

LEA Homeowner's Guide

*Practical ways to protect lakes and
the value of your property*



Lakes Environmental Association, Bridgton, Maine



Photo by Neil Hiltunen

In the Lakes Region, water quality protection begins at home

Lakes Environmental Association, a private non-profit organization founded in 1970, prepared this booklet to give landowners a guide to protecting lakes. If we want to continue to enjoy the extraordinary natural resources of this region, we all must participate in the effort to protect them. Lakes are fragile, so every small effort to help is meaningful, especially when multiplied by what hundreds of other watershed landowners can do. We hope this guide will help you to make a contribution to this important cause.



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About LEA

Lakes Environmental Association (LEA) is a non-profit organization founded in 1970 with the goal of preserving and restoring the high water quality and the traditional character of Maine's lakes, watersheds and related natural resources. Headquartered in Bridgton, Maine, LEA focuses its efforts in the Sebago Lake and upper Saco River watersheds in the western Maine Lakes Region, although its reach and influence extends across the entire state.

Invasive Plant Program

LEA's Milfoil Control Team functionally eradicated invasive Variable Leaf Milfoil from Brandy Pond and the Songo River in 2015, after over a decade of hard work. We then shifted focus to Sebago Cove and Sebago Lake in 2016 and began work in Long Lake in 2017 when an infestation was found there.

Environmental Education

LEA offers environmental education programs to local elementary, middle, and high schools, reaching over 1000 students annually. LEA also hosts educational programs for people of all ages at the Holt Pond Preserve, the Highland Research Forest, the Maine Lake Science Center, and Pondicherry Park, all of which LEA played a key role in establishing.

Lake Water Monitoring

Water monitoring on over 40 lakes and ponds in the area occurs every year through traditional and advanced testing initiatives. Our website contains water monitoring information about all of the lakes in our service area.

Landowner and Municipal Assistance

LEA provides technical assistance to watershed residents interested in preventing erosion on their property. This service, called the "Clean Lake Check Up", helps educate landowners about simple erosion con-

trol techniques and existing land use regulations. LEA also works with municipalities on comprehensive planning, natural resources inventories, and ordinance development.

LakeSmart

Interested owners can request a free property evaluation from LakeSmart through LEA. The evaluation report provides recommendations intended to make property more lake-friendly (read more on page 19).

Courtesy Boat Inspections

Every summer, LEA hires over 30 courtesy boat inspectors to educate boaters at public boat launches about invasive plants and help them perform inspections on their watercraft. This program, begun by LEA, has been adopted across the state.

Maine Lake Science Center

Opened in 2015, LEA's Maine Lake Science Center is a hub for lake research in the state. The center regularly hosts researcher retreats and other events at its remodeled and renovated energy-efficient building located in Bridgton.

Please Join LEA!

LEA is a primarily member-funded operation. If you swim, boat, fish, or simply believe Maine wouldn't be Maine without clear, clean lakes and ponds, please join the Lakes Environmental Association and protect Maine's lakes now and for future generations.

You can become an LEA member with a donation of any amount. Just mail a check to LEA, 230 Main St., Bridgton, ME 04009 or join online at www.minelakes.org.

The Impacts of Soil Erosion

When it rains, where does the water go?

As a shorefront property owner, you can spend many happy hours gazing out at “your” lake, pond, river, or stream. But if you want to guard against the greatest danger to your investment and your quality of life, you need to think seriously about water coming from an entirely different direction -- above.

So the next time it rains, put on a raincoat or pick up an umbrella, go outside, and take a look. You’ll see water pouring off your roof, rolling off your driveway and deck, and running down your yard. But it doesn’t stop there, of course, and it isn’t just the rainwater that’s running downhill, it’s everything water can carry with it.



How does soil erosion impact lake health?

The number one source of pollution to surface water in Maine is soil erosion, according to the Maine Department of Environmental Protection. Each year, rainstorms and snowmelt wash tons of dirt into the water. Watching your valuable property being carried away is bad enough, but there’s worse news. Eroded soil particles carry pollutants such as oil, fertilizers, pesticides, and phosphorus into our lakes.

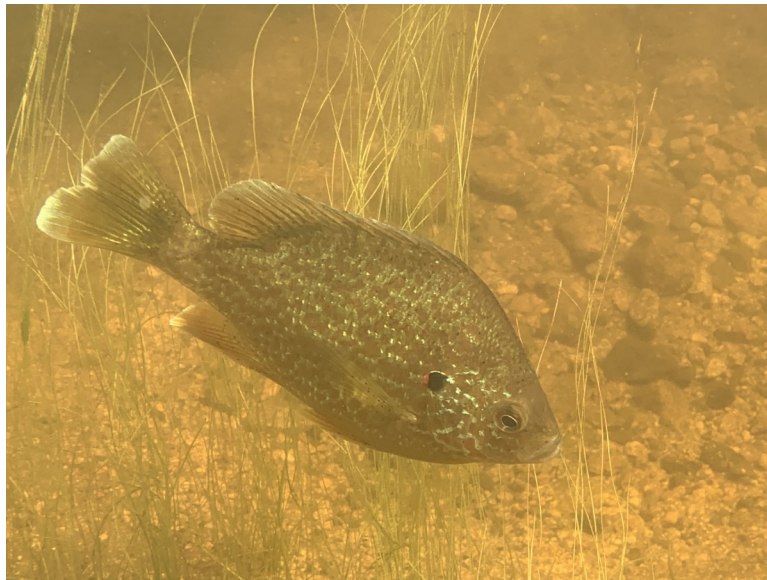
As a property owner and lake lover, your goal is to head off erosion or at least slow it down, so that one part of your property — soil and sediments — won’t damage a major part of your investment — the water quality.



What about the wildlife?

Murky water is also tough on fish and wildlife. It makes it hard for fish to see and feed properly. Sediments can interfere with reproduction since many fish and aquatic insects lay their eggs in gravel beds. Sediments can also fill in streams, making them shallower and warmer, which makes survival difficult for coldwater fish, such as salmon and trout.

