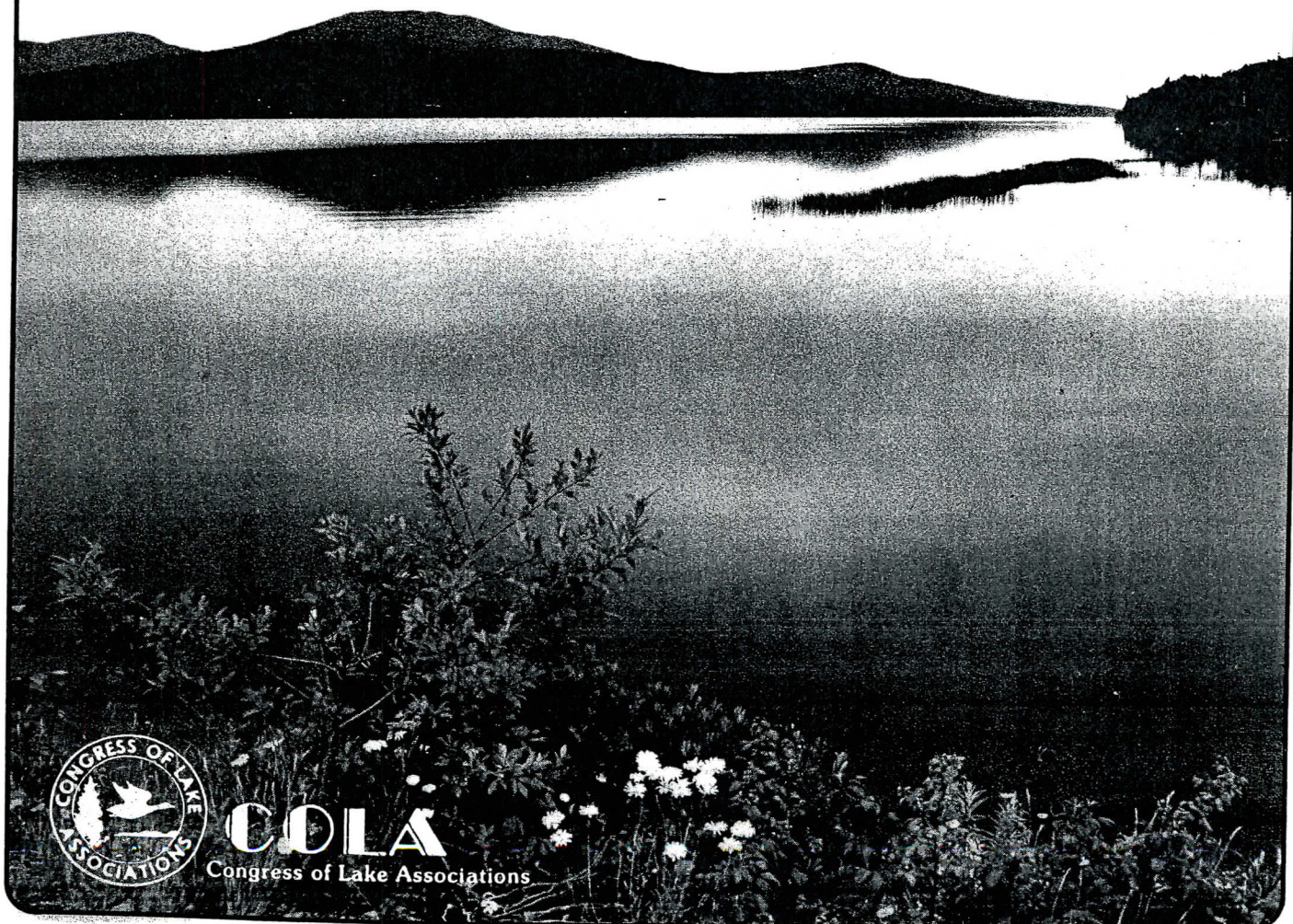


THE LAKE BOOK

Actions You Can Take to Protect Your Lake



COLA

Congress of Lake Associations

General Edition

THE LAKE BOOK:

Actions You Can Take to Protect Your Lake

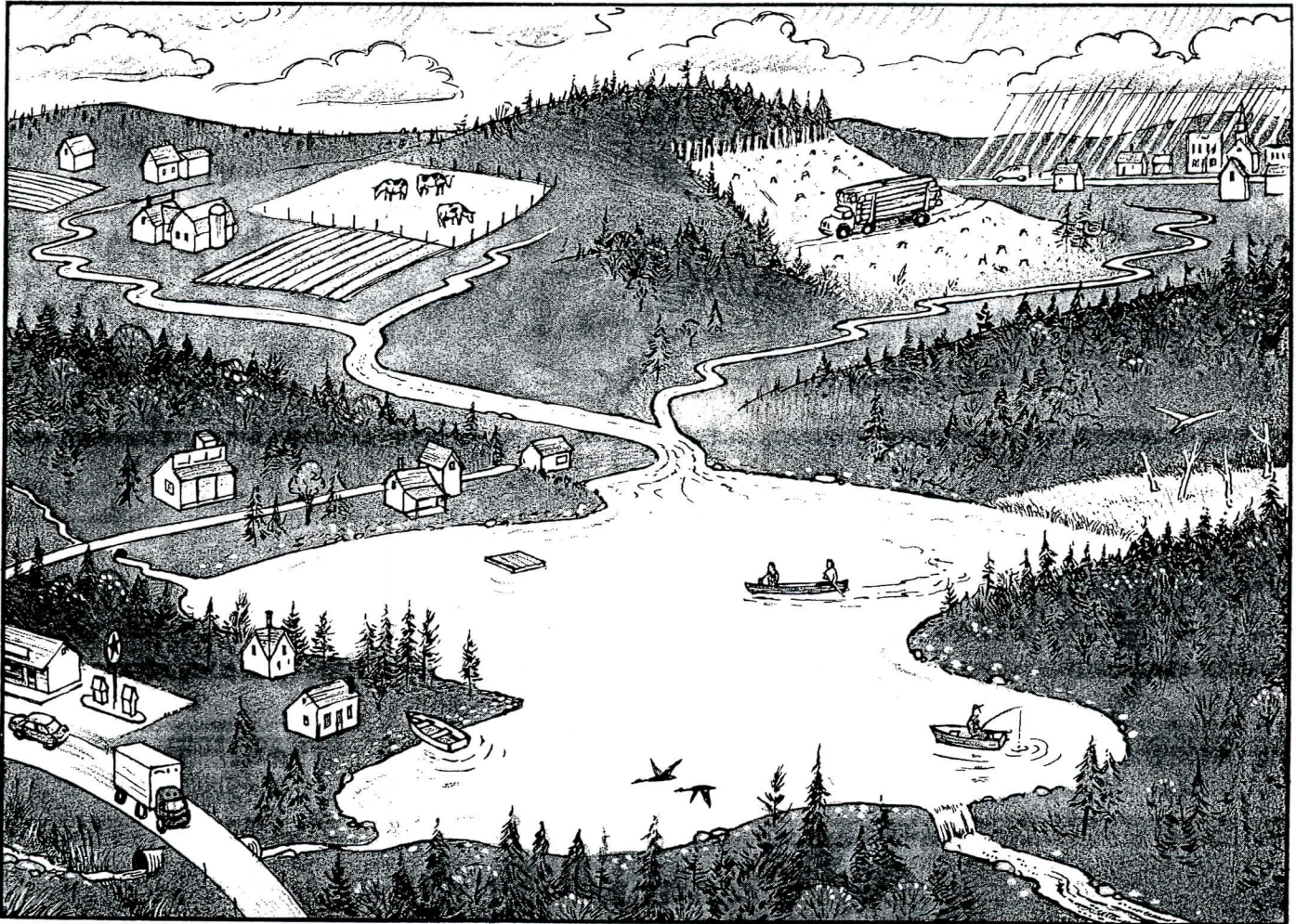
You Can Make A Difference

Your actions can affect the quality of a lake, even if you don't live on the lake, stream, or river, but simply within the lake watershed.

Things you do every day without thinking can affect groundwater and lakes. Little things, like leaving bare, exposed soil all season, or fertilizing the lawn, or failing to have your septic system pumped out, all add up. For

many lakes, time is running out and damage will be done, especially if stormwater runoff, one of the largest contributors to lake pollution, is not controlled.

Just as these little things add up to cause pollution problems, simple actions we take can help stop the pollution. You can make a difference; *The Lake Book* tells you how.



