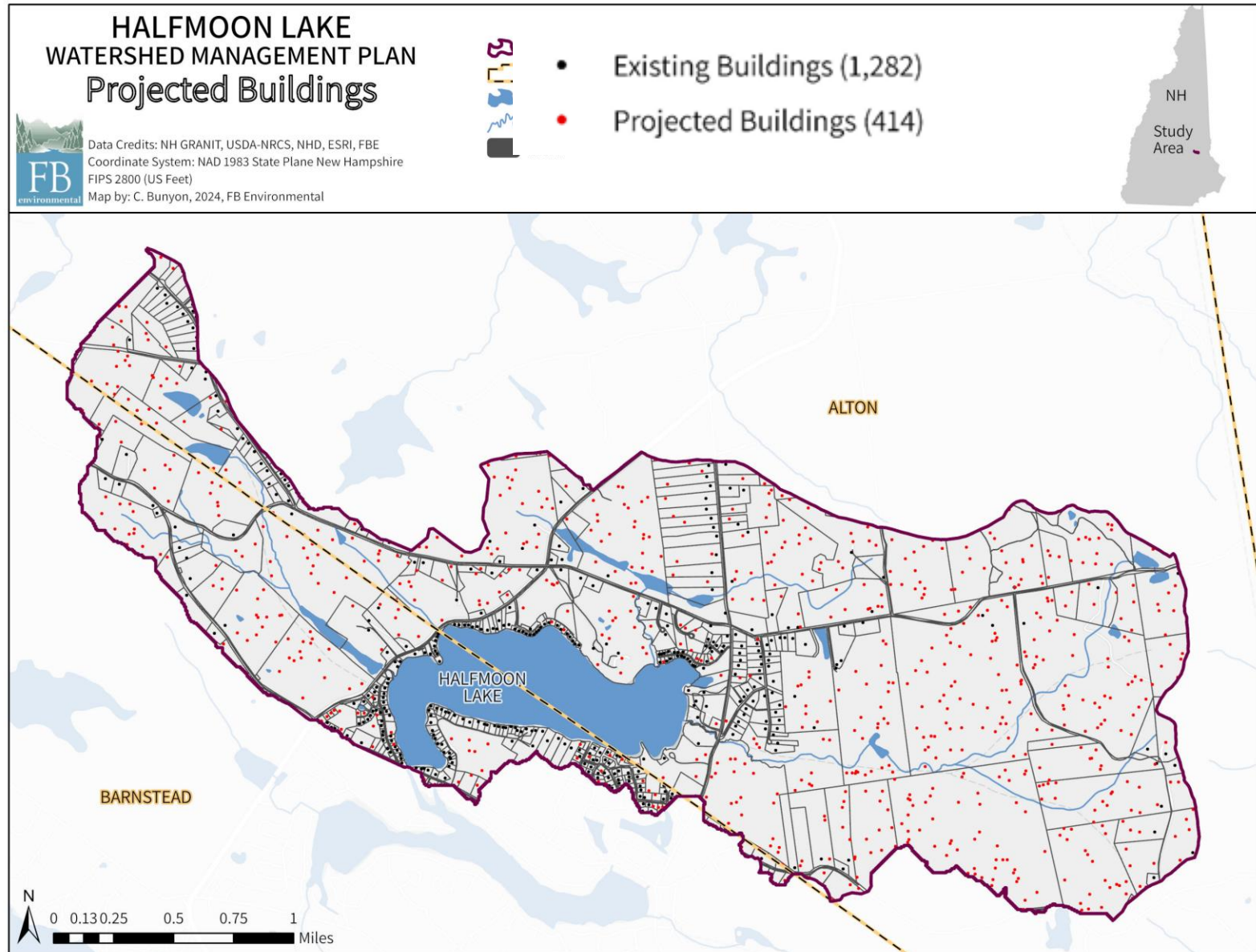
Barnstead: 185

PROJECTED BUILDINGS

Total: 762

Alton: 627

Barnstead: 135



BUILD-OUT ANALYSIS

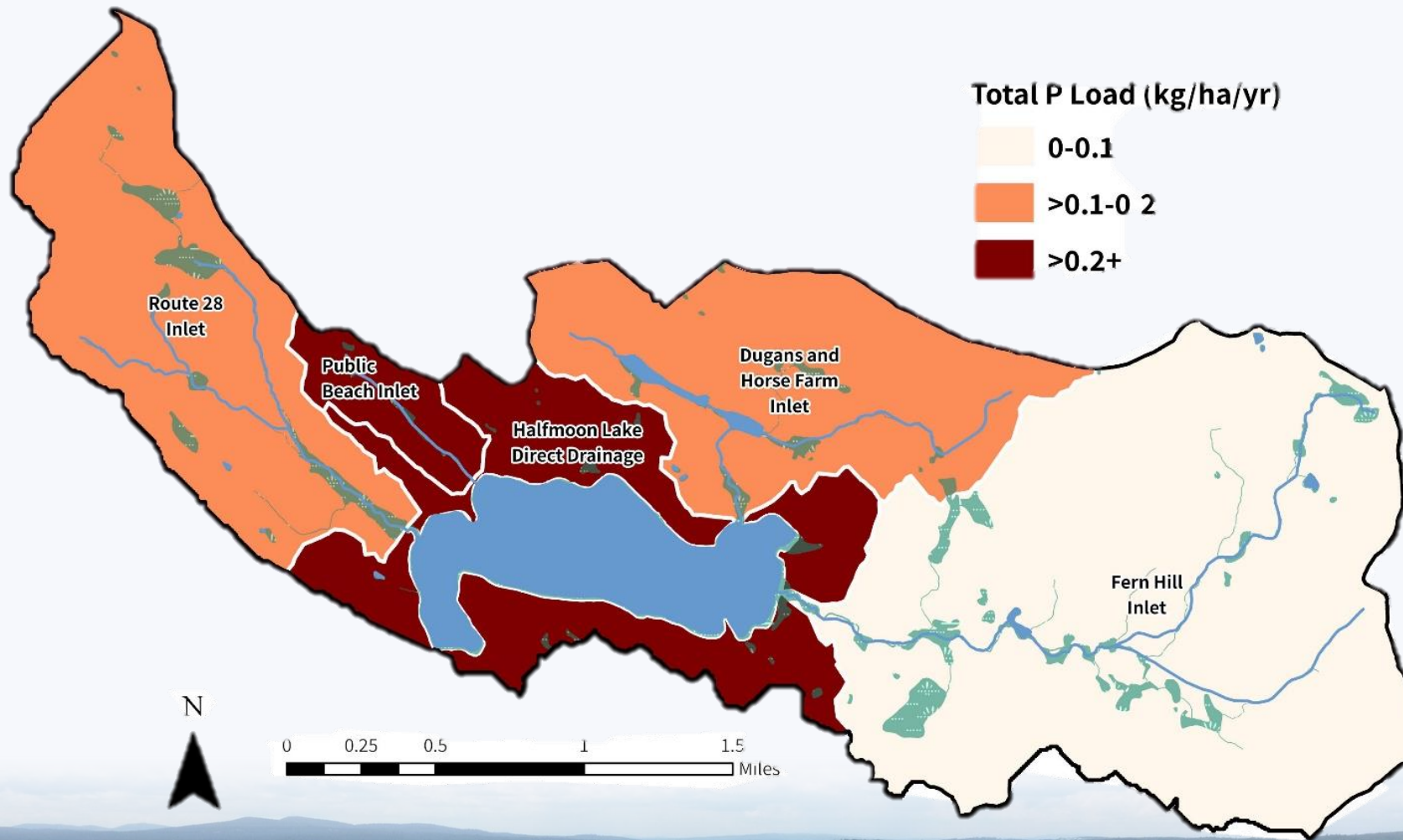
Why are Build-out analyses helpful?

- Visualize, analyze, and communicate about land use decisions
- Inform future planning efforts in the watershed
- Guide future development activities
- Target specific areas for conservation
- Understand how current zoning regulations will affect future development