“The shoreland zone is very important habitat for many of Maine’s animals,” says Bridie McGreavy, Professor of Environmental Communication at the University of Maine. “The majority of Maine mammals use the shoreland zone for a part of their habitat, whether it’s access to the water or food or nesting.”



Is the economy impacted by erosion?

Nothing destroys the value of shorefront property faster than a decline in water quality. In a University of Maine study, 98 percent of shorefront home buyers rated water clarity as one of the primary reasons they bought their home. That’s ahead of quality of swimming (87 percent) and even scenic beauty (82 percent).

The damage caused by erosion can ultimately result in lower shorefront property values and loss of businesses and jobs. But you don’t need studies to tell you how important clean, clear water is. All you need to know is that you don’t want to dive into murky water and a scenic view isn’t very scenic if the water is covered with brown or green scum.



Nothing destroys shorefront property values faster than a decline in water quality.

In a University of Maine study, 98 percent of shorefront home buyers rated water clarity as one of the primary reasons they bought their home.

Why is the Lake Green?

(The dangers of phosphorus)

Phosphorus is a fertilizer. It is present naturally in soil and that's good for plants. But when it washes into lakes, it's bad because phosphorus also fertilizes tiny, floating aquatic plants called algae.

Normally phosphorus is retained and recycled in the forest ecosystem, but soil disturbance and changes in land use allow phosphorus to be transported in surface water runoff. Then it's carried to lakes in stormwater, streams, and drainage channels. It can be attached to soil particles or dissolve in the water itself.

Roads, construction projects, and agricultural activities all add phosphorus to lake ecosystems. Phosphorus can also come from other sources that are more concentrated, such as septic systems, lawn fertilizers, and soaps and detergents.

When excessive amounts of phosphorus wash into a lake, it can fuel an algae population explosion, called an algae “bloom”. That deceptively pleasant name means algae have formed colonies so dense they cover lakes with a greenish-brown scum — complete with an unpleasant odor. It blocks sunlight to beneficial aquatic plants, consumes oxygen (which may lead to fish kills), and interferes with feeding cycles of other aquatic organisms. All of this makes phosphorus a huge threat to Maine's lakes.



A photo from Maine Department of Environmental Protection field staff of an algal bloom on Lovejoy Pond

That's why it's so important to use phosphate-free detergents and phosphorus-free fertilizers. Most Maine soils are already high in phosphorus, but you can check the content in your soil with a simple test, available through the Maine Soil Testing Service (<https://umaine.edu/soiltestinglab/>) for about \$18. If you must fertilize, many stores now carry phosphorus-free fertilizer. When buying fertilizer, remember the amount of phosphorus is represented by the middle number in the ratio on the bag.

Another way to prevent phosphorus from entering lakes is to wash vehicles and boats at public car washes or areas where there is ample soil to infiltrate runoff water. Maine law prohibits washing or bathing in lakes or ponds.

“For lake water quality, there is no other issue that compares to phosphorus.” — Colin Holme, LEA Executive Director

Top Six Ways to Protect your Property and Maine's Lakes

#1: Leave it to nature

As a shorefront property owner, you can fight nature — at great cost and effort — or you can work with it.

Just keep thinking about rain, erosion, phosphorus, and all the problems they can bring to a lake. Then imagine a manicured lawn rolling to the lakefront.

When the rain comes down or the sprinkler is on, water speeds over that flat, green surface nearly as fast as it would on an asphalt driveway. So by planting, pampering, watering, and mowing that lawn, you've created a slippery chute that sends soil, sediment, phosphorus, and chemicals straight into the lake.

In fact, any time you remove vegetation or expose bare soil, you're dramatically increasing surface runoff and the potential for erosion. That's why there are state and local laws regulating shoreline alterations and why many alterations that were once common practices are no longer allowed.

But there's an alternative, one that saves your time and money and also protects the lake's water quality. Nature already has a time-tested strategy to slow rainwater down so it can be absorbed into the earth before it reaches the lake. It's called natural vegetation.

Here's how you can help leave it to nature:

- **Leave existing rocks and vegetation along the shore in place.** Native plants along the lakefront bond the soil together. Trees soak up a huge amount of surface water runoff and provide erosion control, privacy, and fish and wildlife habitat. That's why bushes, shrubs, and groundcovers within the first one hundred feet of lakes and ponds are protected by state and local laws and should be left undisturbed.



In this property, you can see the shorefront is filled with native plants and trees that soak up a huge amount of surface water runoff and provide erosion control, privacy, and fish and wildlife habitat.

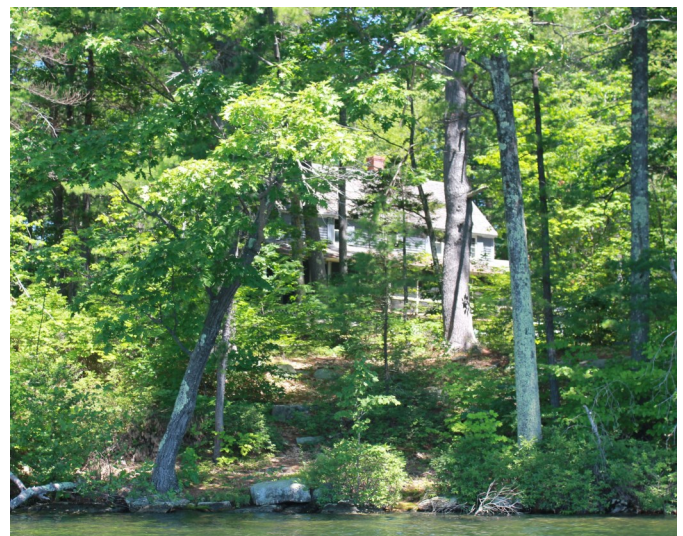
- **Pick up a copy of your local shoreland zoning regulations before doing any work.** Almost all alterations of the shoreline require state and local permitting and approval. For example, trees may be limbed up to one third of their height to provide a view of the lake, but tree cutting standards within the shoreline zone vary from town to town. If you're not sure about the laws or have any questions, call LEA or your local Code Enforcement Officer before removing trees, disturbing soil, or making any alterations.