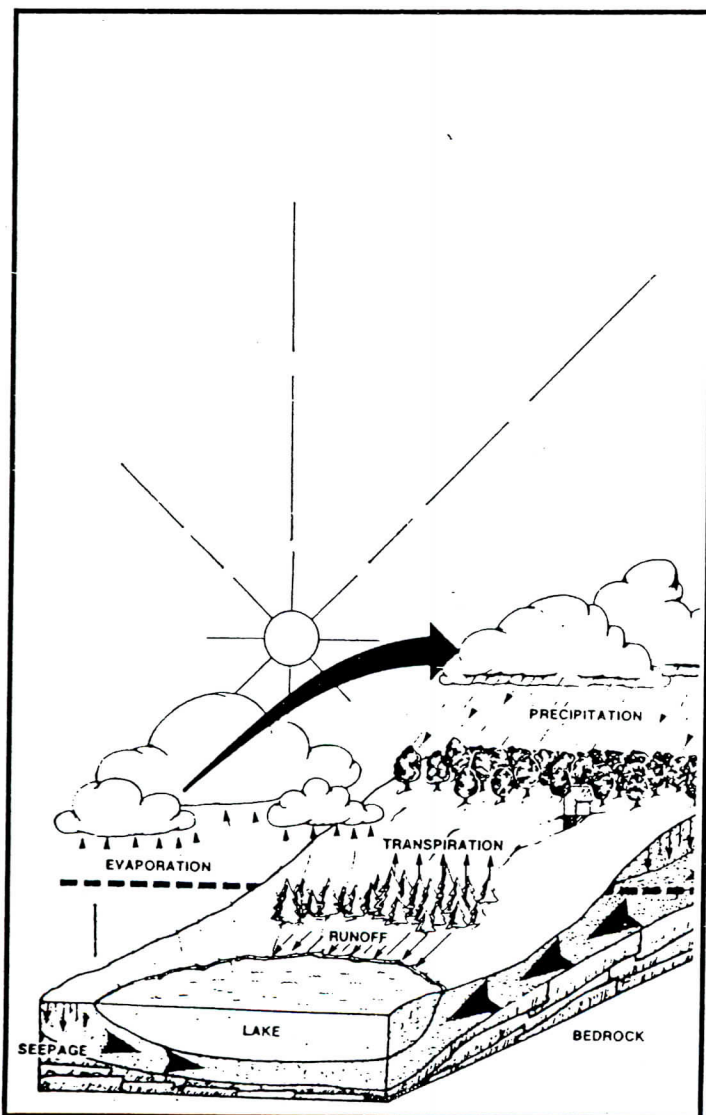
A Lake Watershed: *A lake's watershed consists of all the surrounding land that drains into that lake. Watersheds can extend for miles.*

Lake Basics

The Water Cycle

Lakes are one part of the planet's water cycle. Snowmelt and rainwater flowing over the land fill our lakes, rivers, streams, and oceans.

In a natural setting, the stormwater is cleansed and filtered by the leaf litter and soil. Some water penetrates deeply into the ground to become groundwater and eventually discharges into lakes, rivers and oceans. Evaporation starts the cycle all over again.



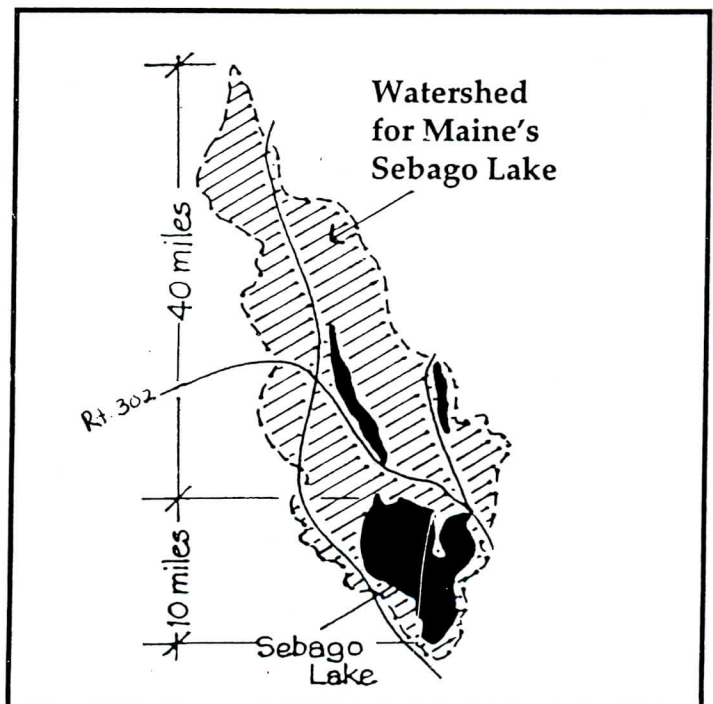
The Watershed

A watershed consists of all the land that contributes water to a body of water. To outline watershed boundaries, connect the points of highest elevation around a lake on a topographic map. Water falling within this bowl flows by gravity in streams and groundwater to the lake.

A watershed can extend for miles. So, lake protection must extend to the entire watershed.

Picture a drop of rainwater landing in your yard 3 miles from a lake. It washes into the driveway and down to the roadside ditch where it flows into a culvert under the road, which then empties into a stream that feeds the lake.

That drop of water might contain lawn fertilizer, motor oil from the road, cow manure from the farm downstream, or dirt from the new development across the street. It all ends up in the lake. And it is probably loaded with phosphorus.



THE LAKE BOOK:

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Phosphorus: The Green Machine

Phosphorus is the major threat to lake water quality.

Phosphorus is a natural element found in rocks, soils and organic material. In nature, it is essential for plant growth. Indeed, people use it as a fertilizer. Human activities, however, contribute higher concentrations of phosphorus to lakes than nature does. They overload the lake. And that is the problem.

In a lake, phosphorus feeds microscopic plants called algae. When phosphorus increases, algae feed on it and multiply. Massive quantities of dead algae then fall to the bottom of the lake, decompose and deplete oxygen levels. The loss of oxygen in the bottom waters can free phosphorus previously trapped in the sediments, further increasing the available phosphorus.

In a clear, cold lake, this gradual decrease in dissolved oxygen causes deep-water trout and salmon to die. In a lake with an already high phosphorus concentration, algal blooms turn the water green and cloudy, more fish die, and unpleasant odors and tastes arise. Such a

lake loses its appeal for swimmers and boaters and, if it is a drinking water supply, greatly increases costs. Property values may plummet.

Many seemingly harmless activities added together can cause phosphorus overloads. For example:

Development, not just during the building phase, but long after everything has stabilized, can increase phosphorus concentrations in stormwater by up to 10 times its natural concentration by eliminating natural "filters" and "sponges" (such as trees, bushes, and puddles); and by creating hard, easily washed surfaces (such as lawns, driveways, roads, and rooftops).

The solution, of course, is to take action. Keep phosphorus out of the lake by:

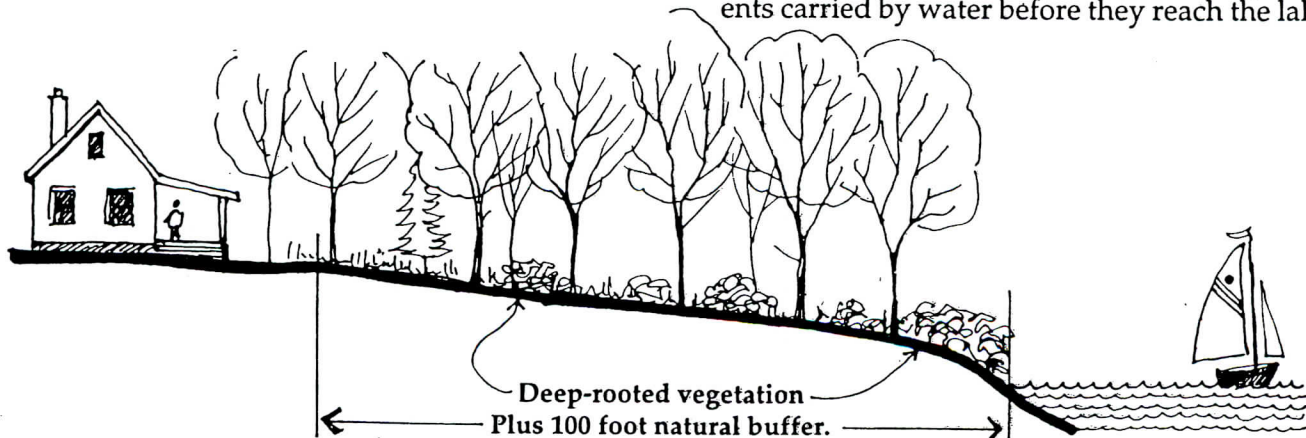
- using the soil and leaf litter as a natural filter
- keeping vegetation as a "buffer" between the shore and developed areas, and
- reducing the size of lawns and other developed areas.