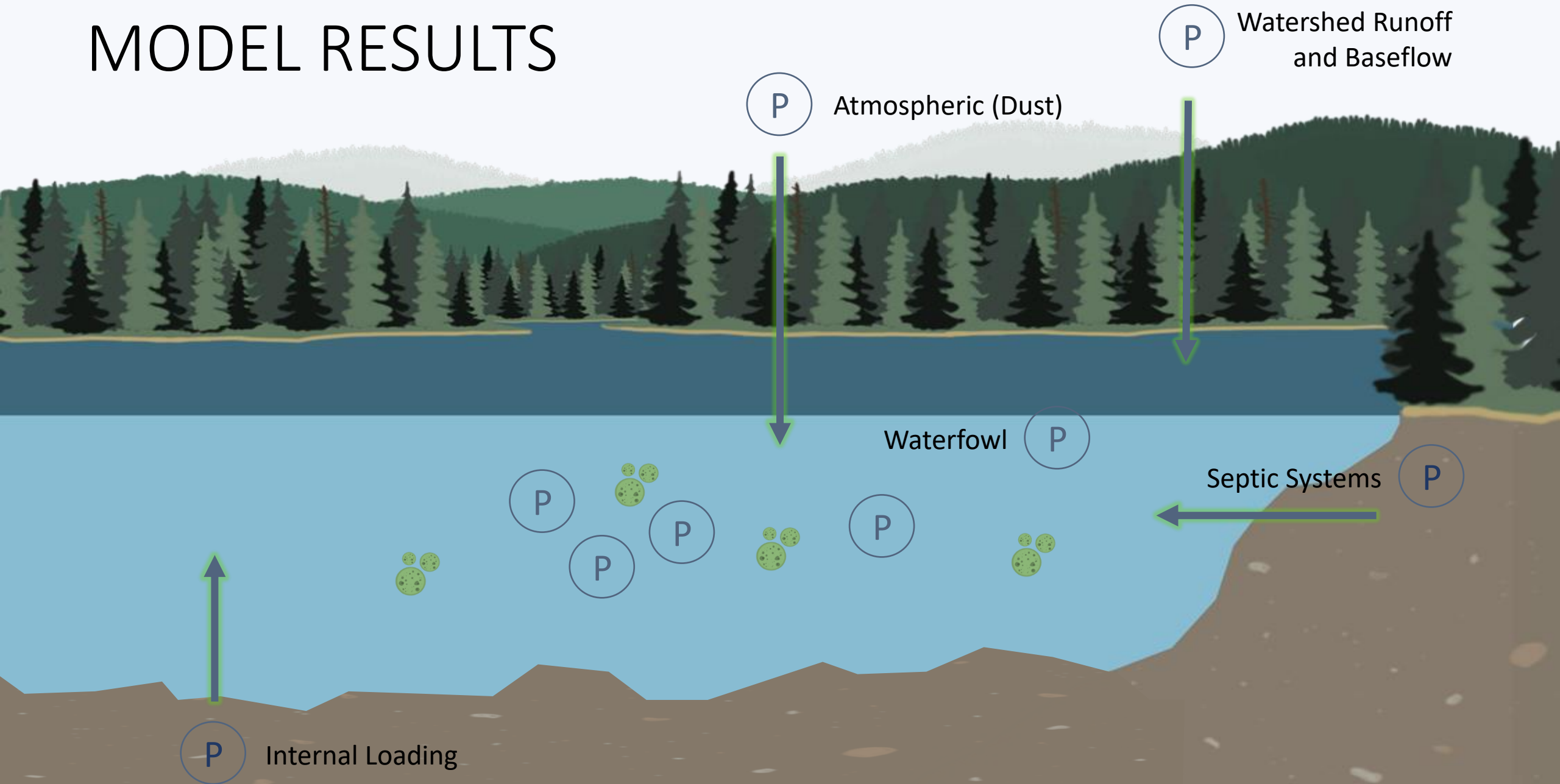
Note: This model and data presented are to be used for planning purposes only.