When there's not enough vegetation to absorb rainwater, soil erodes and washes pollutants, such as oil, fertilizers, pesticides, and phosphorus into our lakes. Erosion is the number one source of pollution to Maine's surface waters.

- **All new structures must meet the required setback from normal high water.** The setback from lakes and ponds is generally 100 feet but can be more depending on individual town ordinances. For instance, Bridgton has a 112' setback for solid wall foundations.
- **Plant a buffer of native shrubs, bushes, and groundcovers or just let nature move back in on its own if your shorefront has already been altered.** If a bank is eroding, rip-rap, or stone armoring, can be installed with the proper state permits. Rip-rap should be used conservatively because the stones do not provide habitat for native species. Rip-rap can trap heat from the sun, heating the water and disturbing wildlife such as fish and amphibians.
- **If you simply can't live without a lawn, minimize its impact with larger vegetation near the lake.** A small garden will look great and reduce runoff, particularly if you use woody plants with deeper root systems that soak up more water.

But why spend Maine's precious sunny days mowing grass? When it comes to taking care of our lakes and lands, nature knows best!



These lakefront landowners have maintained natural vegetation along the water, which helps protect the lake.

#2: Maintain gravel roads and driveways

Water should never run directly from a road into a lake or stream. In fact, the vast majority of all erosion and sedimentation problems within a watershed originate from camp roads. Maintaining effective drainage is probably the most important aspect of road upkeep. Here are some tips to help get you started:

- **Keep your road or driveway above the original ground level.** This will allow the base and sub-base to dry out and help prevent the road from rutting or becoming soupy.
- **Maintain a proper crown to provide for adequate road drainage.** Crowning a road is essentially creating a slight ridge in the center of the road that water will run away from. A good slope is usually about one-quarter inch of crown per foot of road width (3" crown for a 12' wide road). In certain areas, it is generally better to have the road slope gently in one direction. This is called ramping. When ramping, use 1/2" of elevation per foot of road width.
- **Regular grading is necessary to maintain the crown after winter plowing.** Grading should be done with a steel tine rake, York Rake, or Front Runner-type grader by an experienced operator. When grading is done, make sure there isn't a berm left on the shoulder, which will catch and accumulate stormwater.
- **Good ditches are essential for good roads.** Ditches collect road runoff and subsurface water and allow them to drain away from the road. They should be stabilized with vegetation or lined with rock, with outlets to low, natural areas away from any water bodies or wetlands. Ditches should be U-shaped to allow for the water to flow over a wider surface area, as opposed to V-shaped ditches, which are prone to erosion.

What's the difference between crushed stone and gravel?

There is sometimes confusion between crushed stone and gravel, as the terms get interchanged, depending on where you live. Crushed stone is just stone crushed down to a particular size (often ¾ inch or 1½ inch), whereas gravel is small stone, sand, and fines that are all mixed together and packed into a hard surface. Crushed stone is great for infiltration trenches, infiltration steps, and French drains. Gravel is best used for driveways, roads, and other surfaces that should be hardpacked.



Good ditches are essential to collect road runoff. On the left, the ditch has badly eroded, and on the right (shown from the opposite angle) it has been armored against erosion with large angular crushed stones called “rip-rap”.

#3: Use erosion control on construction

Any project that requires soil disturbance, such as building a home, addition, garage, or driveway should be planned with erosion control in mind.

Crushed stone infiltration beds should be installed along the drip edges of buildings to catch roof runoff.

You can also prevent water from running directly into lakes or streams by maintaining the natural topography and natural vegetation and by diverting runoff into wooded areas.

Erosion control measures such as silt fences, erosion control mulch berms, and hay bale barriers should be installed before work begins and maintained for the duration of each project. These measures must also be installed correctly to function properly.

The silt fence shown here was properly “keyed in” and was augmented with a berm of erosion control mix. Both of these measures, combined with hay mulch, helped to ensure that no sediment left this worksite.



Here are important things to consider when installing common erosion control measures:

- Erosion control barriers (silt fences, hay bales, and erosion control berms) must be placed along a contour so that water does not build up in any low area.
- Silt fences must be “keyed in” by burying the bottom four to six inches of the fabric in the ground. If this can’t be done because of frozen ground, ledge, or heavy roots, the bottom eight inches of the fence should be set on the ground and covered with clean three-quarter inch crushed stone.
- Hay bales must be placed in a row with their ends tightly abutting. Any gaps should be tightly stuffed with loose hay. Hay bales also need to be “keyed in” at least four inches into the ground to prevent water flow under the bales.
- Erosion control berms should be at least two feet wide and one foot high and composed of erosion control mulch, stump grindings, or other similar non-erosive material.

#4: Pump out your septic tank

Septic tank sludge levels should be checked every two years. A tank should be pumped when it is half full or every two to three years for year-round residents and every three to four years for seasonal residents.

Septic tanks must be maintained to function properly. If settled solids are not removed from the tank, they will wash into and clog the leach field. A clogged leach field will cause the system to fail and require replacement.

Septic systems usually have a life span of 25 years or less. Do you know when your system was installed? If your system was put in after 1974, you can search through the State's records for septic systems here:

<https://www1.maine.gov/cgi-bin/online/mecdc/septicplans/index.pl>

To help prolong the life of your septic system:

- **Conserve water.** The less water you use the better your septic system will work.
- **Be cautious with drain cleaners and use bleach sparingly.** Sink plungers or drain snakes are inexpensive and more effective than chemical drain cleaners. Septic systems require living microorganisms to break down waste. Strong cleaning agents will kill these microorganisms and cause your system to fail.
- **Don't install or use in-sink garbage disposals.** Ground garbage and food waste overburden septic systems and slow their functions. Composting vegetable scraps is good for the environment and improves soil.
- **Stay away from commercial products that claim to clean your septic tank without pumping.** These products can contaminate groundwater and may clog your leach field.
- **Don't put paint or chemicals into septic systems.** These hazardous products kill microorganisms and can contaminate drinking and lake water.