AVOID PHOSPHORUS OVERLOAD

Actions You Can Take

Create Buffer Strips

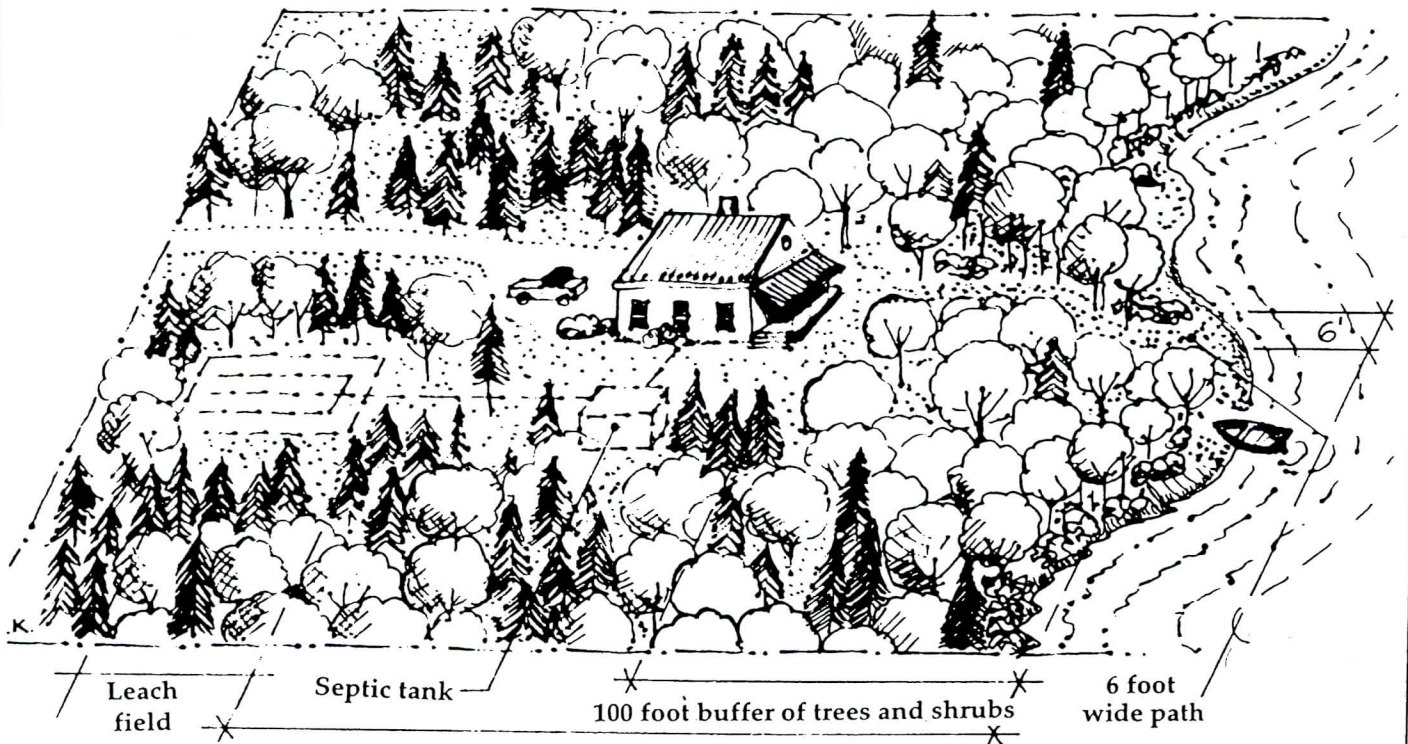
- Leave at least 100 feet of naturally vegetated areas (buffer strips) along lake shores and river banks and at least 25 feet, preferably 50 feet or more, along road ditches and intermittent streams. Buffer strips intercept runoff and filter sediment and phosphorus from water before it reaches the lake
- Plant deep-rooted, woody vegetation along lake shores, streambeds and road ditches, if the natural buffer has been removed. (Plant roots stabilize the shoreline, prevent erosion and take up nutrients carried by water before they reach the lake.)



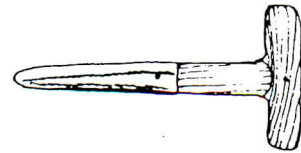
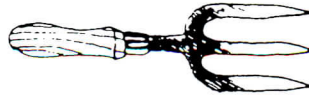
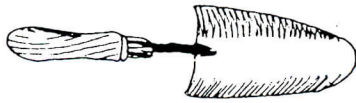
BUILD RESPONSIBLY

Actions You Can Take

- Find a builder who follows good soil protection practices. Minimize the area disturbed and use liberal amounts of hay and other mulches to prevent erosion. Erosion control is the most important technique.
- All disturbed areas should be mulched within one week and should be seeded or mulched within one week of final grading.
- On erodible soils or on slopes, also use filter fabric fences or hay bale dams to control erosion that does take place.
- Follow local and state lake protection laws and obtain necessary permits. Both you and the builder may be legally responsible. Information about laws is available from your town office and state environmental agencies.
- Build on flat or gently sloping land. Steep slopes (over 20%) mean a greater likelihood of erosion and run-off problems.
- Preserve existing ground features. Natural depressions allow water to puddle and soak in, instead of running off.
- Avoid constructing ditches that run directly into lakes and streams. Detain runoff in depressions or divert flow to flat, wooded areas. Flowing water carries sediment and phosphorus. Detaining or dispersing water allows it to seep into the soil where sediment and phosphorus are filtered out.



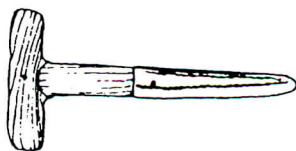
Leach field set back at least 200' from lake (check local laws)



GARDEN WITH CARE

Actions You Can Take

- Keep your lawn, garden and other cleared areas small. Enjoy the natural beauty and privacy of the site; maximize the opportunity for phosphorus-rich storm water to soak into the ground.
- Don't rake leaves or other forest floor debris. They help trap and filter water and prevent erosion.
- Use fertilizers only if a soil test indicates the need. Then, follow these guidelines: apply small amounts over a period of weeks and never apply fertilizer before or right after a heavy rain. Liquid fertilizer may be best to prevent run-off of excess phosphorus, if properly applied.
- Choose natural alternatives to herbicides or pesticides for your garden and lawn; and redesign your garden using local plants so that it will require less maintenance. Herbicides and pesticides are poisonous and easily carried by run-off water into lakes and drinking water supplies.
- Choose non-phosphate detergents, or use plain water when washing a car or other large item. Don't let the detergent and rinse water get into the lake or streams.



PHOSPHORUS CONTENT OF DETERGENTS:

Soaps and detergents contain phosphorus that can contribute to the algae problem in a lake. Here is a sampling of soaps and their phosphorus content. Read the label before you buy.

POWDER DETERGENTS

0% in Arm and Hammer, Green Mark. Less than .5% in All, Bold, Bright Water, Cheer, Dash, Oxydol, Rinso, Shop 'n Save, Surf and Wisk.

The following detergents have less than .5% if a code embossed on the package begins with "O", but much higher if the code begins with a "P". They are (with P) Ajax 10%, Fresh Start 17.5%, Tide 7.4%, Fab 10.7%. Read labels carefully!!

LIQUID DETERGENTS

All liquid detergents checked (Arm and Hammer, Bright Water, Cheer, Dash, Dreft, Era, Fab, Green Mark, Ivory Snow, Purex, Solo, Surf, Tide, Top Crest, Top Crest Wool Wash, Whisk, Woolite, and Yes) were phosphorus-free. Unfortunately, all are sold in plastic bottles which may create disposal problems. Cheer Free, Dash, Dreft, Ivory Snow, Solo and Tide were sold in bottles containing at least 25% recycled plastic.

DISHWASHING DETERGENTS (POWDERED)

All 6.1%, Cascade 7.5%, Electrosol 7.1%, Electrosol Concentrated 8.7%, Shop 'n Save 8.7%, Sunlight 6.1%, Shaw's 8.1%.

DISHWASHING DETERGENTS (LIQUID)

Cascade 4.4%, Palmolive 5.8%, Sun Light 4%.

HOUSEHOLD CLEANERS

Abrasives: Ajax 0%, Bon Ami 0%, Comet 0%.
Other Cleaners: Spic and Span (0% with "O" in code, or 7.6% with "P" in code.), Murphy's Oil Soap 0%.

REDUCE HAZARDOUS MATERIAL USE

Actions You Can Take

- Store hazardous materials in contained, safe areas. Containment prevents contamination of water supplies and lake water by undetected leaks.
- Dispose of paint thinners or chemical products responsibly — not on the ground or down the drain. These products cannot be removed by natural processes. Instead:
 - Let latex paint air dry in a well-ventilated place until it hardens, then put it in your garbage. This will help prevent toxic waste leaking into a landfill.
 - Allow used paint thinner and solvents to settle, then pour off the clear liquid and reuse. The sludge should be air-dried and put in the garbage.
 - Never dispose of any motor oil or other petroleum products on driveways or roads.
 - Most oils and petroleum products are high in phosphorus and contain other toxics. Motor oil can be recycled: take it to a service station that collects used motor oil.



Checking Lake Water Quality

There are many measures of lake quality, including clarity and suitability for swimming and drinking.