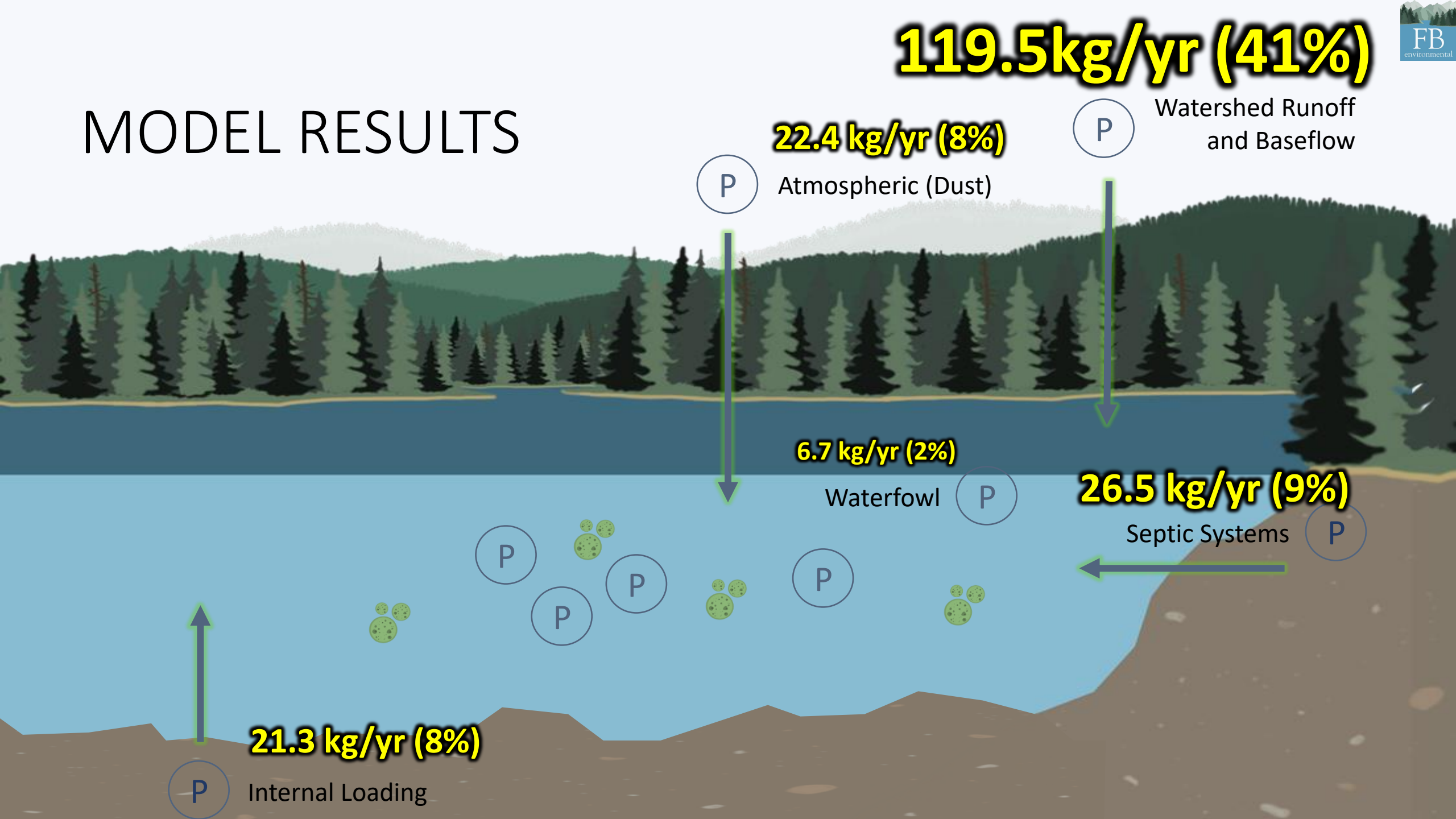
LAKE LOADING RESPONSE MODEL



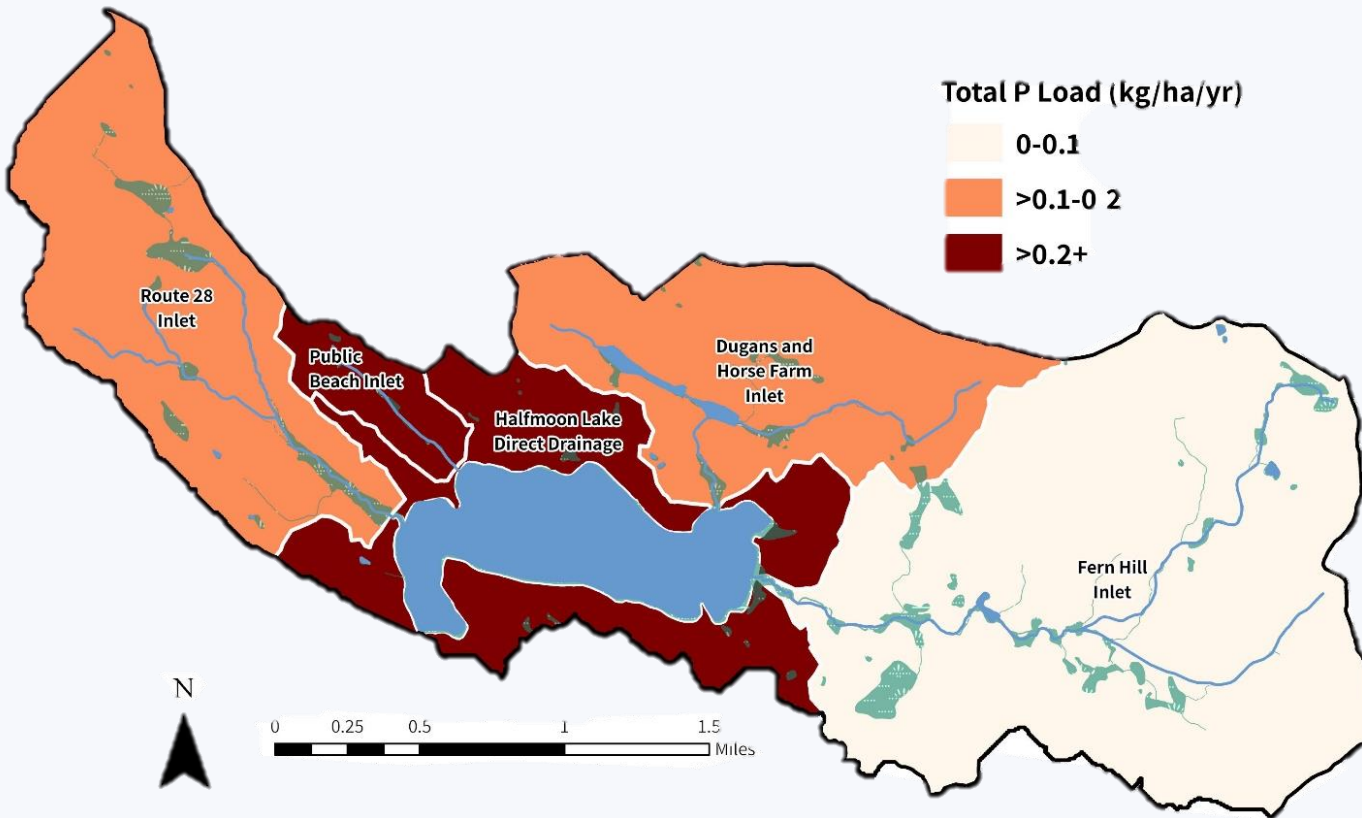
MODEL RESULTS



MODEL RESULTS



LAKE LOADING RESPONSE MODEL

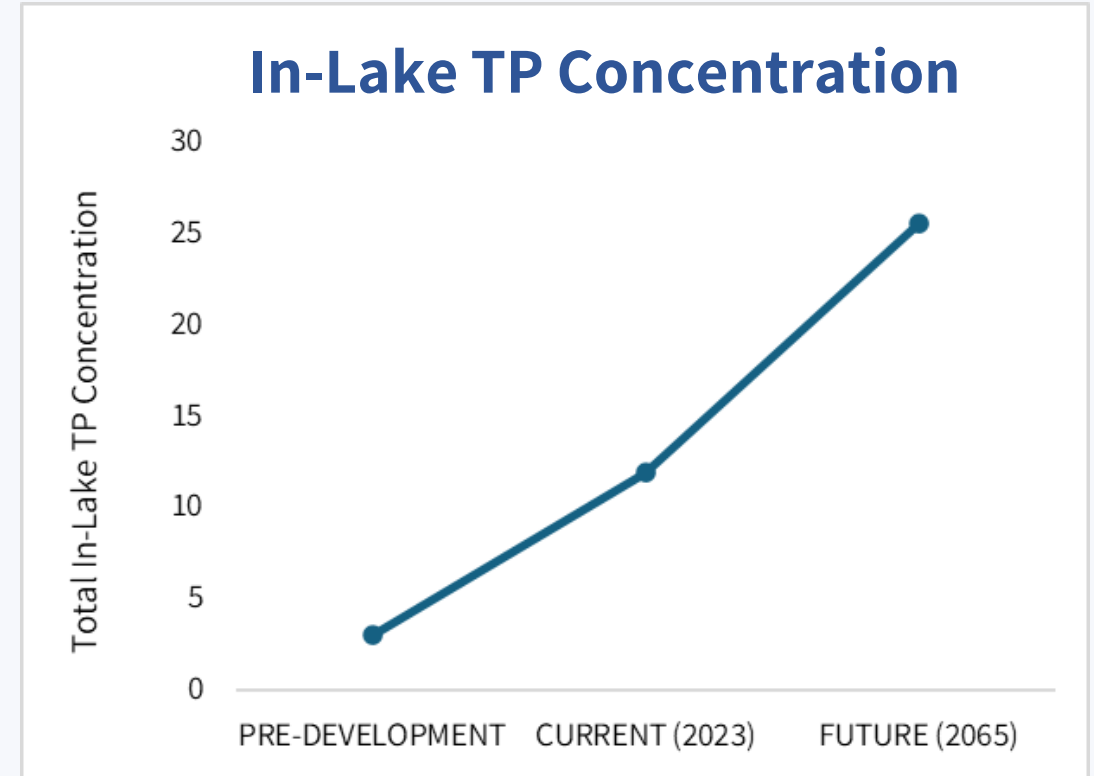
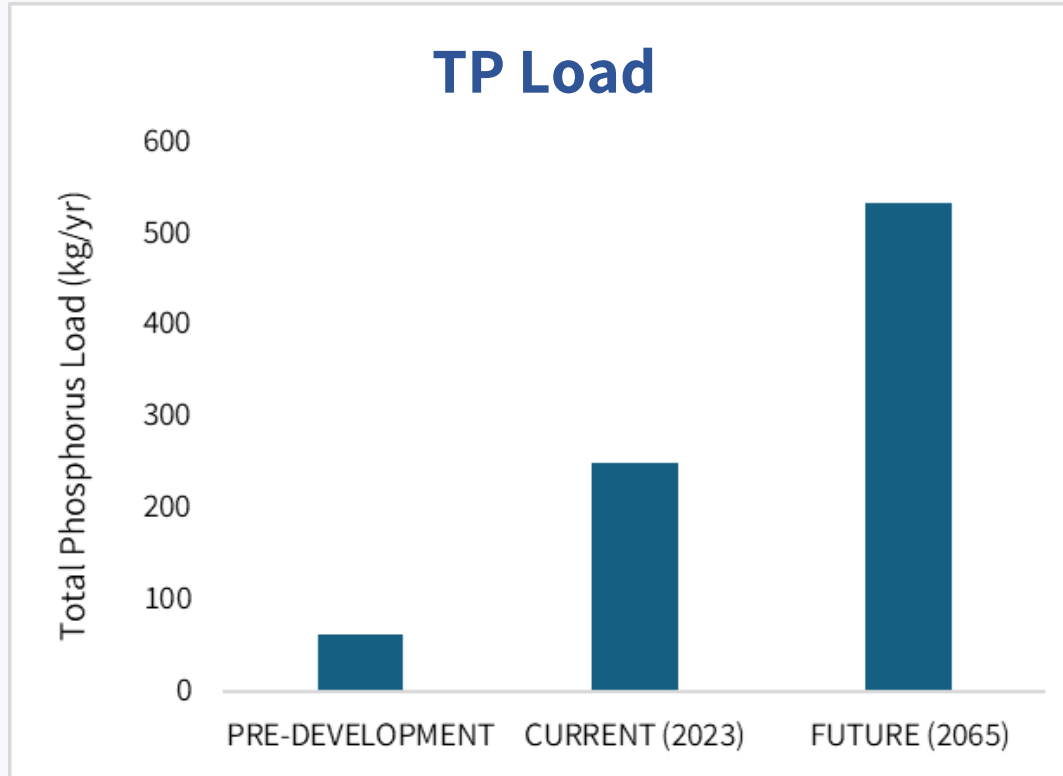


Sub-watershed	Land Area (hectares)	P mass (kg/year)	P mass by area (kg/ha/year)
Halfmoon Lake Direct Drainage	209.3	53.9	0.26
Dugans and Horse Farm Inlet	252.8	28.3	0.11
Fern Hill Inlet	643.2	47.1	0.07
Public Beach Inlet	44.9	12.4	0.28
Route 28 Inlet	283.2	41.1	0.15

1 hectare = ~2.47 acres



LAKE LOADING RESPONSE MODEL



SETTING WATER QUALITY GOALS & OBJECTIVES

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WATER QUALITY GOAL

To improve the water quality of Halfmoon such that they meet state water quality standards for the protection of Aquatic Life Integrity (ALI) and Primary Contact Recreation (PCR), and substantially reduce the likelihood of harmful cyanobacteria blooms in the lake.



WATER QUALITY OBJECTIVES

1

Reduce phosphorus loading from **existing development** by **33%** (45 kg/yr) to Halfmoon Lake to improve the average in-lake summer total phosphorus concentration to 8.1 ppb and annual chlorophyll-a concentration to 3.0 ppb.

2

Prevent or offset phosphorus loading from **future development** by 3.2 kg/yr to Halfmoon Lake to maintain average summer in-lake total phosphorus concentration in the next 10 years (2034).