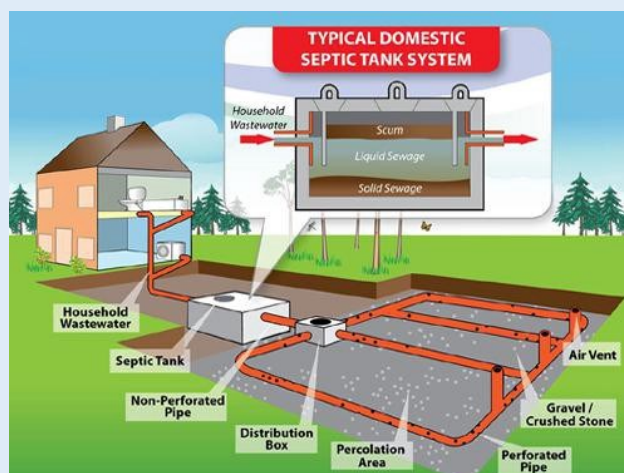
Have you
noticed signs
of a failing
septic system?

⇒ Do your toilets flush slowly or back up easily?

⇒ Have you noticed a wet, smelly spot in your yard, especially after doing laundry?

⇒ Is the grass over or around your septic system greener than the rest of your lawn?

⇒ Is the area around your septic system or drain field wet even when it hasn't rained?



#5: Watch out for invasive plants

Milfoil (below) and other aquatic invasive plants are a major threat to Maine's lakes. They can drastically change ecosystems, ruin recreation, and severely reduce tourism and lakeside property values. These plants can spread quickly and infest an entire lake from a small plant fragment. Once established, they are nearly impossible to remove. Control methods are extremely costly and do not guarantee eradication.

Boating is the primary method by which these plants are spread between lakes and ponds. Plants get carried on motors, fishing gear, anchor lines, and trailers and can survive out of water for long periods of time. Prevention is the only effective control measure.

To help avoid spreading invasive plants:

- Check your boat, trailer, gear, and anchor lines thoroughly before and after visiting any lake.
- Remove all plants and plant fragments and dispose of them in trash receptacles or on high, dry land.
- Avoid boating in areas of dense plants.
- Support the invasive sticker program. (<https://www.maine.gov/dep/water/invasives/invsticker.html>)
- Inform others about the dangers of aquatic invaders.



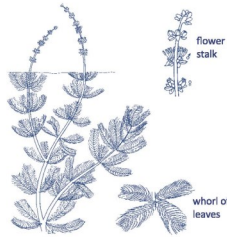
Invasive Variable Leaf Milfoil

Maine's Most UNWANTED Aquatic Invasive Plants

Under Maine law, it is illegal to transport ANY aquatic plant on the outside of a vehicle.
It is also illegal to sell, propagate, or introduce to Maine waters these aquatic invasive plants.

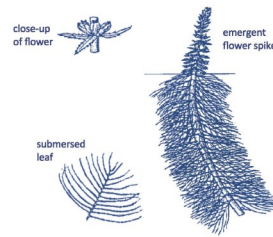
EURASIAN WATERMILFOIL*

*Myriophyllum spicatum*¹



VARIABLE-LEAF WATERMILFOIL*

*Myriophyllum heterophyllum*²



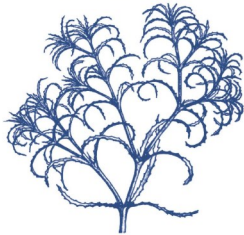
PARROT FEATHER*

*Myriophyllum aquaticum*¹



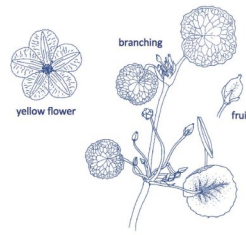
BRITTLE NAIAD

*Najas minor*³



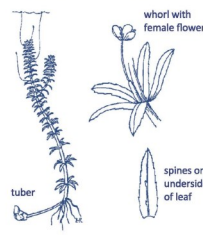
YELLOW FLOATING HEART

*Nymphoides peltata*¹



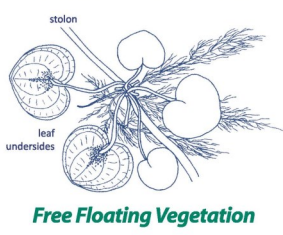
HYDRILLA

*Hydrilla verticillata*¹



EUROPEAN FROGBIT

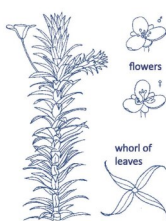
*Hydrocharis morsus-ranae*¹



Free Floating Vegetation

BRAZILIAN ELODEA

*Egeria densa*¹



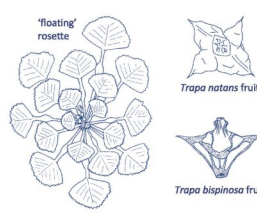
CURLY-LEAF PONDWEED

*Potamogeton crispus*¹



WATER CHESTNUT

Trapa species^{1,5}



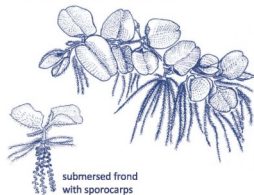
WATER SOLDIER

*Stratiotes aloides*¹



GIANT SALVINIA

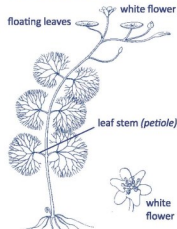
*Salvinia molesta*¹



Free Floating Vegetation

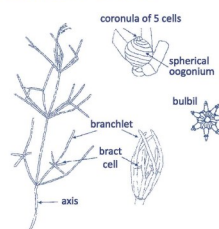
FANWORT

*Cabomba species*¹



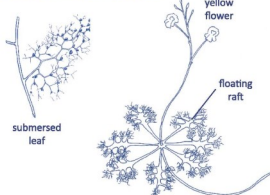
STARRY STONEWORT

*Nitellopsis obtusa*⁴



SWOLLEN BLADDERWORT

*Utricularia inflata*⁵



Free Floating Vegetation

* All non-native milfoils are considered invasive in the State of Maine.