Clarity

Most people are concerned about how clear and clean the water is, but clarity is not necessarily a measure of purity: many toxics are invisible and lakes acidified by acid rain can be very clear. Clarity, however, does indicate the amount of suspended materials, such as silt and algae, that is in the water. Poor clarity may indicate a phosphorus problem since algae are usually the most abundant substance.

Lake transparency is commonly measured by lowering a black and white disk (called a Secchi disk) into the water until it just disappears from sight. Volunteers can be trained to use Secchi disks to monitor their lakes for possible changes in water quality.

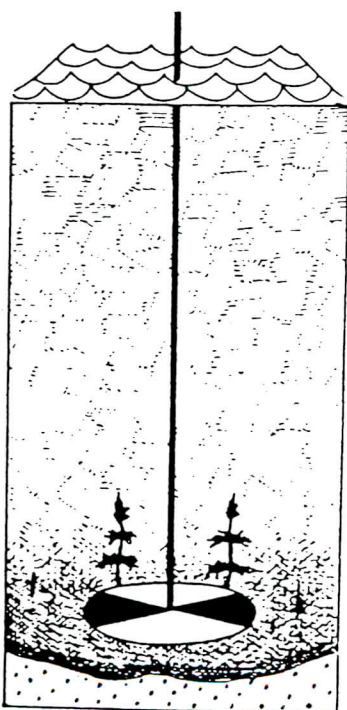
Suitability for Swimming

Lakes are valued for swimming, but under some circumstances may not be swimmable. Algal blooms may make swimming undesirable. Also, occasional high bacteria counts at a local beach or in a cove will temporarily close that area to swimming. Often the problem is from too many swimmers and not enough use of toilet facilities. A day or two is usually sufficient to allow nature to lower bacteria counts, unless the source is a poorly maintained septic system.

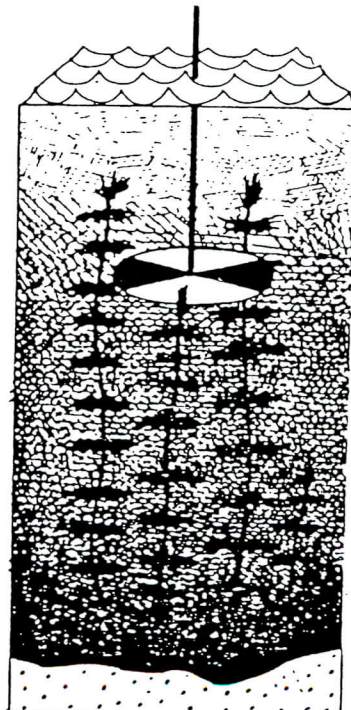
Suitability for Drinking

Do not drink lake water without disinfecting it. Bacteria, viruses or parasites can cause sickness. They may come from a malfunctioning septic system or from warm-blooded animals.

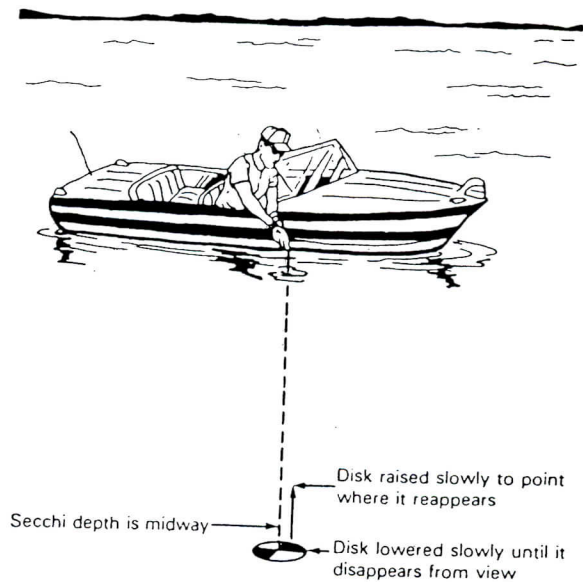
MEASURING WATER CLARITY WITH A SECCHI DISC



A clear lake



A turbid lake



CHECKING WATER QUALITY

Actions You Can Take

- Disinfect your lake water before you drink it by heating the water to a rolling boil for at least 5 minutes to destroy any bacteria, or adding eight drops of household bleach (4-5% available chlorine) to each gallon of water and allowing it to stand 15 minutes. Then shake or stir.
- To restore the taste of treated water, allow it to stand a few hours and then pour it back and forth between clean containers to restore the dissolved gases.
- Find out the water quality of your lake by contacting the lakes section of your state environmental agency.
- Volunteer to monitor your lake. Many states have volunteer lake monitoring programs. For information, check with your lake association, your state environmental agency or a state coalition of lake associations.
- Have the water at your local beach tested at high use times or after a period of heavy run-off due to rain. Your local water or sewage district may be able to do the test.



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Understanding Septic Systems

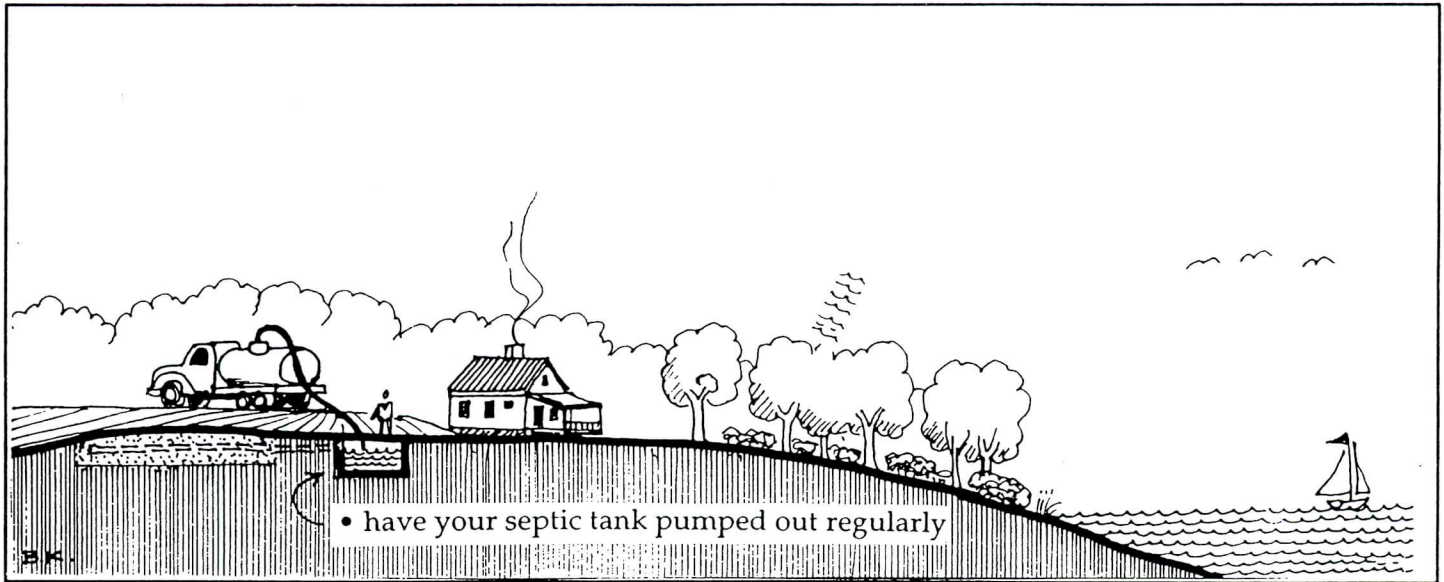
A septic system relies on a tank to collect and separate household waste and a leach field to filter pollutants and wastewater. The system relies on natural microorganisms to consume much of the waste.

A well designed, constructed and maintained septic system does not contaminate water supplies. But if the tank is too full or the microorganisms are dead, solids will overflow into the leach field and clog the system. Neglected or malfunctioning septic systems will cause

bacteria and phosphorus to be flushed into the groundwater, stream, or lake.

This is why it is critical to:

- have your septic tank pumped out regularly
- keep products that cannot be broken down out of the system
- avoid using chemicals that kill microorganisms.