RECOMMENDATIONS FOR WATER QUALITY IMPROVEMENT

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ACTION PLAN

Categories:

- (1) Water Quality Monitoring
- (2) Watershed and Shorefront BMPs
- (3) Road and Driveway Management
- (4) Municipal Operations
- (5) Land Use Planning and Zoning
- (6) Land Conservation
- (7) Septic Systems
- (8) Agricultural Practices
- (9) Education and Outreach



WATER QUALITY MONITORING

- ✓ Continue monitoring the water quality of Halfmoon Lake and its tributaries to track changes over time
- ✓ Consider expanding tributary monitoring to the early spring and during wet weather for conductivity, chloride, and turbidity.
- ✓ Consider collecting sediment samples from the deep spot.
- ✓ Gather more volunteers to assist in baseline monitoring

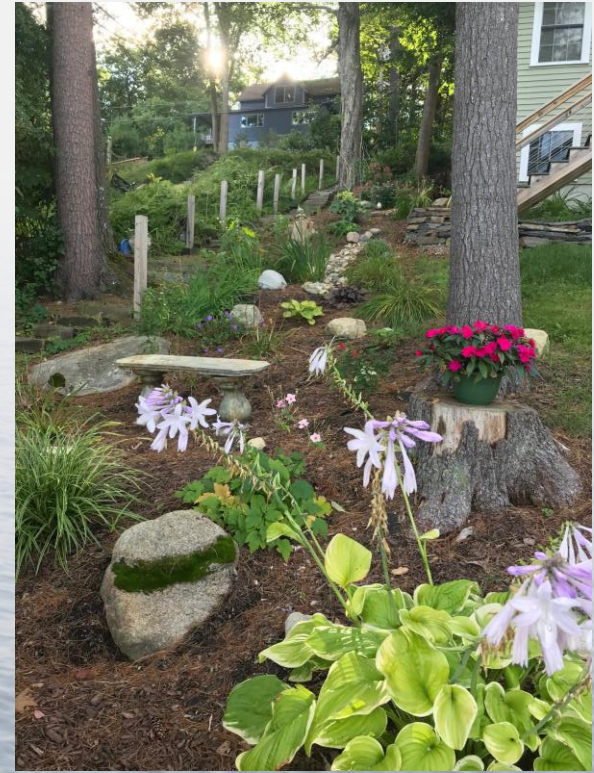


WATERSHED & SHOREFRONT BMPS

- ✓ Mitigate erosion and stormwater runoff from the top 6 Watershed Survey sites.
- ✓ Provide technical assistance or guidance for the high impact shoreline properties.
- ✓ Then focus on the next 7 prioritized sites and moderate impact shoreline properties.
- ✓ Continue to promote LakeSmart and community engagement

LANDOWNERS HAVE THE MOST POWER TO MAKE A DIFFERENCE FOR THE LAKE'S HEALTH

- Death by 1000 cuts; every action along the shoreline (good or bad) has an impact on the lake's water quality
- **What can you do to help?** Educate yourself on how to properly manage your land and the activities conducted on it to minimize impact to the lake.



WATERSHED & SHOREFRONT BMPS



Reduce, divert, and infiltrate surface runoff.



Minimize and define parking areas and pathways.

Minimize pollutants (e.g., fertilizers, detergents, and other phosphorus-based products).



Stabilize shoreline access points through vegetation or riprap.



Maintain shoreline, streamside, and wetland buffers.



RESOURCES AVAILABLE TO LANDOWNERS

- Become LakeSmart certified through NH Lakes
- Check out online resources:
 - UNH Extension *Landscaping at the Water's Edge*
 - NHDES Soak Up the Rain NH *Homeowner's Guide to Stormwater Management*
 - NHDES Shoreland Rules fact sheets
- Have septic system inspected
- Participate in future grant opportunities that fund improvements



ROAD MAINTENANCE & TRAINING

- ✓ Municipal best practices
- ✓ Stormwater runoff and erosion control on roads and other town property
- ✓ Low road/driveway salting



© Water Education Colorado



High Point, SEATTLE, WA
Credit: Seattle Public Utilities

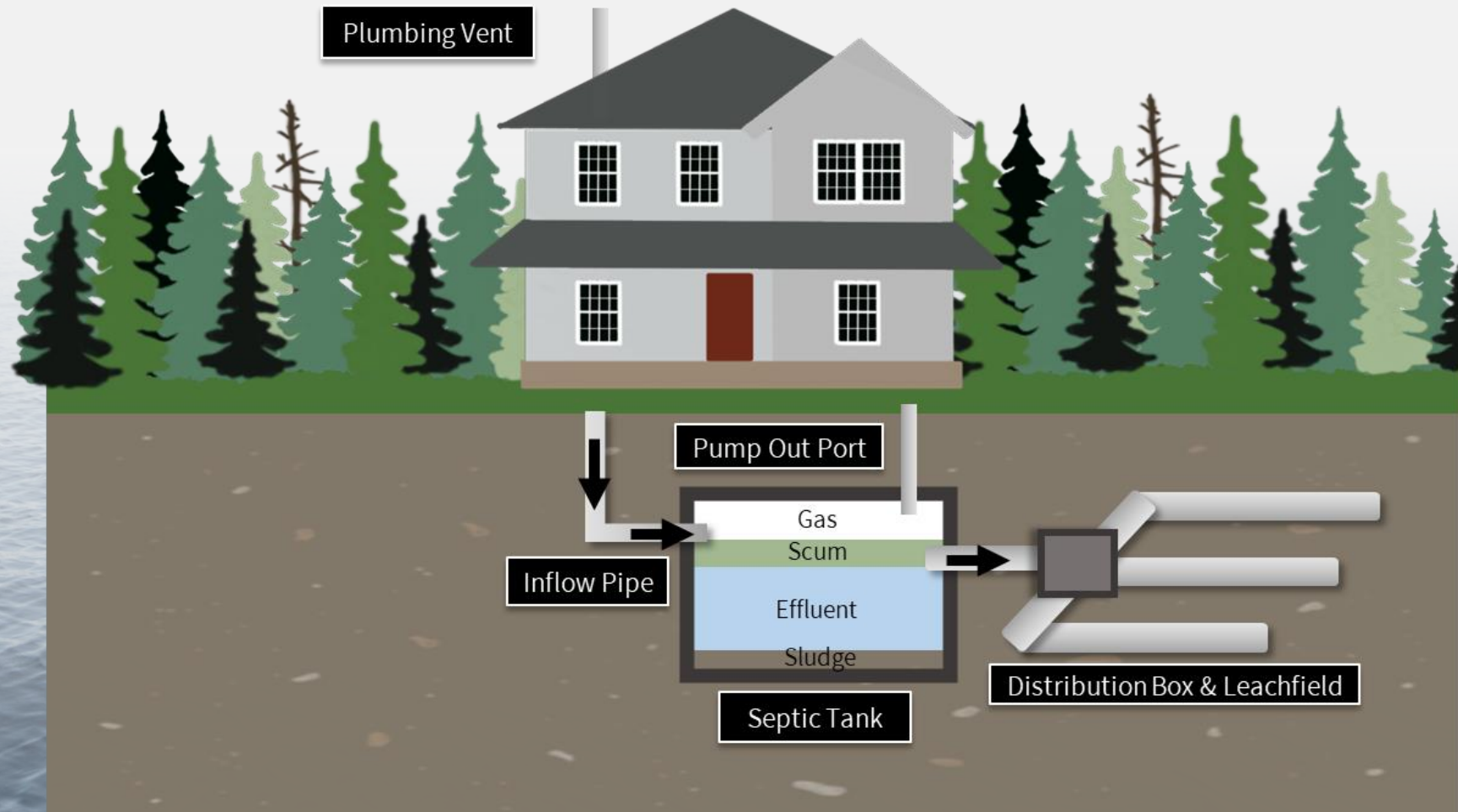
MUNICIPAL PLANNING & CONSERVATION

- ✓ Update ordinances and setbacks for water quality protection
- ✓ Work to create conservation land within the watershed



SEPTIC SYSTEMS

- ✓ Regular septic system inspections (every 3-5 years)
- ✓ Regular pump outs when the scum layer is as thick as 1/3 of the effluent layer (~ every 1-3 years)



EDUCATION & OUTREACH

- ✓ Continue to grow the Lake Association
- ✓ Share what you learn with your neighbors and help each other



Lake Kanasatka BMP volunteers

ACTION PLAN

Also includes

- ✓ A timeline of the suggested actions
- ✓ Responsible parties
- ✓ Grant opportunities per item
- ✓ Milestones to measure progress



NEXT STEPS

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NEXT STEPS

1. Public comment period: [Nov 15 – Dec 15](#)
2. FBE to incorporate feedback and edits: [Dec 15 – Dec 31](#)
3. Final review: [Jan 1 - Jan 10](#)
4. Submission to NHDES

Your First Implementation Grant!

Full application Due Jan 10.





Christine Bunyon
FB Environmental Associates
christineb@fbenvironmental.com



Nina Kelly
President
Halfmoon Lake Association
HMLAPresident@outlook.com

Thank you!