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2. Aquatic Plants of New England Series. G. E. Crow and C. B. Helquist 1983. Illustration by Pam Brun.

3. Das Pflanzenreich, 1900 by Ernst Gilg and Karl Schumann. Image listed under public domain under the terms of GNU Free Document License, courtesy www.biolib.de.

4. Mary Jane Beilby and Michelle T Casanova. Springer - Heidelberg, New York, Dordrecht, London, 2014.

5. Aquatic plant line drawings are the copyright property of Lake Stewards of Maine.

For assistance, please contact:

Lake Stewards of Maine (207) 783-7733 stewards@lakestewardsme.org

For additional assistance, please contact Maine DEP (207) 287-3901

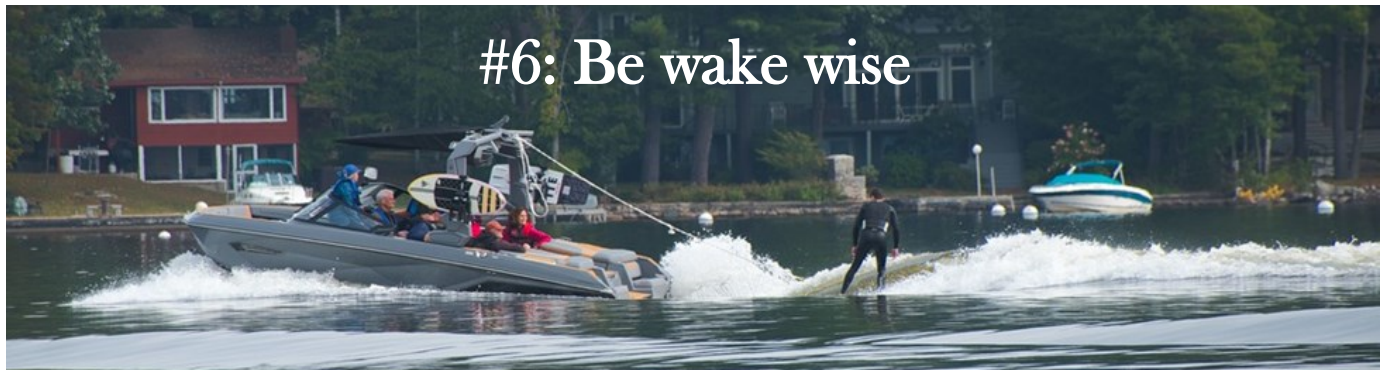
www.LakeStewardsOfMaine.org

www.LakesOfMaine.org

LAKE
STEWARDS OF MAINE
Volunteer Lake Monitoring Program

Original poster
design by Portland
Water District





#6: Be wake wise

Large wakes can have a BIG IMPACT on the health of our lakes, wildlife, and other users.

Large wakes produced by wake boats and boating between 6-12 mph (fast enough to push the bow out of the water but not fast enough for the boat to plane) can be detrimental to the health of our lakes by:

- Stirring up nutrient-laden bottom sediments which feed algae
- Causing shoreline erosion which destabilizes waterfront property and adds more sediment and nutrients to the water
- Damaging docks and boats on the shore
- Impacting the experience of others recreating on the lake
- Spreading invasive species; wake boats that use ballast water to push down the stern may also transport invasive species in their ballast tanks, which remain wet even after they are emptied.



This photo shows a loon nesting platform on the shores of Kezar Lake after a wake boat went by.

Photo courtesy of the Kezar Lake Watershed Association



BE WAKE WISE!

Wake surfing can be done safely by staying in deep water and away from the shore.

Love wake sports AND your lake? Then follow these simple guidelines:

- Wake surf far from shore — 500 feet out or more is best.
- Wake surf in deep water — these waves can stir up sediment more than 20 feet down!
- Go slow and keep the bow of the boat down in coves and narrow areas.

BOATERS' GUIDE

COMMON BUOYS AND THEIR MEANINGS



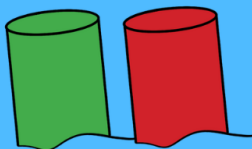
Danger! Marks a hazard like rocks, stumps, or other hazardous areas.

Danger! Boats should not pass between buoy and nearest shore.



Slow, no wake, or headway speed only. Headway speed is as slow as possible while maintaining control (or less than 6 mph).

Stay away! Marks dense milfoil or invasive aquatic plant area.



Red and green buoys mark channels. When returning, a boater must keep the red aids on the right (starboard) side of the boat.



Diver down! Stay at least 100 feet back.

Pro tip: Hazards (like rocks) are not always marked! The best way to protect your boat is to be cautious in areas of the lake you don't know and follow headway speed laws (<6 mph within 200 ft. of the shoreline). Going slow also protects wildlife and shorelines from excessive wakes.

CHECK FOR INVASIVES



This is invasive milfoil. It destroys ecosystems and swimming areas. Long Lake, Brandy Pond, Sebago Lake, Little Sebago Lake, Sebago Cove and the Songo River all have patches of it!

Please try to avoid boating through any areas with plants near the surface.

SECURE YOUR STUFF

Every year our milfoil divers find phones, cameras, clothes, and trash on the bottom of the lakes. Not only is littering illegal, but electronic devices contain toxic chemicals that can leach into the water. Try a floating waterproof case for phones and cameras.

ADMIRE WILDLIFE FROM A DISTANCE

Wakes from boats and other human interaction can drive off nesting loons permanently. A loon vocalizing at you or splashing across the water is a sign they are stressed.

GET THE LEAD OUT

Don't fish with lead tackle! Lead poisoning (from eating abandoned fishing tackle) is the leading cause of non-natural death for loons in Maine.

TAKE A BOATER EDUCATION COURSE

It's not only smart, it is required if you were born after January 1st, 1999!

DON'T FORGET!

Boats not registered in Maine require the **Lake and River Protection Sticker** (it's included in Maine boat registration).