Keep these things out of your septic system

Actions You Can Take

1

Liquids that kill the natural micro-organisms that break down the waste:
• strong cleaning agents (bleach, drain cleaner, etc.) • paint • chemicals

2

Products that fill up a septic system and cannot be broken down:
• cigarette butts • paper towels • grease • sanitary napkins • diapers

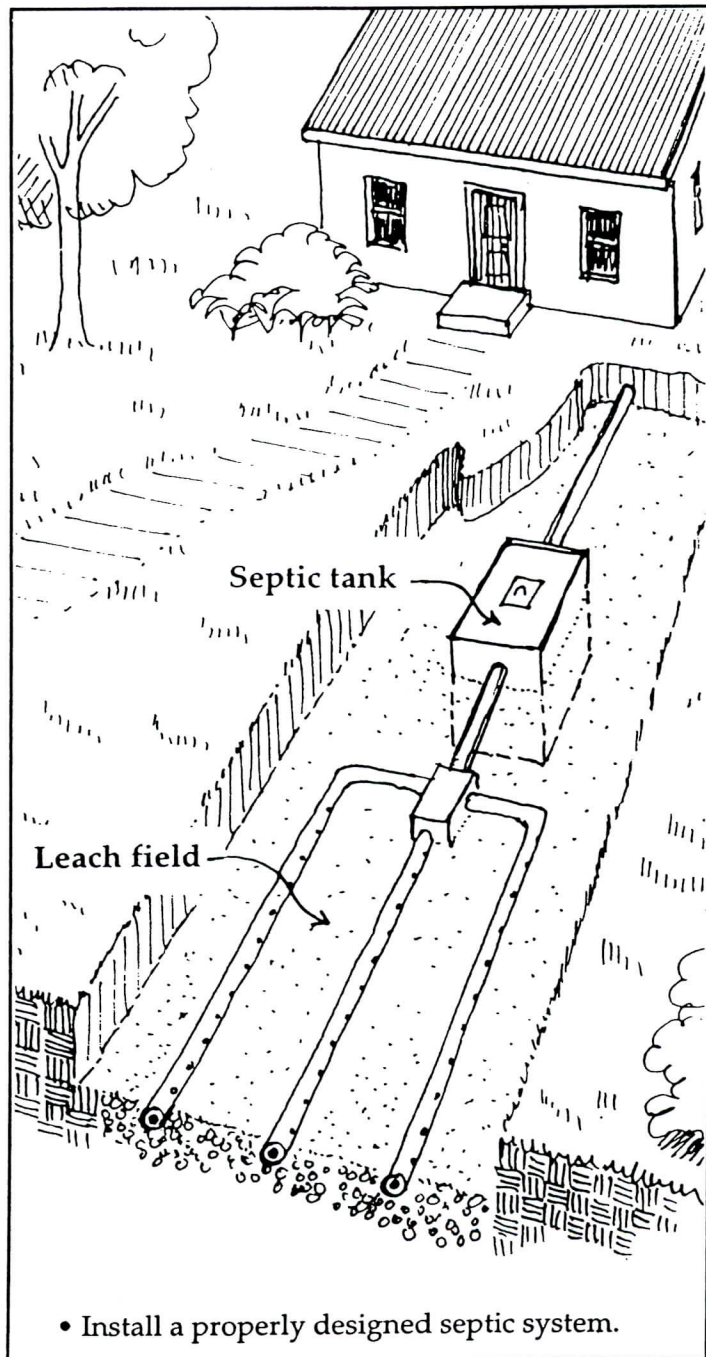
3

Waste that overburdens the septic system:
• ground-up garbage from a disposal

Understanding Septic Systems

MAINTAIN A HEALTHY SEPTIC SYSTEM*Actions You Can Take*

- Install a properly designed septic system that protects water quality and removes phosphorus. Locate it as far from the water as possible so there is ample soil to remove phosphorus and bacteria.
- Check the sludge level in your septic tank every year. Pump it when sludge fills half of the tank (the average is every 2-3 years for year-round residents, 5-6 years for seasonal residents). If settled solids are not removed from the tank, they will wash into and clog the leach field.
- Organize neighborhood septic tank pumping. Pumpers usually reduce the price for large volume jobs.
- Conserve water; give the septic system time to "rest" after heavy use. The less water you use, the better your septic system will work.
- DON'T use commercial products that claim to clean your septic tank without pumping. These products can clog your leach field and many contain chemicals which can contaminate groundwater.
- Use non-phosphate detergents. Generally, liquid detergents have no phosphate and powder detergents have some, but be sure to check the product labels. Phosphate detergents can double the amount of phosphorus entering a septic system. Leach fields can only treat a finite amount of phosphorus. Reducing the amount of phosphorus prolongs the life and efficiency of a septic system. (See list of detergents on page 9.)



- Install a properly designed septic system.

THE LAKE BOOK:

Actions You Can Take to Protect Your Lake

A Picture Perfect View

People value lakes because of their natural and scenic qualities.

Few can "own" a view; it belongs to everyone. Your view could be ruined by a thoughtless person who builds too close to the lake, paints the camp a highly visible color, or cuts too many trees on the lake shore. Likewise, you are part of someone else's view.

The natural landscape, your view, is also critical for wildlife. To survive, wildlife and fish need the clean water, food and habitat found in and around lakes. When people build houses, lawns, roads and docks, they reduce wildlife habitat.

Lake shore property owners have an obligation to protect views to and from the lake. Think of yourself as a partner with the other owners. Keep your section of lakefront as natural as possible and encourage your neighbors or "partners" to do the same. At the same time, you will be protecting wildlife habitat.



PROTECT THE VIEW

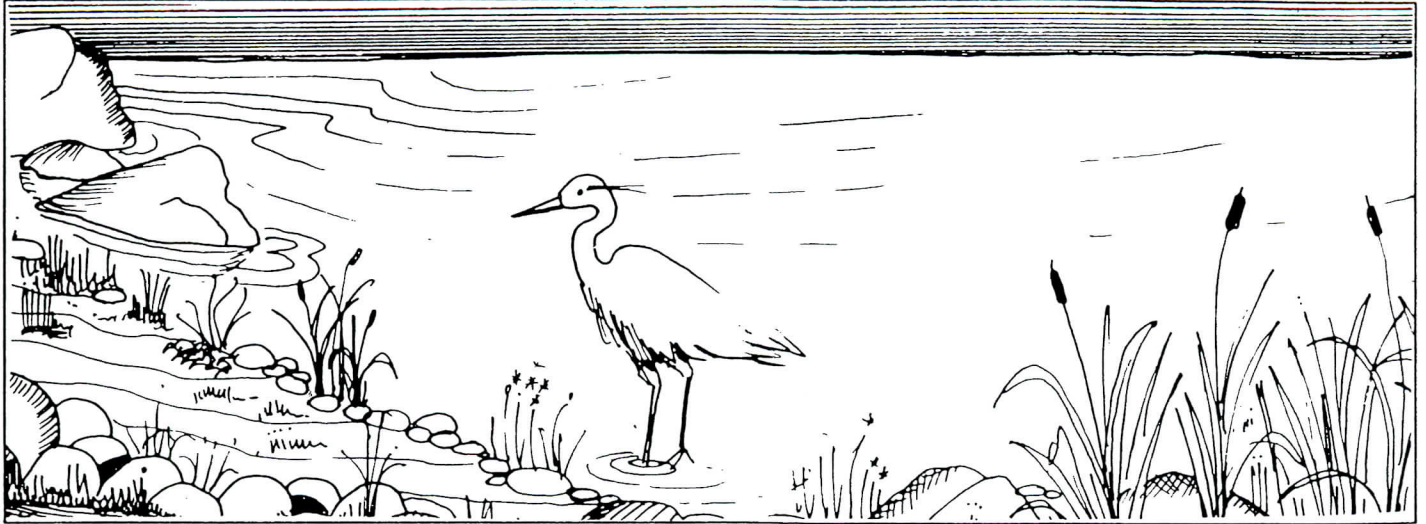
Actions You Can Take

Minimize the area you set aside for buildings and open space.

- Keep the shoreline free from permanent structures, such as docks, retaining walls and boat houses. In fact, these may not be legal or permits may be required.
- Maintain low visibility. Leave a natural, undisturbed, wooded buffer strip between the developed area and lake shore (see page 6). Besides protecting water quality and wildlife habitat, a buffer strip will provide you greater privacy. (Also, buffer strips may be required under local and state laws.)

- If you've removed the natural buffer zone, plant a new one and encourage natural vegetation to grow back. (See page 6.)
- Place new buildings well back from the shoreline and paint them a dark color to blend in with the natural landscape.
- Use a winding footpath, not a paved road or sweeping lawn, to get to the lake. A winding path prevents erosion (see diagram on page 7).
- Avoid bright outdoor lights. Even one light on the lake can destroy that feeling of remoteness.
- Limit clearing to pruning the lower limbs of trees between your house and the lake; severely limit any tree cutting within 100 feet of the lake. Check local and state laws regarding clearing.

No Beach is a Good Beach



The first thing you may want to do as a new owner is create your own beach. That is one thing you shouldn't do!

Some lakes have natural beaches. They were created over time by geology and water movement and therefore are stable. Plants and animals adapt to these beach environments.

A load of sand dropped at the edge of the lake, how-

ever, is a form of pollution and the combined effect of many beaches can harm a lake. Sand is a significant source of phosphorus and can cover critical edge habitat, suffocate freshwater clams and mussels and eliminate fish breeding areas.

Finally, artificial beaches won't stay and usually they are illegal. The water currents and waves will wash away the sand and without a continual source for new sand, the beach will disappear.

KEEP THE SHORE NATURAL

Actions You Can Take

- Leave the shoreline in its natural condition; don't build an artificial beach. Leave existing rocks and aquatic plants in place to break waves. (They prevent erosion and stabilize the shoreline.)
- Use temporary docks, which are put in and removed seasonally. Avoid creosoted or pressure-treated wood. Cedar is a better option and is very durable.
- Don't build a permanent dock; a permanent dock

will disturb bottom habitat, alter wave patterns and cause erosion where none occurred before.

- Use a public beach, boat launch, or marina for access to the lake. By concentrating recreational uses in one area, you protect the shoreline habitat elsewhere.

NOTE: Check with your town office and state environmental agencies before you undertake a project in the lake or on the shoreline. You may need a permit.

UFO's: Unidentified Floating Objects

1. Murky, Green Colored Water.

Description: Murky, green-colored water, possibly scum, that looks like blue-green paint on the windward shore, unpleasant odor.

Analysis: Algal Bloom. Algae are microscopic plants that are natural components of lakes. When very high phosphorus concentrations occur, one species of algae will out-compete the others and become so abundant that the water becomes murky.

2. Yellow-Green Dust.

Description: Yellow-green dust on the lake in early summer.

Analysis: Pollen from nearby pine trees. The pollen might look similar to algae, but pollen is yellow-green and dust-like and floats mainly on the surface. (An algal bloom is green to blue-green.) Over time the pollen will become water logged and sink from sight. Pollen does not have any effect on water quality.

3. Dark Cloud

Description: Dark cloud in the water accompanied by an oily sheen.

Analysis: The cloud is probably insect cases left behind from a hatch of aquatic insects; the insects hatch any time during the open-water season. The wind often concentrates the cases along the shore and, as they decompose, an oily film sometimes forms on the water surface.

4. Dead Fish.

Description: Dead fish floating on the water or washed up on the shore.

Analysis: An occasional few dead fish along a shore is not significant. Sometimes anglers release injured fish which die, or midsummer stress due to warm water and disease may kill a few fish.

Numerous dead fish (i.e., dozens), or dead fish of more than one species is a cause for concern. Report your find to your state environmental agency or to your state fish and wildlife department.

5. Green Cotton Candy

Description: Green, cotton candy-like clouds floating in shallow waters.

Analysis: Filamentous algae are common in many lakes and may not indicate a water quality problem. These clouds usually appear after heavy runoff in the spring or following a long, hot spell in the summer.

However, concentrations of this form of algae only in specific areas may indicate a local pollution source, such as a contaminated stream or failing septic system. If a lake develops this type of algae around the entire shoreline, it may be the first indication of a phosphorus problem in the entire lake.

6. Foam

Description: Foam "soap suds" on the surface or along the shore.

Analysis: Foam along the shore probably does not indicate pollution from laundry waste. Virtually all detergents today are a biodegradable form which is easily broken down by bacteria. Most foam is natural.

Foam is created when the surface tension of water is reduced and air is mixed in, causing bubbles. Many natural organic compounds will reduce surface tension, including those from decomposing algae or fish. In a lake, these organic compounds are mixed with air by wind and currents to produce foam.

Large quantities of foam are often found on windward shores, coves and in eddies. Natural foam has a somewhat earthy or fishy aroma. Detergent foam, in contrast, will have a noticeable perfume smell.

7. Red, Itchy Rash

Description: A red, itchy rash on swimmers soon after coming out of the water.

Analysis: Swimmer's itch, which a doctor must diagnose, is a rash probably caused by a fluke. A fluke is a parasite that must, at one point in its life cycle, locate and penetrate the tissue of a vertebrate. If the fluke encounters a swimmer, it will partially penetrate the bather's skin.

The swimmer may notice a prickling sensation after getting out of the water. This is the body's natural defense system rejecting the fluke. Red spots and swelling, similar to the reaction some people have to mosquito or black fly bites, develop later and can last a week or longer. Some people are more resistant to swimmer's itch than others.

To help prevent swimmer's itch, liberally apply suntan oil or baby oil before entering the water. This makes the skin slippery and discourages attachment of the fluke. Also, once swimmer's itch is detected in one area, try another area; swimmer's itch can be very localized and the other side of a cove or beach may not be infected. Outbreaks of swimmer's itch usually occur for a two week period in early to mid July.

8. Worm-like Animals

Description: Flat, worm-like animals stuck to your skin.

Analysis: Leeches are found in shallow, protected waters, and are active on hot summer days and most active at night. They are attracted to water disturbance around docks and swimming areas.

The best way to avoid leeches is to swim in deep waters off a boat or float.

One successful way to control leeches is bait trapping. Punch small holes in the sides of a metal can with a recloseable lid (e.g., a 1-pound coffee can). Bait it with raw meat. Once the leeches have entered and fed, they cannot leave. Remove the can from the water and dispose of it properly.

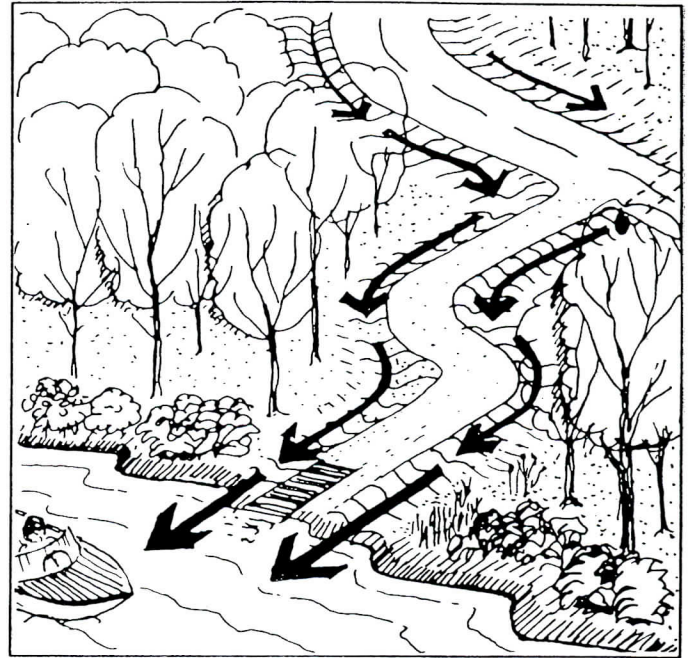
Ducks have been used to control leech populations, but an overabundance of ducks can create other problems. Ducks host a number of parasites, including swimmer's itch, and duck waste is high in phosphorus.

Roads & Ditches: Phosphorus Highways

Eroding dirt or gravel roads, ATV trails, new roads close to the shore, culverts and roadside ditches — even worn footpaths — are all highways for sediment and phosphorus to get to a stream or lake.

It doesn't take much to start the process: a heavy thunderstorm will quickly scour open ground on a construction site, erode a sloping path, or wash out a newly constructed or recently cleared roadside ditch. An erosion site miles from the lake, but still in the watershed, can alter lake water quality. And, numerous erosion sites along miles of roads and ditches have a severe, cumulative effect on lake water quality, especially during a downpour.

Flowing water scours erosion channels and picks up sediments which carry phosphorus. The faster the water flows, the more phosphorus and sediments end up in a lake.



BUILD RESPONSIBLY

Actions You Can Take

- Design and build new roads and driveways with culverts, drainage diversions, ditches and roadside buffers to deal with runoff from major storms. Ask your county Soil and Water Conservation District for help.
- Work with your town to adopt town road standards that will reduce phosphorus runoff.
- Avoid construction on steep slopes (greater than 20%). On lesser slopes, use water bars and diversions. Most towns do not allow roads with slopes greater than 10%.
- Improve poor roads and driveways by diverting stormwater off them into roadside ditches that are vegetated or stone-lined and that are U-shaped — not V-shaped.
- Divert water flowing in roadside ditches that have long sloping runs into flat wooded areas where phosphorus and soil are filtered out. Use frequent ditch turn-outs to slow the water flow.
- Retain or plant buffer strips along roads and uphill from ditches to intercept nutrient-rich runoff before it gets into the ditch.
- Organize volunteers to go out during or right after a heavy rainstorm to identify and trace sources of erosion. Determine which streams and rivulets are brown with silt and find out where erosion is worst. Then work with landowners to correct the problems. For assistance, check with your state environmental agency's lakes program, your county Soil and Water Conservation District or your state coalition of lake associations.