Native plant guide

We strongly encourage planting at LEA because trees, shrubs, and even perennials have much bigger roots than lawn grasses, and these roots absorb water before it gets to the lake. Lawns can prevent surface erosion, but they have little capacity to absorb stormwater runoff. Natural vegetation between development and any waterbody is the best way to treat runoff. While we encourage the use of native plants, if they are unavailable at local nurseries then consider using native hybrids and cultivars.

The right plant depends on the conditions on your property.

Here are some options:

- **Growlow sumac** (*Rhus aromatic 'growlow'*) — It looks good all year long, requires virtually no maintenance and tolerates hot dry sites. Full sun.
- **Bush cinquefoil** (*Potentilla fruticosa*) — Tolerates a variety of soil conditions and has numerous small yellow flowers during the summer. Full sun.
- **Rhodora** (*Rhododendron canadensis*) — Intricate pink flowers in early spring before leaf out. Needs somewhat wet soil. Full sun to part shade.
- **Common juniper** (*Juniper communis*) — Super hardy, always looks good. Full sun.
- **Canadian Yew** (*Taxus canadensis*) — Hardy, deep green foliage, prunes well and has numerous small red berries in the fall. Partial shade to shade.
- **Northern bayberry** (*Myrica pensylvanica*) — Deep green, waxy aromatic leaves. Spreads nicely. Full sun to partial shade.
- **Bearberry** (*Arctostaphylos uva-ursi*) — Beautiful, creeping groundcover that tolerates sandy acidic soils. Full sun.
- **Creeping juniper** (*Juniper horizontalis*) — Spreads nicely, tolerates hot, dry sites. Full sun.
- **Lowbush blueberry** (*Vaccinium angustifolium*) — Everybody loves blueberries! Rarely need maintenance. Full sun.
- **Sheep laurel** (*Kalmia angustifolium*) — Beautiful clusters of deep pink flowers in mid-spring. Full sun to partial shade.

Check out : mainelakes.org/resources/more/native-plants/

for more information on going native.



Blue Flag (*Iris versicolor*) is a striking native iris for damp areas.



Beebalm (*Monarda didyma*) is a vibrant red native that spreads quickly in moist, partially sunny areas.



Maidenhair Fern (*Adiantum pendatum*) likes moist, organic soils with some partial shade.

Lake Stratification 101

Lake stratification is the separation of water in a lake or pond into distinct layers. This is caused by density differences in water at different temperatures. However, wind also plays a key role in maintaining and breaking down stratification. This layering happens in both the summer and winter and breaks down in the spring and fall, allowing for “turnover” – full mixing throughout the water column.

In Maine, three layers often form: the **epilimnion**, **metalimnion** (also called the thermocline), and the **hypolimnion**.

The epilimnion is the warm surface layer of the lake and the hypolimnion is the cold bottom layer. The thermocline is a narrow zone in between these layers where temperature and oxygen levels change rapidly. The exact depths of each layer change over the course of the summer and from lake to lake and year to year.

Due to the nature of stratification, which does not allow for exchange between the top and bottom layers, oxygen and nutrient concentrations often differ significantly between the upper and lower portions of a stratified lake. This is especially true in late summer.

This has several consequences for the lake. Light penetration is greatest near the top of the lake, meaning that algae growth primarily occurs in the epilimnion. Algae growth will sometimes peak near the thermocline, often in lakes with deep light penetration and higher hypolimnetic phosphorus levels.

Oxygen levels in the epilimnion are constantly replenished through wind mixing, but the hypolimnion is cut off from the atmosphere, leaving it with a fixed volume of oxygen which is slowly used up over the summer. This can affect coldwater fish species in some lakes.

Phosphorus, the limiting element controlling algae growth in our lakes, is often more abundant in the hypolimnion because it is stored in sediments.

When oxygen levels are low at the bottom of the lake, as often happens in late summer, a chemical reaction occurs that releases stored phosphorus from sediments. However, due to the density barrier at the metalimnion/thermocline, these nutrients do not move easily into the surface waters. This often causes a buildup of phosphorus in the deep hypolimnion. In most cases, this is not a problem, but if this barrier breaks down early because of high winds or artificial disturbance from humans high nutrient bottom waters can make their way to the surface, which can result in algae blooms.

Epilimnion

The warm upper waters are sunlit, wind-mixed, and oxygen-rich.



Smallmouth Bass

Metalimnion

This layer in the water column, also known as the thermocline, acts as a thermal barrier that prevents the interchange of nutrients between the warm upper waters and the cold bottom waters.



Landlocked salmon

Hypolimnion

In the cold water at the bottom of lakes, food for most creatures is in short supply, and the reduced temperatures and light penetration prevent plants from growing.



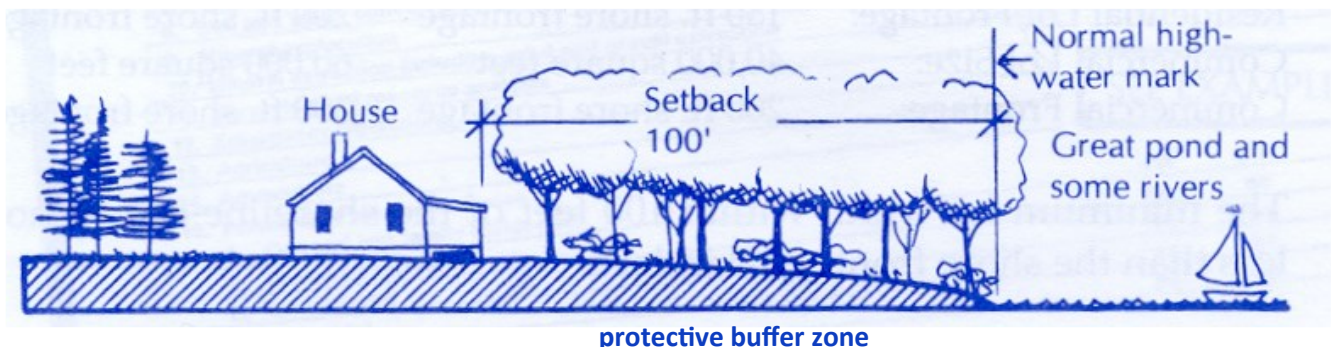
Lake trout, also known as togue

Laws Protecting Water Quality



Since these ordinances regulate many activities, you should contact your town office (see page 21 for contact info) or LEA before planning or starting any construction or cutting of vegetation near a lake or stream. Ask the Code Enforcement Officer for information and assistance. LEA can also provide consultations and technical assistance regarding land use laws.

- **Shoreland Zoning** – This law is administered and enforced by towns with oversight from the State. Its purpose is to protect water quality, prevent erosion in shoreland areas, preserve vegetation and wildlife, and conserve natural beauty by regulating lot size, construction, sewage disposal, and alteration of vegetation. Shoreland zoning pertains to the land within 250 feet of the normal high water line of any lake or river and within 250 feet of the upland edge of freshwater wetlands of ten acres or more. Many streams, brooks, and tributaries are zoned with protective buffers that extend 75 or 100 feet from their shorelines. Shoreland zoning laws differ from town to town. They affect building and structure size, setback and location, sewage disposal, earth moving, and clearing and cutting of trees, bushes, and ground cover.
- **The Natural Resources Protection Act** – This law is administered and enforced at the state level through the Department of Environmental Protection (DEP). Its purpose is to protect Maine's natural resources from damage due to development and improper use. It applies to lakes, ponds, wetlands, rivers, streams, brooks, and vernal pools. Projects that build, drain, dredge, fill, or change the land, water, or vegetation within or adjacent to these protected resources require a permit from the State. Examples include permanent docks and moorings, shoreline rip-rap, vegetative cutting, bridges, and expansions of non-conforming buildings. Call DEP or LEA for information.



- **The Site Location Law and Subdivision Law** — These laws regulate large projects and land developments that subdivide property. Larger projects require review and approval under both laws by state and local boards. Smaller projects are reviewed on the local level by the municipal planning board. The purpose of both laws is to provide standards and safeguards for soil erosion, water quality, traffic safety, water supplies, sewage disposal, solid waste disposal, scenic or natural beauty, and wildlife habitat.

- **The Conversion of Seasonal Dwelling Law** — This law is administered at the state level, but enforced locally. The purpose is to ensure that seasonal sewage disposal systems can function under year-round use without polluting nearby waters or causing other health hazards. In order to convert a seasonal cottage to a year-round dwelling, the local plumbing inspector must grant a conversion permit. The inspector will issue the permit if records show that the existing sewage system meets the State Plumbing Code Standards or if the owner can show that site conditions will allow installation of a sewage system that meets state standards.



- **The Erosion and Sedimentation Control Law** — This law is administered at the state level through the DEP and applies to all filling or earth moving that exposes soil to erosion. It applies in all areas, whether or not they fall within the shoreland zone, and requires that measures to control erosion and sedimentation are put in place before any work begins.
- **The (External) Plumbing Code** — All subsurface sewage disposal, including outhouses and gray water systems, must be installed in conformance with the Maine Subsurface Wastewater Disposal Rules. The guidelines require a valid plumbing permit or a completed application for a permit when proposed construction in the Shoreland Zone involves sewage disposal. Contact your local plumbing inspector or Code Enforcement Officer for more information.
- **Stormwater Management Law** — New federal requirements for “small construction activities” have recently taken effect. The regulations pertain to construction activities greater than one acre or projects that trigger Subdivision or Site Plan Review. The regulations are statewide and there will no longer be an exemption for single-family homes as there was in past regulations. Notification forms and copies of the Maine Construction General Permit (MCGP) can be obtained by calling the Portland DEP office at 207-822-6300.



LakeSmart

LakeSmart Helps You Make Your Property More Lake-friendly

Interested owners can request a **free** property evaluation from LakeSmart. The evaluation report provides recommendations intended to make property more lake-friendly by eliminating and preventing erosion. LakeSmart recommendations allow interested owners to take effective action to protect their lake's health.

Common recommendations include:

- Protect and/or create effective vegetated buffers at the lakeshore
- Divert water off driveways to stabilize ditches or buffers
- Use infiltration trenches at building driplines
- Cover pathways with erosion control mulch or crushed stone
- Limit lawns, recreation areas, and pathways near the lake

LakeSmart Awards

If an evaluation shows your property to be particularly lake-friendly, LEA recognizes you with a LakeSmart Award. Each award is accompanied by two distinctive signs intended for display at the shoreline and at the road. These signs may encourage lake-friendly practices throughout your neighborhood.

For more information about LakeSmart or to sign up for a consultation call LEA at 207-647-8580.



Natural vegetated buffers line this lakefront home, protecting the water from nutrients, erosion, and stormwater.

A Year in the Life of a Lake

Winter is a quiet time. Ice blocks out the sunlight and also prevents oxygen from being replenished in lake waters because there is no wind mixing. With little light below the ice and gradually diminishing oxygen levels, most biological activity slows down; however, some cold water algae continue to thrive.

Spring is a period of rejuvenation in the lake. After the ice melts, all of the water is nearly the same temperature from top to bottom. During this period, strong winds can thoroughly mix the water column, allowing for oxygen to be replenished throughout the entire lake. This is called spring turnover. Heavy rains, combined with snow melt and saturated soils, are a big concern in the spring. Water-logged soils are very prone to erosion and can contribute a significant amount of phosphorus to the lake. Almost all soil particles that reach the lake have attached phosphorus.

Summer arrives and deeper lakes will gradually stratify into a warm top layer and a cold bottom layer, separated by a thermocline zone where temperature and oxygen levels change rapidly. The upper, warm layers are constantly mixed by winds, which “blend in” oxygen. The cold, bottom waters are essentially cut off from oxygen at the onset of stratification. Cold water fish, such as trout and landlocked salmon, need this thermal layering to survive in the warm summer months and they also need a healthy supply of oxygen in these deep waters to grow and reproduce.

Fall comes and so do the cooler winds that chill the warm upper waters until the temperature differential weakens and stratification breaks down. As in Spring, strong winds cause the lake to turn over, which allows oxygen to be replenished throughout the water column.



Need help?

Just ask for an LEA Clean Lake Check-Up! If you call our office, we will set up an appointment to answer questions, visit your property, analyze problems, and design ways to prevent or control them. You'll be safeguarding your investment and protecting water quality.

Call 207-647-8580 to schedule a site visit.



Contacts & Resources

LEA Main Office

230 Main St., Bridgton, ME 04009
(207) 647-8580

LEA Maine Lake Science Center

51 Willett Rd., Bridgton, ME 04009
(207) 647-3318

Connect with us online on our
website, Facebook, and Instagram!

www.mainerlakes.org



Local Town Offices:

Bridgton

(207) 647-8786

Casco

(207) 627-4515

Denmark

(207) 452-2163

Harrison

(207) 583-2241

Naples

(207) 693-6364

Sebago

(207) 787-2457

Sweden

207-647-3944

Waterford

(207) 583-4403

Maine Warden Service

284 State St., Augusta, ME 04330
(207) 287-8000

www.maine.gov/ifw/warden-service/

Southern Maine DEP

312 Canco Road, Portland, ME
04103
(207) 822-6300

www.maine.gov/dep/



Name _____

Winter Address _____

Summer MAILING Address _____

Favorite Lake _____

Year Round Phone _____

Email _____

Would you like to receive emails on LEA outings, events and educational offerings? ☐ Yes ☐ No

I am interested in information on estate planning and planned giving: ☐

Donation Information

☐ \$1000

Benefactor

☐ \$500

Patron

☐ \$250

Sponsor

☐ \$150

Lake Sponsor

☐ \$100

Family

☐ \$50

Individual

☐ \$ _____

Other Amount

I would like to make an
additional donation to the:

☐ Maine Lake Science Center \$ _____

☐ Milfoil Fund \$ _____

☐ Environmental Education Fund \$ _____

☐ Check Enclosed ☐ Charge my Credit Card \$ _____

Credit Card # _____

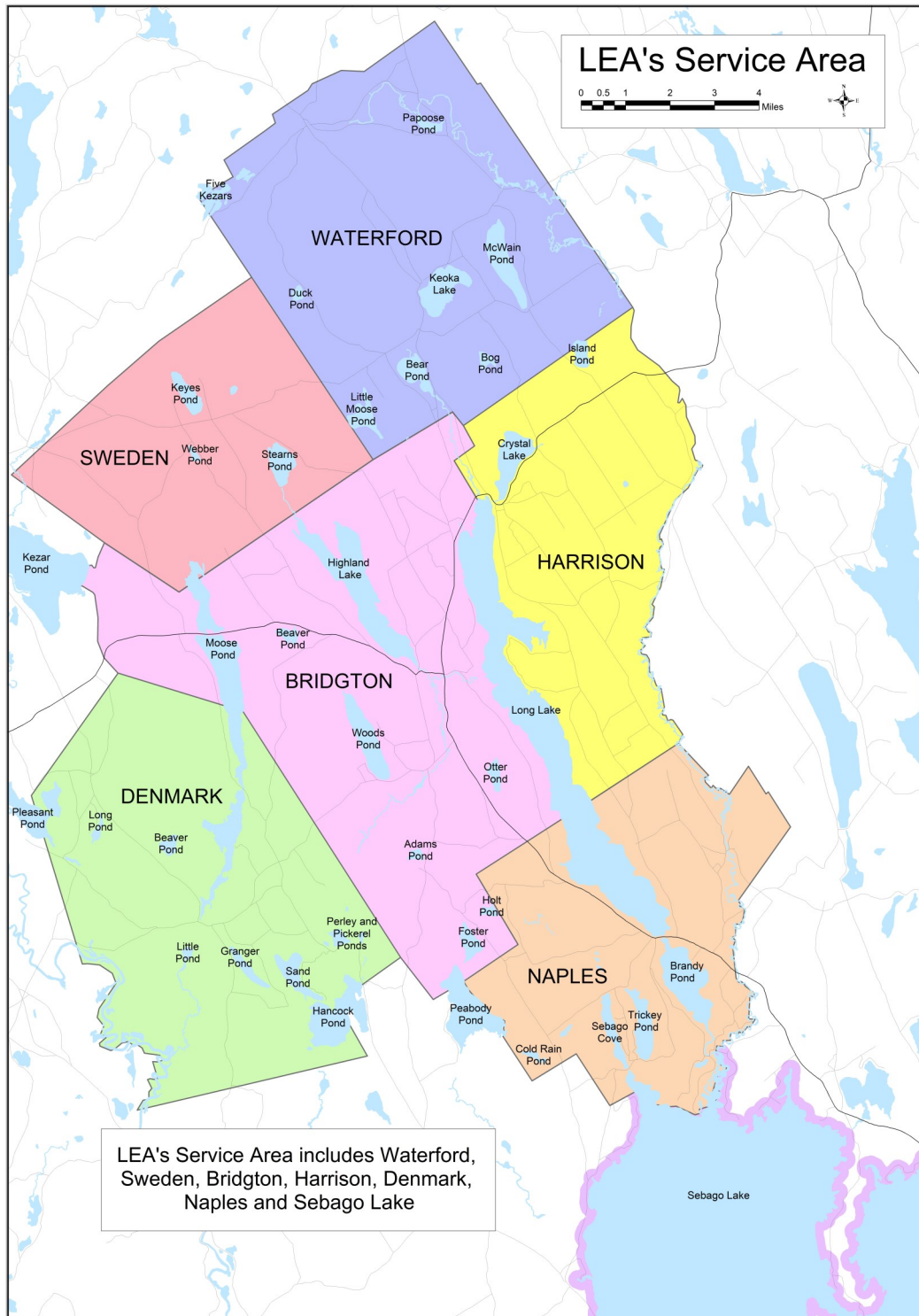
Expiration Date ____/____/____ CVC # _____

Signature _____

☐ Anonymous Gift (We occasionally acknowledge our donors publicly. Check this box if you would like your donation to remain anonymous.)



Lakes Environmental Association
230 Main Street
Bridgton, Maine 04009



Protecting the lakes we love since 1970