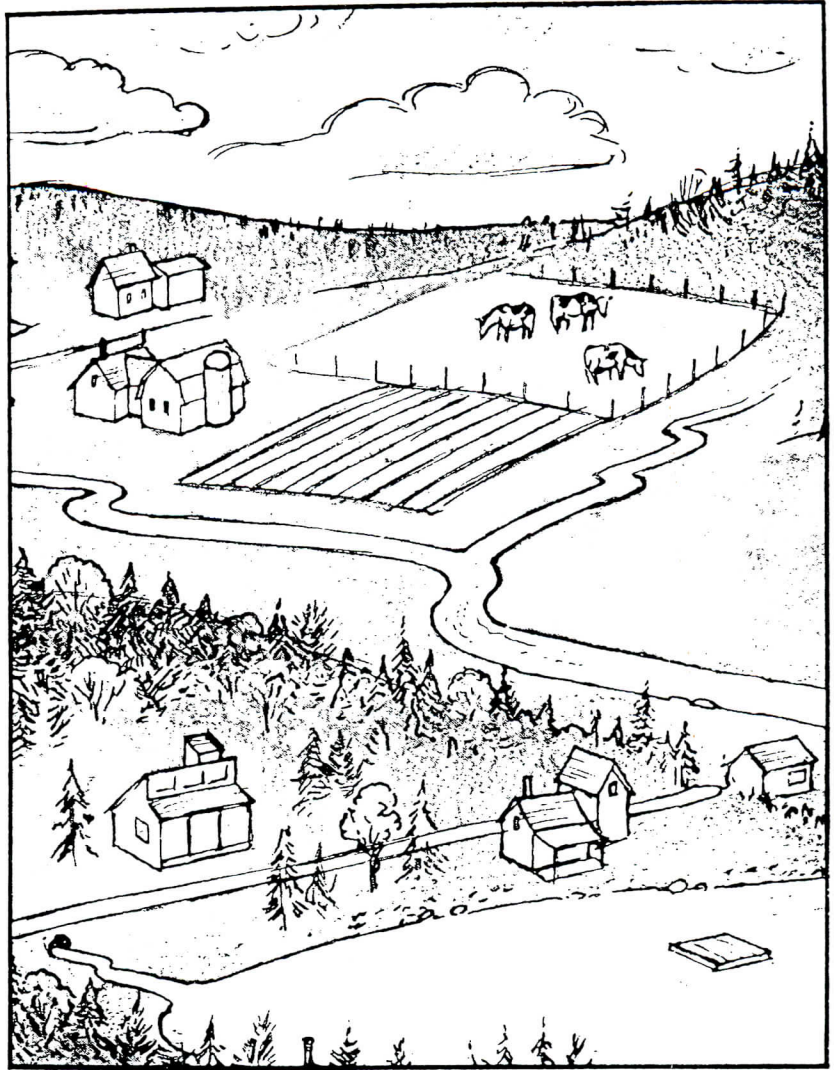
THE LAKE BOOK:

Actions You Can Take to Protect Your Lake

Farming, Fertilizers & Phosphorus

In many lake watersheds, agriculture is an extremely significant source of phosphorus pollution.

Large expanses of bare or freshly tilled soil are prone to erosion. Commercial fertilizers and manure, if not carefully stored and applied, can also end up fertilizing the lake. But there are actions that farmers can take to protect lake quality and increase crop productivity.



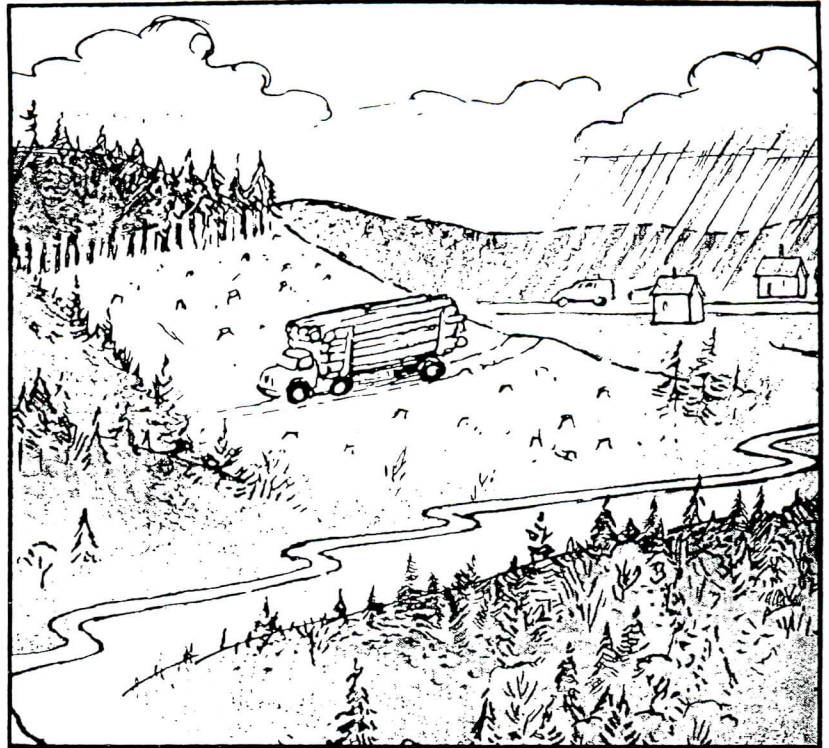
AVOID FARMLAND EROSION

Actions You Can Take

- Strip crop and contour plow where appropriate, to reduce the potential for erosion; these practices break up large expanses of tilled soil and slow the flow of stormwater.
- Plant winter cover crops to reduce erosion. The roots stabilize the soil during runoff.
- Apply fertilizer only during the growing season when it can be utilized by the plants, but not before a storm.
- Store manure in properly designed pits or stacking sites to reduce nutrient-rich runoff which can contaminate groundwater and lakes.
- Avoid the use of pesticides since they can contaminate groundwater, rivers, lakes and streams.
- Use best management practices; consult your county Soil and Water Conservation District or your state environmental agency's Nonpoint Source Pollution Coordinator.

Logging Jobs: Don't Cut & Run

Forestry operations can be a significant source of phosphorus. Carelessly built logging roads, stream crossings and clearcuts can funnel phosphorus into lakes, warm stream waters and alter habitat. Furthermore, the silt can suffocate insect larvae and fish eggs in nursery areas.



AVOID EROSION ON LOGGING JOBS

Actions You Can Take

- Cut only small openings. Large openings remove the protective forest canopy and can increase erosion.
 - Leave broad strips of wooded land next to streams (at least 75 feet) and along the lake shore (at least 100 feet): check local and state zoning requirements for specific cutting limitations.
 - Incorporate culverts, water-bars, and dips into logging roads and skid trails to prevent erosion. Use switchbacks on steep slopes. Revegetate logging areas.
 - Keep slash (unwanted branches and wood debris) out of streams and ponds. It interferes with fish and wildlife and can cause erosion of stream banks.
 - Check with your town and state environmental agencies to find out if you need a permit for crossing streams or wetlands on your property. Not all crossings require permits and some crossings can be permitted without review. Both the contractor and the property owner may be legally responsible for obtaining permits.
- Avoid working in extremely wet areas and during "mud season." The soil's ability to hold and filter water can be destroyed by heavy equipment.
- After the operation, revegetate all exposed soil areas in skid trails, yarding areas, etc.
- Consult your county Soil and Water Conservation District, your state forest service or your state environmental agency's Nonpoint Source Program.

THE LAKE BOOK:

Actions You Can Take to Protect Your Lake

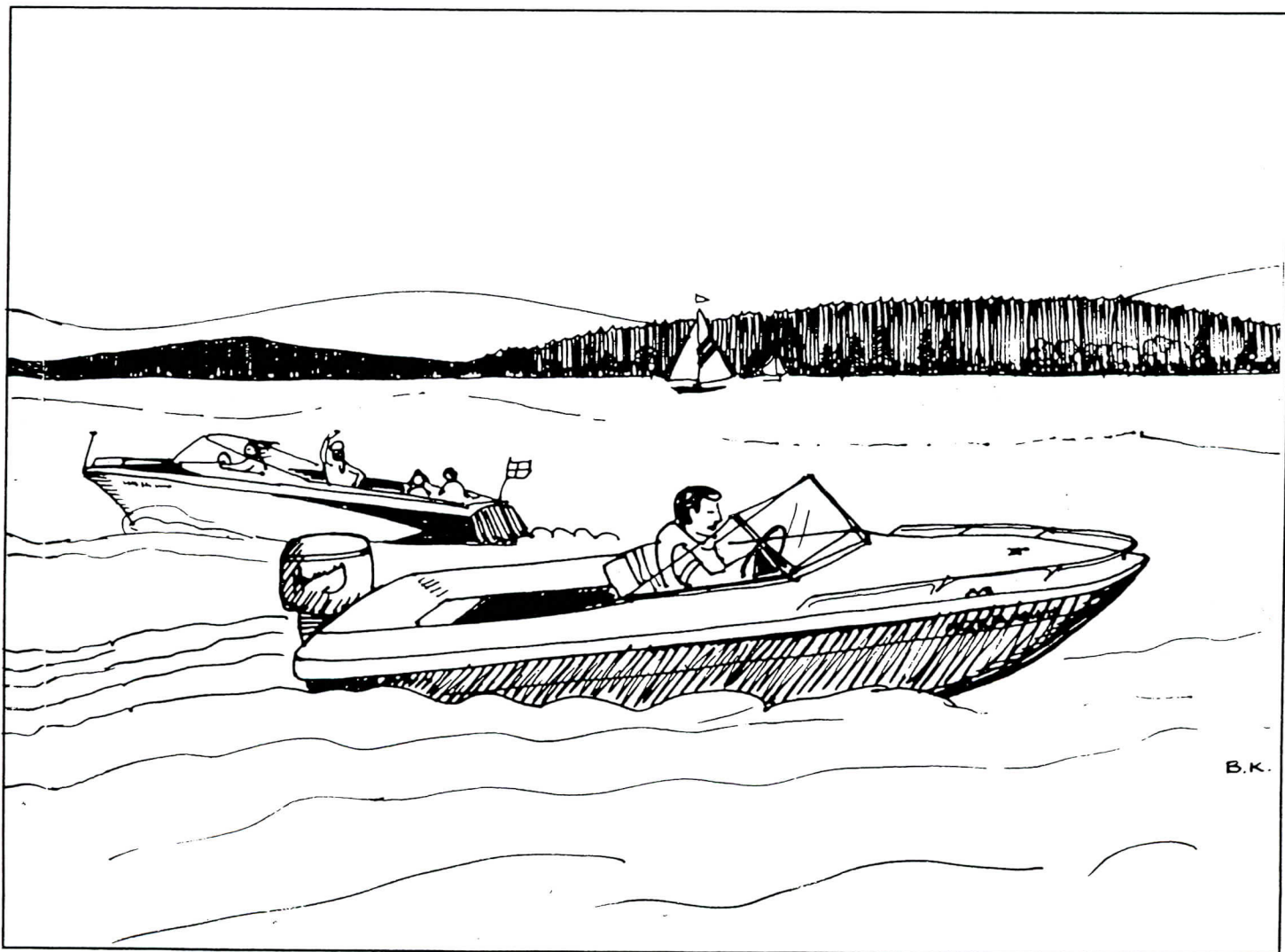
Boating Boom . . .erang!

Many lakes are suffering from a "boomerang" affliction: they attract boaters because of their beauty and accessibility, but too many boaters and/or careless boating decreases their attractiveness.

Boating has always been part of the lake experience. However, as motors have gotten bigger, problems have increased. The most serious boating problems are directly related to increased motor boat use: safety, congestion, noise pollution, accelerated shoreline erosion and sedimentation from bigger wakes, air and water pollution from poorly tuned engines, wildlife harassment, gas spills and human waste.

Each of us must be responsible for our own actions and then work to change the actions of others.

Boating laws are administered by different agencies; it varies state to state. In some states, towns that have worked with lake associations have hired their own harbor masters or other officials to patrol lakes and enforce the boating laws. If you have concerns, talk with your local police department or the state agency that handles recreational vehicles.



PRACTICE RESPONSIBLE BOATING

Actions You Can Take

When buying a boat:

- Choose a boat that fits the size and depth of the lake. This applies to both length and horsepower. Avoid boats with V-shaped hulls; they create large wakes and chop up vegetation.
- Buy an engine with good fuel-burning efficiency. Make sure the engine and boat complement each other.
- Use correct gasoline/oil mixtures. Use lead-free gas.
- Be careful when handling gas to avoid spills. Fix leaks.
- Make sure the engine has current air emission controls which prevent smelly clouds of exhaust from escaping. Have frequent tune-ups.
- Keep your muffler in good condition. Exhaust pipes should be below the water line.

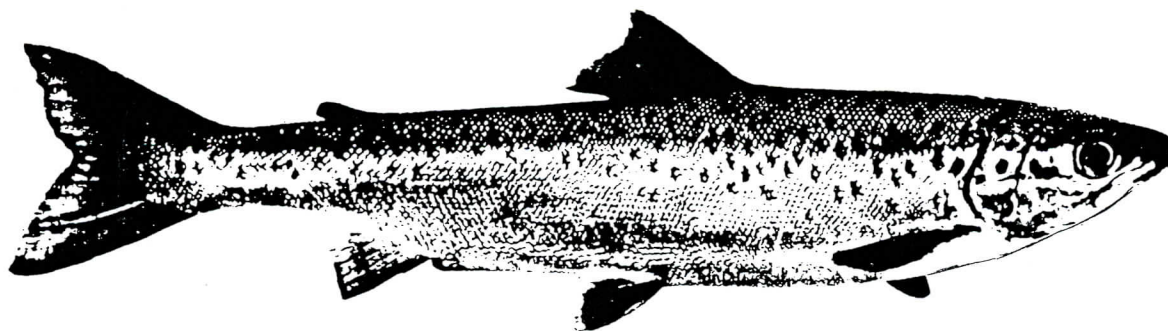
When driving a boat:

- Drive at safe, fuel-efficient speeds.
- Watch your wake and slow down if it gets too big; large wakes erode the shoreline and damage wildlife habitat.
- Do not operate motorized watercraft within 200 feet of any shoreline (including islands) at greater than headway speed.
- Operate motorized watercraft away from

shallow areas. Motors churn up bottom vegetation and habitat, scare nesting birds off their nests and re-suspend phosphorus-rich sediments.

- Keep a trash bag handy and make sure nothing is thrown into the lake. Never leave cut fishing line or plastic materials in the water.
- Dispose of boat sewage and waste water by keeping it in a sealed holding tank and pumping it out at a marina. In most states, overboard discharge of sewage and waste water is illegal.
- Enjoy the natural quiet of being on the lake. Avoid playing loud radios or tape recorders. Sound travels easily over water to everyone on the lake.
- Stay away from birds and animals and their nests. Following or chasing them in a boat may separate parents from their young, or frighten animals from their natural habitat.
- Obtain a copy of your state's boating laws and know the "rules of the road."
- Operate jet skis, wet bikes, surf jets and similar vehicles responsibly and safely.
- Minimize the use of your motor boat. Refrain from driving in the morning and evening, when people enjoy the quiet. Choose canoeing, sailing and rowing as alternatives.
- In many states, the owner who permits another person to operate his or her watercraft is liable for violations by the operator.

Different Fish for Different Lakes



To fish, not all lakes are alike.

Some lakes are shallow, warm and have lots of aquatic plants. Bass, perch and pickerel, for example, like these warm-water lakes.

Other lakes are deep with a large volume of cold, well-oxygenated water. These lakes support trout and salmon fisheries.

Temperature and oxygen levels are the two major factors that control whether or not certain fish species are present. Other factors such as available habitat,

competing species and stocking practices are influences as well.

Declining water quality may result in the loss of a cold-water fishery. Increased phosphorus, for example, ultimately leads to the loss of oxygen in the deeper regions of the lake (see page 6). Once cold water fish habitat is lost, usually it cannot be regained. Restoration of poor water quality lakes is expensive and can improve lakes only to a certain degree, not enough to support trout and salmon.

PROTECT YOUR LAKE'S FISHERY

Actions You Can Take

- Prevent phosphorus from getting into the lake. Follow actions described on pages 6-9.
- Guard against the introduction of aquatic plants and fish species not naturally found in your lake. For example:
 - Post signs at all boat landings telling boaters to

remove and throw away any plant remnants from their boat or trailer before they launch their boat. Signs may be available from your state agencies. (See sample on page 25.)

- Do not release any fish into your lake that were not caught there. It may be illegal. Introduced species may out-compete existing species for food and habitat.
- Don't leave cut fishing line in the water. Carry a trash bag in your boat and pick up any line that other people have left. Make sure trash bins are available at boat launches.

Aquatic Nurseries for Plants & Fish

Rooted aquatic plants grow in shallow, protected waters. Although they may seem like nothing more than nuisance weeds at times, their overall benefit is immense:

They provide spawning habitat for certain fish species and nursery areas for virtually all warm-water fish.

They provide habitat for many small insects and crustaceans which in turn are important food sources for fish.

They stabilize lake sediments by absorbing the force of waves and reducing shoreline erosion. Their roots trap sediment particles and hold them in place.

They absorb nutrients, such as phosphorus, and thus reduce undesirable algae growth.

One thing aquatic plants do not do is indicate a pollution problem. They may thrive, however, where tree removal, filling, construction and shoreline erosion have occurred.

Some people complain about aquatic plants, but we need to learn to live with aquatic plants and recognize their vital role in nature. Furthermore, the removal of plants is only temporary. They quickly grow back.

LEARN TO LIVE WITH AQUATIC PLANTS

Actions You Can Take

- Don't remove plants until you have checked to determine if a permit is needed. Removal by hand-cutting, raking or pulling is least harmful to the lake.
- Don't use herbicides. Many camp owners use their lakes as a water supply. An herbicide application could contaminate your neighbor's drinking water. Furthermore, the dose of herbicides needed to kill aquatic plants will also kill other aquatic organisms vital to the food chain.
- Remove plant fragments from boats and trailers before leaving a lake. Plant fragments can travel with the boat to a new lake where they can establish roots and spread. Even if your state has not been invaded by nuisance species, it could happen if you are not vigilant. It is especially important to check your boat when travelling from one lake to another.

Remove all plants and plant fragments from:

