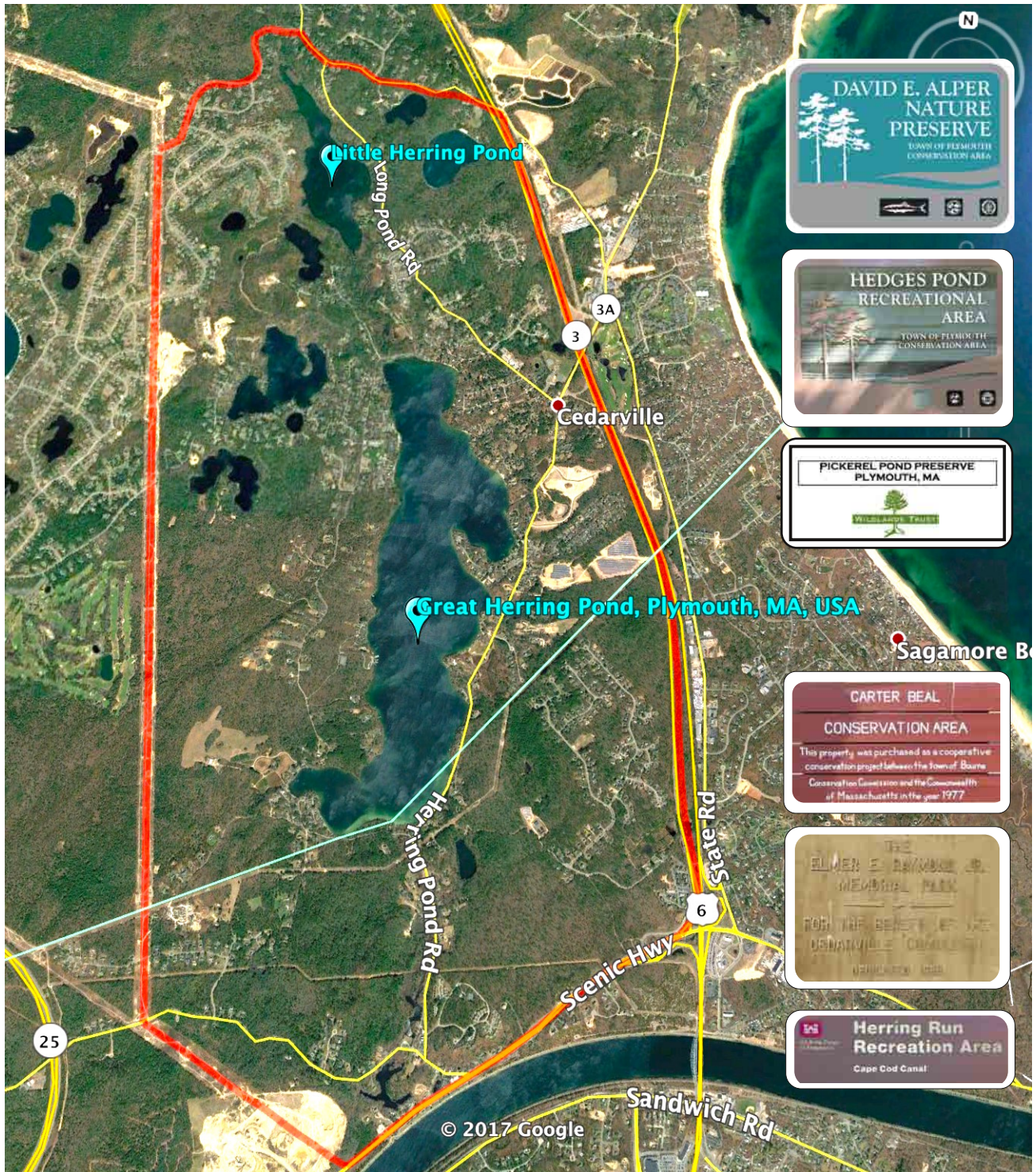


The Herring Ponds Watershed

Stewardship and Volunteer Action Guide

Plymouth and Bourne, Massachusetts



Preface

Our ponds and their surroundings – Pine Barrens vegetation and adapted animal life -- make up a globally rare living ecosystem in dynamic equilibrium. This "balance" can be disturbed easily, by common individual actions and events. For example, a rain storm might wash fertilizer from a lawn into a pond. Such runoff provides undesirable nutrients for algae and aquatic plants, allowing them to multiply excessively. Dirt, salts and oils washed off cars and roads find their way down driveways and sewer grates into a pond. Defective septic systems might seep raw sewage that could end up in groundwater, feeding ponds and wells. Even well-maintained septic systems can cause dangers to the environment. These systems are not designed to hold back household cleaners, expired medications, or organic chemicals discarded in a toilet. These substances can end up in a pond where we swim or the groundwater we might later drink. Once groundwater is polluted, it can stay that way for several thousand years. But there are things we can do to protect our watershed: small acts, easily undertaken, that will allow us to make sure that Great Herring Pond, and the other ten ponds in our watershed, are here and healthy so that our grandchildren's grandchildren can swim and fish and paddle and play in these waters.

Cover image:

State-designated "Herring River Watershed Area of Critical Environmental Concern" outlined in **red**

Public open space and recreational access areas are listed along the right side of the map:

Town of Plymouth Parks in the ACEC

- David E. Alper Nature Preserve
- Hedges Pond Recreational Area
- Elmer E. Raymond, Jr. Memorial Park

Wildlands Trust Open Space

- Pickerel Pond Preserve

Town of Bourne

- Carter Beal Conservation Area

US Army Corps of Engineers Site

- Herring Run Recreation Area



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Thanks / Join us

The Herring Ponds Watershed

Your Stewardship and Volunteer Action Guide

Plymouth and Bourne, Massachusetts

The Purpose of this Guide

A committee of the Herring Ponds Watershed Association created this guide to educate residents about our **watershed**: what it is, its importance, its fragility and resilience, and what each of us can do to maintain and improve the water quality, as we manage and protect the remaining globally rare Massachusetts Coastal Pine Barrens vegetation and wildlife in our yards and neighborhoods.

Our well-being is intimately linked to the health of our waters. We enjoy living on or near our ponds with their natural beauty and recreational opportunities. We obtain all our water for daily living from wells drilled into the aquifer beneath our watershed, while we dispose of household wastewater through septic systems with beneficial bacteria leach fields designed to help protect that groundwater.

Our ponds also attract seasonal residents and visitors to swim, fish, bike, hike, birdwatch, and enjoy boating. These diverse activities require clean water, accessible open space, and a healthy ecosystem.

A watershed is an area of land in which all the water above and below the ground is constantly moving downward toward the lowest point. In our watershed, the major collection basins are Great and Little Herring Ponds, which discharge to the Cape Cod Canal and ultimately the Atlantic Ocean. Most other nearby ponds are in "kettle holes"(formed by glacial ice blocks) with no surface inlets or outlets.

In recent decades Plymouth and Bourne residents have noticed that the water quality in some other nearby ponds has been deteriorating. In summer, their waters are greener and murkier. Slime algae grow on rocks and dock ladders, invasive plants take hold, and the numbers of valued fish decline.

The good news is that it is not too late to save our watershed – if each of us does our part.

We're all good people. We all want to do the right thing for our children and grandchildren. We're all in this together. We want to protect our precious water resources, but often we do not know what we can do.

This booklet will give you some ideas for some small things you can do in order to make a big difference. Let's do it together. Your guide begins with the big picture – providing basic information you need to know about our watershed and the water cycle – and then identifying actions that each of us can take to safeguard our water and the integrity of the land which drains to it. Many of the solutions are simple; some will even save you money. So read on and ***join us*** in protecting our watershed.

Please keep this booklet as a handy reference.

The cost of printing and distributing this guide was paid for by a generous donation from a watershed summer resident. Creation and layout was an all-volunteer effort of our membership.

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Printed by Powder Horn Press, Plymouth, MA



The Flow of Time

Ancestors of today's Herring Pond Wampanoag Tribe lived in the forests around south Plymouth's ponds for thousands of years before the landing of the Mayflower "...when life was grounded in the earth and the natural world and turning of the seasons, when people lived in circles of relationship and cooperation, and the Spirit of Creation was not distant and obscure but practical and real and present in every moment."

Source: *Wampanoag Morning: Stories from the Land of the People of the First Light Before the English Invasion Deals*. 2008. Author: Manitonquat (Medicine Story). Published by: AuthorHouse, Bloomington, NJ.

After some 400 years of colonial forest clearing and farming, small industry development, canal building, cranberry growing, and residential sprawl, in 1991, the State of Massachusetts recognized and designated an "Area of Critical Environmental Concern" (ACEC) in southern Plymouth and Bourne. The 4,450-acre **Herring River Watershed ACEC** contains eleven ponds* (the largest, Great Herring Pond, is 376 acres), numerous freshwater wetlands, two rivers**, productive and retired cranberry bogs, and over 300 acres of protected open space. The Herring River Watershed ACEC (boundaries shown in red on the cover) includes important watershed topography - glacial outwash plains and moraines pitted with kettle hole ponds - that provides unique resources, landscapes and recreation for residents and visitors.

* Ponds: Black, Foundry, and Mill Ponds (Bourne); Black Jimmy, Elbow, Great Herring, Hedges, Island, Little Herring, Pickerel, and Triangle Ponds (Plymouth) ** Rivers: Carters River (Plymouth); Herring River (Bourne)



Herring River - photo by Brian Harrington

The ACEC contains one of the most important **herring runs** along the coast and supports a regionally important freshwater recreational fishery. Other recreation activities revolve around boating and three major summer camps for children. The area lies within the Plymouth-Carver Sole Source Aquifer and thus is critical to public water supply. State-listed rare and endangered species, including the box turtle and spotted turtle, are present. Historic and cultural resources from the Native American and colonial periods include the core habitation area for the Herring Pond Wampanoag tribe.

Source: <http://www.mass.gov/eea/agencies/dcr/conservation/ecology-acec/herring-river-watershed.html>



Wampanoag Wetu <http://ccesmedia.blogspot.com/>



1627-style Pilgrim Homes



21st Century Home

Since 1970, construction of 800+ homes to the west of Little Herring Pond, has added hundreds of wonderful new residents and millions of dollars to property tax rolls, while much of the former tree and ground cover has been removed and replaced with roofs, lawns, driveways, roads, and septic fields.



A "shoal", "gleam" or "army" of herring congregating in the Herring River

The Water Cycle in the Watershed

Whenever it rains or snows, water falls directly into, or runs off into, the ponds and percolates down through sandy soils into groundwater. Groundwater bubbles up from springs in Little Herring Pond and discharges through the Carter River into Great Herring Pond. Additional springs in Great Herring Pond increase outflow into the Herring River, then to Foundry Pond, and the Cape Cod Canal (formerly the Monument River) to the Atlantic Ocean via Cape Cod Bay and Buzzards Bay.



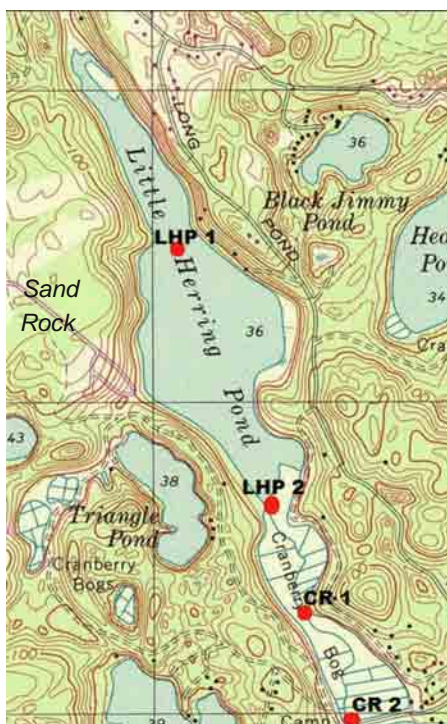
Each watershed is unique. You live in one, whether it is the Herring River Watershed or another; it is your ecological address in the world. The world is an interlocking system of such water drainage basins.



Surface water on Earth evaporates due to solar heating, then rises and condenses to form clouds in the atmosphere. As droplets grow heavier around air-borne particles in clouds, they fall back to Earth as rain or snow. Raindrops (or snowflakes that accumulate and melt) on land run off as surface water or percolate into groundwater, naturally filtered.

This natural purification and supply cycle is a free ecosystem service. We do not have to engineer the system or use energy to pump water around. Without human interference this cycle repeats naturally, replenishing fresh clean water like a renewable resource. We do, however, routinely interfere with the natural cycle by diverting water to homes, lawns, businesses, bogs, and factories: for consumption, cleaning, and flushing away wastes.

Human activities affect both the quantity and quality of water in the watershed. With monitoring and good stewardship practices we can minimize our unintended adverse effects on nature's beneficial operation of the watercycle.



Since 2008 The Herring Ponds Watershed Association has been working with the Town of Plymouth to monitor biological and chemical water quality at key points in the watershed. Since 2016 the main repeat sampling sites are GH05 and GH10, and LHP1 and LHP2.



Water quality sampling stations in LHP and GHP ("R" designates stormwater runoff sampling sites)

Pollution carried by runoff is now the number one cause of water pollution in the United States.

You can think of a watershed as the stage (with props) on which the water cycle acts. It is the entire geographic area where all runoff is conveyed to the same outlet. It encompasses the ground (soil, sand, and rock), surrounding atmosphere, manmade structures, and all of nature's interacting creatures – from single-celled organisms to complex plants and animals.

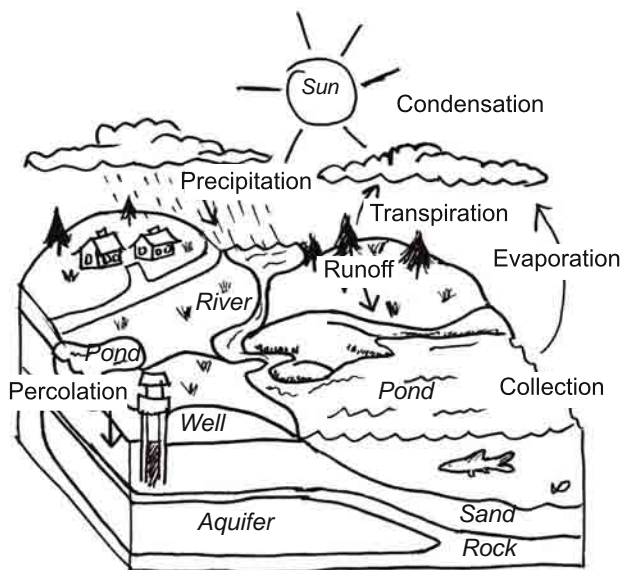


Diagram adaptation by Claire Esterman

Thinking of the watershed as a funnel with a single spout is also useful. It illustrates the idea that runoff from a wide drainage area (the funnel's rim) may be concentrated into a smaller area, picking up speed (and erosive power) as gravity transports it to the outlet and into another catchment basin.

You might think that precipitation dilutes, cleanses, and washes away pollutants, but the funnel analogy makes the point that gravity is also at play

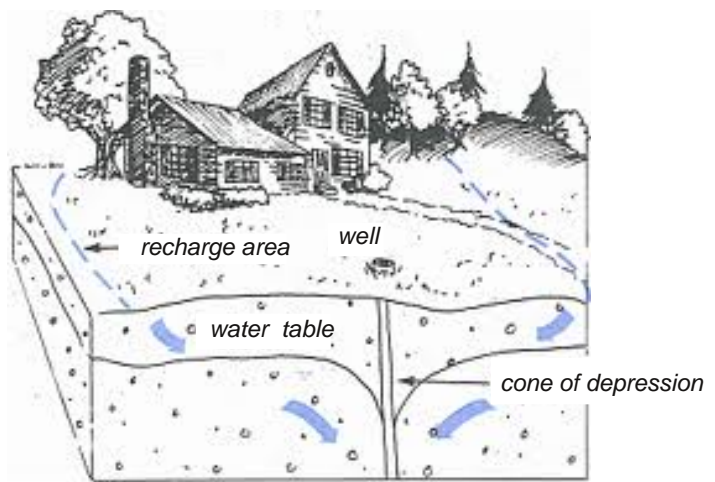
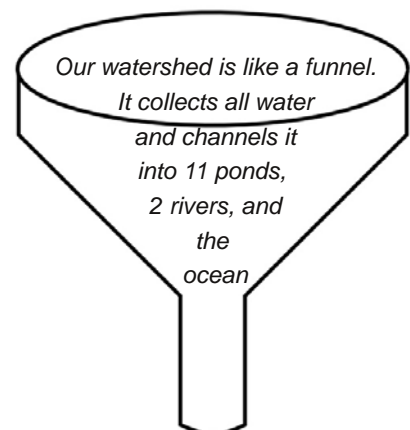
concentrating debris, sediment, nutrients, and other runoff-borne pollutants into our ponds.

About twelve thousand years ago, retreating glaciers deposited thick layers of sand in the Plymouth/Cape Cod coastal area. Rapid percolation through sand results in less filtration for pollutants carried by runoff toward the ponds and the underground aquifer, the sole source of water for drinking and domestic use throughout the area. Underground water also moves relatively quickly through layers of sand.

Most residents and businesses in the area pump water out of the ground through wells by tapping into the Plymouth-Carver Aquifer, which underlies multiple towns and watersheds. Quantity as well as quality of groundwater is a concern.

When pumping exceeds the rate of recharge from percolating rain and snowmelt, it lowers the amount and level of this ancient reservoir, forming "cones of depression", increasing the depth at which new wells must be drilled and lowering the future capacity of existing wells.

Septic systems have a design lifetime of 25-30 years under the best conditions. Due to lot constraints they are often placed the minimum safe distance from drinking water wells. When they are poorly maintained or fail, septic systems seep untreated wastewater into the water table.



A pumping well alters the water table around the well and diverts flow to the well.

Source:

http://www.ct.gov/deep/cwp/view.asp?a=2685&q=322276&deepNav_GID=1654

The Big Picture

The Herring River watershed today has a flourishing diversity of plant and animal life, though it is different than in the past.



Eastern Box Turtle

"When the Pilgrims arrived on these shores they found the hills and ridges covered with dense forest and filled with an abundance of wild game. The valleys and lowlands were carpeted with a growth of tall, coarse grass in which there were only Indian Foot Ways and animal traks visible. The ponds and streams were alive with fish of all kinds and the shores were filled with shell fish. It was in this land of abundance that the Indians...hunted the plentiful game, caught the needed fish and grew their towering corn in the rich soil. Overall this was the land of the Wampanoags..."

Source: *Bournedale the Forgotten Village*, Donald Jacobs, 1996, Wm S. Sullwold Publishing, Taunton, MA



Little Herring Pond View from the North

In the northernmost part of the ACEC, a small stream and groundwater springs feed into Little Herring Pond. Oral history indicates that the pond was formed by damming the south end to supply water for flooding cranberry bogs at the north end.

General Information: Little Herring Pond is a 90-acre, shallow pond with an average depth of three feet and a maximum depth of only four feet. The bottom is composed of gravel and muck. The pond is fed by groundwater (including springs at the northern end) and runoff, and feeds into Great Herring Pond. The pond is heavily vegetated during the summer months. The pond has 2.3 miles of shoreline, with cranberry bogs at the south end.

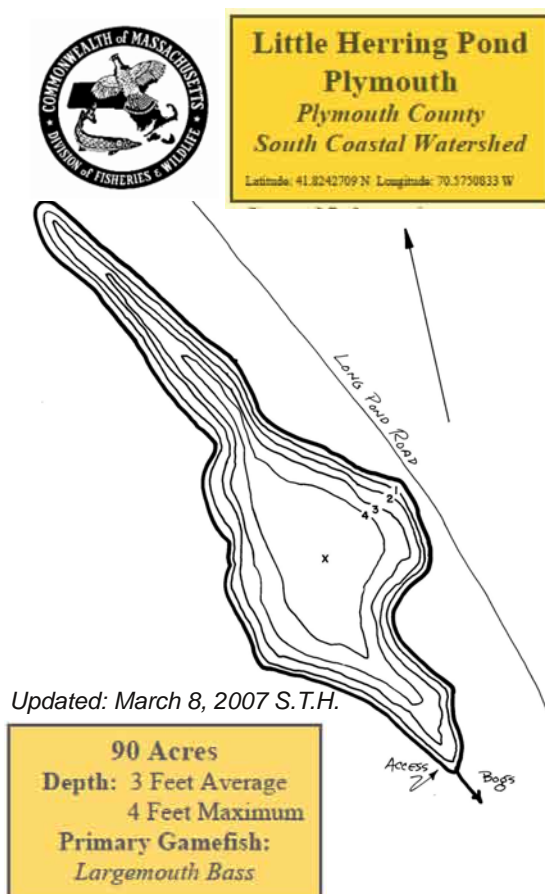
Access: Public access is a Plymouth county right-of-way located off Little Herring Pond Road, which is off of Carters Bridge Road.

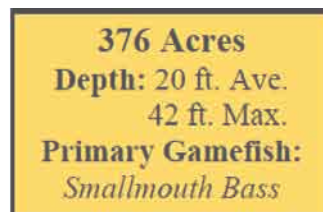
Management History: Between 1909 and 1947, the pond was stocked with brown trout, chain pickerel, largemouth bass, white perch, yellow perch, brown bullheads, and black crappie. An October 1912 survey noted that it was considered a good pond for fishing and for ducks and that the north end of the pond rarely froze due to many springs. The pond was surveyed in July 1952. Smallmouth bass, chain pickerel, brown bullheads, yellow perch, pumpkinseed, alewife, Johnny darter, banded killifish, bridle shiner, golden shiner and white sucker were all recorded.

Fish Populations: The pond was last surveyed on August 1, 1994 and contained yellow perch, largemouth bass, pumpkinseed sunfish, golden shiner, bluegill, chain pickerel, alewife, blueback herring, white sucker, brown bullhead, smallmouth bass and American eel.

Condensed and adapted from Source:

<http://www.mass.gov/dfwle/dfw/habitat/maps/ponds/pdf/dfwlithe.pdf>





Condensed from: www.mass.gov/dfwele/dfw/habitat/maps/ponds/pdf/dfwgrea.pdf

General Information: Great Herring Pond is a 376-acre natural warmwater pond with an average depth of 20 feet and a maximum depth of 42 feet. The pond, historically also known as Lake Manomet, is named for its large size and its herring run. Its outlet is the Herring River, formerly known as Monument River, which used to flow into Buzzards Bay. This river now enters the Cape Cod Canal at the Bournedale Herring Run. The pond's water supply is an inlet from Little Herring Pond, cranberry bogs, and groundwater. Water color is generally clear and transparency is about 8 feet. Due to its windswept nature, the pond is unstratified during the summer months. The pond's 5.3 miles of shoreline is moderately developed with houses, roads, cranberry bogs, a summer camp (Camp Bournedale), and a Mass Maritime Academy training and sports facility. The bottom is primarily sand and rubble with mud in deeper and more sheltered areas.

Access: Public access to Great Herring Pond is a state Office of Fishing and Boating Access Ramp located on Little Sandy Pond Rd, Town of Bourne, at the southern end of the pond. The boat ramp is unimproved and enters shallow water and is therefore best suited for canoes, inflatables and other shallow-draft, hand-carried craft. Larger boats of shallow draft can be launched with a four-wheel drive vehicle. Parking spaces are available for about six vehicles.

Management History: An October 1912 survey reported "yellow perch, white perch, pickerel, bass, roach, shiners and minnows, herring plentiful" and "it is a popular summer resort presenting a wild and picturesque appearance. Great Herring Pond supports one of the best herring runs in Massachusetts. The herring spawned in this pond attract striped bass in the Cape Cod Canal and have created one of the best striper hotspots on the East Coast. Prior to 1947, the pond had a long history of indiscriminate stockings, including brown trout, smallmouth bass, largemouth bass, bluegills, brown bullheads, white perch, yellow perch, chain pickerel, black crappie, and walleyes. Two artificial tire reefs were installed in 1975 to provide additional fish shelter. Walleye were stocked here experimentally in the 1980s, but failed to thrive.

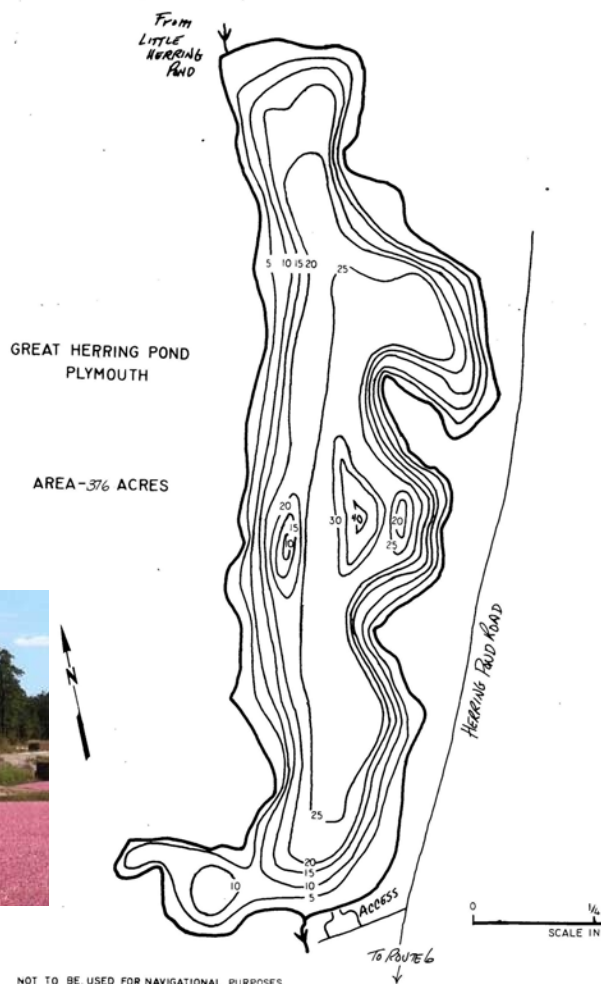
Fish Populations: The pond was last completely surveyed in the summer of 1984, when nine fish species were present: yellow perch, white perch, white sucker, brown bullhead, banded killifish, smallmouth bass, chain pickerel, golden shiner and American eel. A May 2001 fish survey found abundant smallmouth bass and three additional species: largemouth bass, pumpkinseed, and tessellated darter. An occasional walleye is also reported. Alewife and blueback herring are abundant in the pond from late spring through fall.

Fishing: Great Herring Pond offers good smallmouth bass and white perch fishing. Try off the points on the eastern shore and also the two sunken islands near the center of the pond. Abundant forage from the Bournedale herring run translates into good growth rates for gamefish and panfish but may

make the gamefish a little harder to catch during the summer months, when schools of young-of-year herring are readily available. Updated: March 23, 2007 S.T.H.



Cranberry bog agriculture

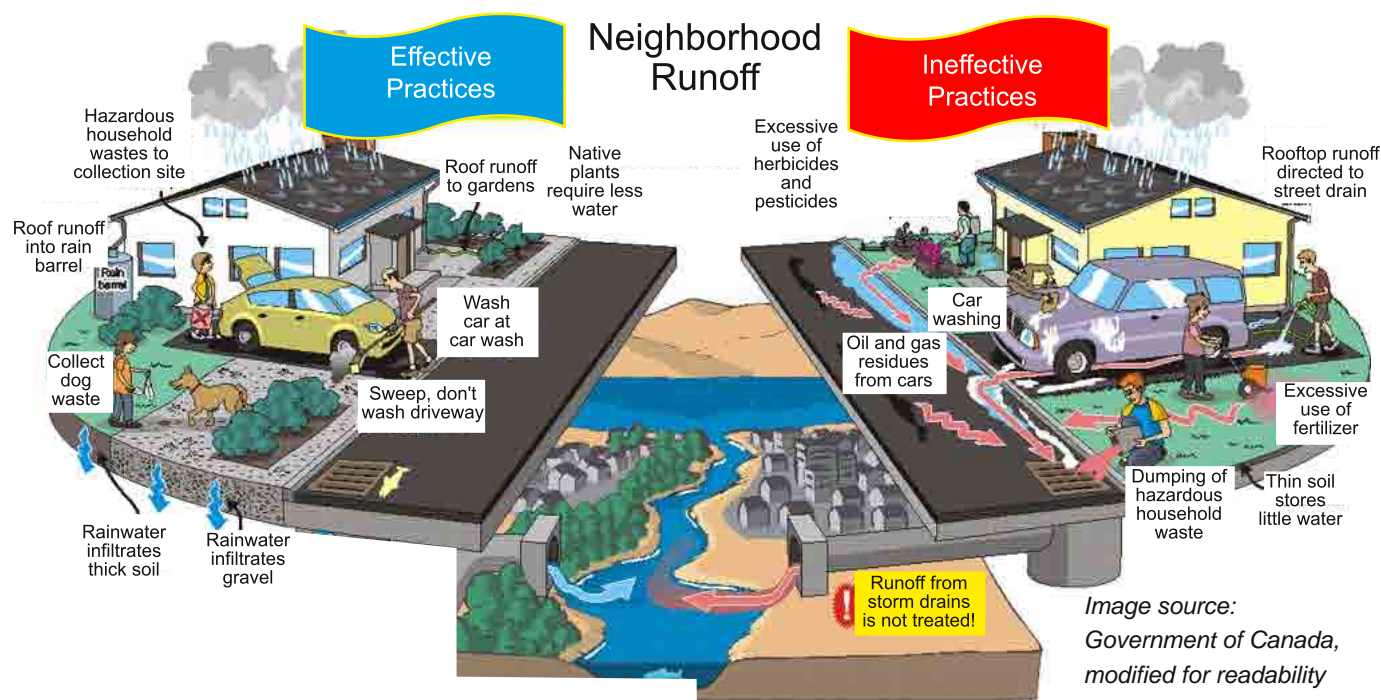


Together We Can Make a Difference

Even if you don't live right on the water, your everyday activities have an impact on our watershed as nutrients and pollutants travel through runoff. Groundwater moves beneath all of us and needs protection against chemicals applied to our lawns, spilled on our roadways, or flushed down our toilets and sinks. These pollutants all eventually reaches our ponds, streams, and our wells.

We can protect our watershed – if each of us plays our part. Individual actions do make a difference. Consider your share in the community, be considerate in managing your home, carefully plan your yard and sewage maintenance, and volunteer for critical water quality monitoring.

The figure below contrasts effective and ineffective watershed stewardship practices around our homes and neighborhoods. Additional tips and methods are listed in the next sections.



Runoff from neighborhoods in the ACEC flows directly to surface or groundwater without treatment.

Ways to Help in Your Own Yard

Homeowners who provide plantings (preferably native species) for wildlife food and cover, a water source, a brush pile, and/or nest boxes to raise young, can plot these features on <http://yardmap.org/> and have their property certified as a backyard wildlife habitat by the National Wildlife Federation: <https://www.nwf.org/Garden-for-Wildlife/Certify>

Wildlife readily attracted to properly sized and sited nest boxes include Wood Ducks, Screech Owls, Bluebirds, Great Crested Flycatchers, Carolina and House Wrens, Tree Swallows, Black-capped Chickadees, White-breasted Nuthatches, Flying Squirrels, Red Squirrels, Raccoons, and various bats. Pick a species of interest; research via library, Internet, or local store; buy or build a nest or roost box; then sit back, watch and enjoy the action.

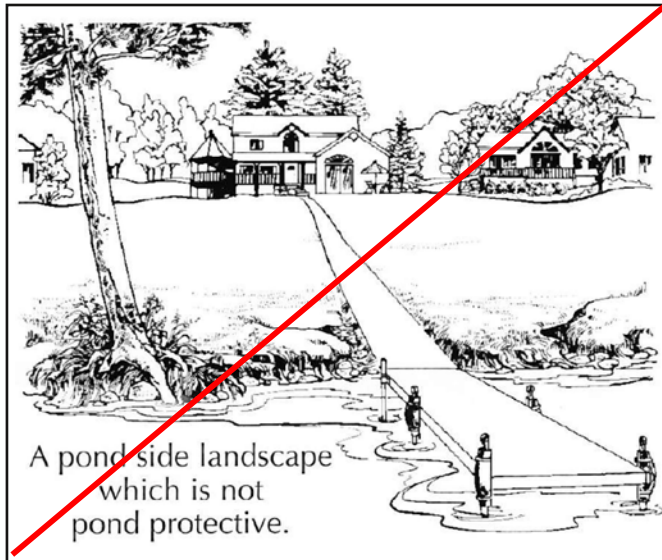


Shoreline Defense - Vegetated Buffers

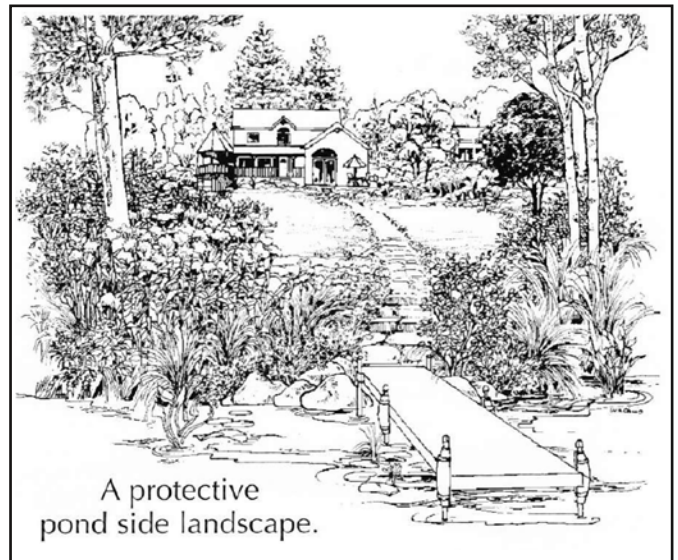
We love to live right on the edge or within sight of water. Often, though, the way we develop shorelines and water views threatens the health of our ponds and rivers.

One trend has been to remove the natural vegetation along the shore and replace it with lawns, concrete or stone walls, or trucked-in sand.

The problem is that storm water runoff carries a huge amount of pollutants into a pond, unless the runoff is captured in vegetation growing along the pond or on the slopes above it.



No Shoreline Buffer



Shoreline Vegetated Buffer

Images courtesy of Orleans Pond Coalition, MA

A great solution to this problem is planting beds of plants, especially **native plants**, along the shoreline -- trees, shrubs, grasses, wildflowers and ground cover. These are called "vegetated buffers." These buffers slow down, trap, and filter runoff (carrying sediment, sand, oil, gas, anti-freeze, pesticides, fertilizers and pet droppings) before it enters the ponds.


Green buffers also prevent shore erosion, add beauty to our yards, preserve habitat for plants and wildlife, and discourage geese from crossing them to graze on our lawns - just as the original, undeveloped shoreline did.

Another tip: Avoid paved or straight paths from your home to the shoreline. Instead create a curved path that reduces the velocity of runoff water rushing downhill.

Use Habitat Network software to map and plan your property's habitat stewardship features.

<http://content.yardmap.org/>

GOT CANADA GEESE PROBLEMS?



Some research has found that nuisance geese occur almost entirely at sites where lawns abut a body of water. Geese actively select sites where they can forage on a lawn and reach the safety of open water without anything in the way. Sites with more complicated vegetation along the shoreline seem to discourage geese habitation by reducing the forage area for these geese (lawn) and by making it more difficult for the geese to reach the water when they are startled.

Source: <http://content.yardmap.org/learn/wild-shores/>

Tips for Watershed Living

Saving water is as important as keeping it clean. Conserving water at home reduces input to your septic system.

- Fix toilet and faucet leaks.
- For older toilets, try filling a milk jug or two with water and placing them in the tank to reduce water used with each flush. Or place a brick in the tank.
- Install water-saving showerheads.
- Don't let the water run while shaving, or brushing your teeth.
- Buy a front-loading washing machine when replacing your present one. It saves water, energy, and laundry products.
- Only run a dishwasher or washing machine with full loads.
- Capture roof runoff in a rain barrel for use in gardening and emergency reserve against power outages (when your well pump won't work).



Rain Barrel

Control chemical pollution at home.

- Dispose of hazardous wastes on special collection days (check town schedules and locations).
- Reduce runoff and increase the health of a lawn by adjusting the mower height to 3 inches. (Mowing height influences root depth and density of grass shoots -- the most important factors for healthy turf. Clippings also reduce the need for fertilizers.)

• Reduce use of lawn fertilizers, pesticides and herbicides. If you choose to fertilize, try **compost or slow release fertilizers** – they help build soil and reduce chemical runoff. It is especially important in our watershed to use **zero or low phosphate fertilizers**.



Compost Bin

- Build a compost bin to make your own organic fertilizer from yard and kitchen wastes.
- Consider reducing the amount of lawn by planting native trees, shrubs, and flowers which are hardier and require less fertilizer, pesticide, and water. They also improve filtering of rain into the soil, reducing runoff and erosion.

• Add a wildflower meadow, rain garden, bioswale, or raised bed garden to the yard to further slow runoff and increase filtration.

- Scrub boat hulls and decks with a brush instead of using more toxic boat cleaning soaps. Avoid products with a toxic warning on the label. Wash boats with phosphate-free soap or laundry detergent and wash it on the lawn or where the runoff will seep into the ground rather than running into a storm drain.

• The same applies to washing cars. It's better yet to take our cars and trucks to a car wash. In Massachusetts they are required to retain and recycle the wastewater.

- Fix leaks from cars and other motorized equipment promptly. Oil, antifreeze, and other fluids will run off with rain into storm water drains, or directly into streams and ponds. Use antifreeze containing propylene glycol rather than the very toxic ethylene glycol.

• Carefully refuel any motor boat, especially if it is in the water. Even small fuel spills are dangerous to people and toxic to aquatic life. Never fill until fuel is spilling out of the tank over-flow vent.



Rain Garden - Image Source:

http://hardscapes.siteone.com/diy_rain_gardens.htm

We once learned the 3R's as Reading, 'Riting, and 'Rithmetic.
Sustainable living now requires we learn to
Reduce Reuse Recycle Repurpose Restore Re-think Respect

Septic System Care

- Understand how your septic system works...a combination of physical and biological processes.
- Don't use antibacterial cleaners or toxins. Use bleach, disinfectants, and drain and toilet bowl cleaners sparingly.

- Have your septic system pumped out to remove the sludge and floating scum. All systems should be pumped at least every 3 -5 years to avoid system failure.

- Don't overload your system. A dripping faucet or leaky toilet can add hundreds of gallons to the system each week. When planning a large gathering, rent a portable toilet.

- Don't use a garbage disposal. It adds large amounts of grease and organic matter to the system and will shorten the life of a soil absorption field. Compost what you can and dispose of greasy waste in your regular trash.

- Don't kill the beneficial bacteria in your septic system by flushing chemicals down the drain.

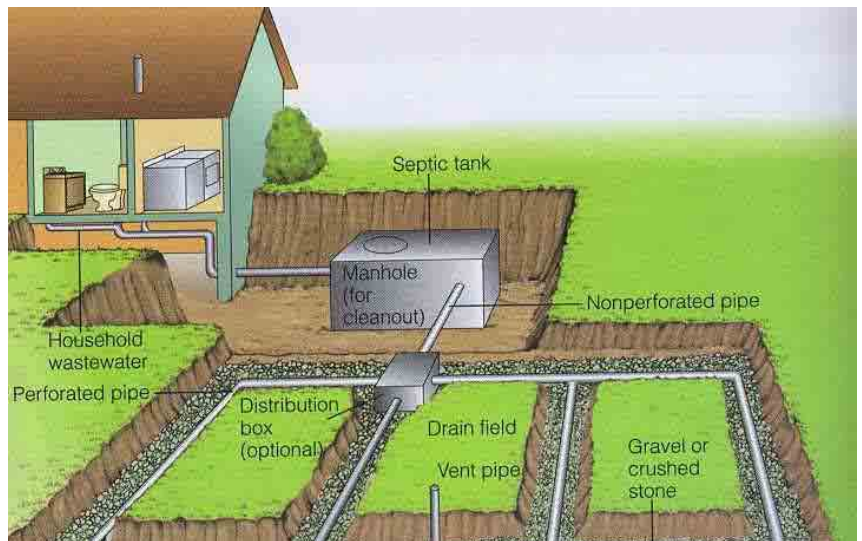
- Don't park or drive over the soil absorption area.

The compaction of the soil from the weight of the vehicle will reduce the system's capacity.

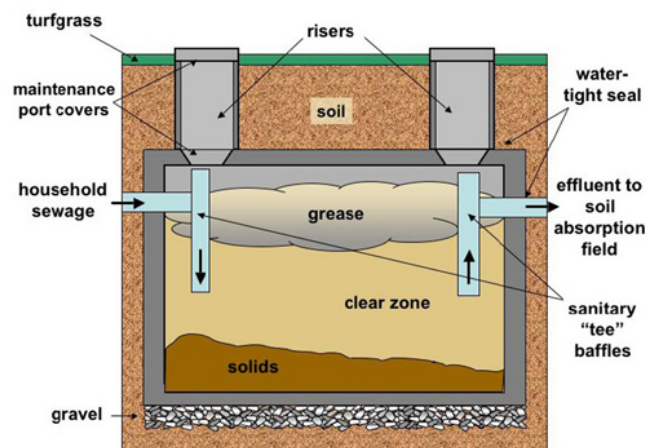
- Never pour toxic materials down your drain. If unsure how to dispose of any material found around your home, call the Massachusetts DEP Hotline: 800-343-4320

- Regular maintenance is most important in making sure your septic system works well. Periodic pumping helps prevent solids from escaping into the drainfield and clogging perforated distribution pipes and soil pores.

MA DEP recommends that a properly maintained septic system should be pumped out at least once every 3 years.



Typical private on-site septic system with pump-out tank and drain field



Detail of underground septic tank shown in diagram above

Never dispose of used motor oil or other auto products down household or storm drains. One gallon of oil can foul one million gallons of water - that's a year's water supply for 30 people!



Sunset on Great Herring Pond - Photo by Jed Smith

Monitoring Water Quality

Within a watershed, ponds and streams are the places where the groundwater reaches the surface. A pond, therefore, is a kind of looking glass into the quality of groundwater and can serve as an early indicator of possible water problems. Since water is an extremely important part of our daily life, and most of us pump it directly out of the ground for drinking without further treatment, the health of this resource is of utmost importance to all of us.

From its beginning in 2008, a key purpose of HPWA has been to take pond water samples at regular intervals and have them analyzed by a certified laboratory for possible pollutants. The purpose of this analysis is to establish a long-term database of the health of the ponds. The Town of Plymouth has provided encouragement, assistance and grant funding. Just as in medicine, it is far easier and cheaper to prevent than to cure. HPWA volunteers go out in boats five times a year to take water samples from locations on Great and Little Herring ponds.

Nearby ponds have had dramatic changes in their water quality, with serious consequences for residents living in those neighborhoods: heavy algae blooms, a foul smell, swimmer's rash, dead mollusks or fish on the shore, or rapidly multiplying aquatic nuisance plants.

This algae-choked scene is what ponds can look like with careless stewardship. This is called cultural eutrophication, caused by over-fertilization from nutrient-laden runoff. Fortunately this photo was *NOT* taken in our watershed.



Water Samples are Tested for:

- E-coli
- Total Phosphorus
- Nitrite-N
- Nitrate-N
- Total Kjeldahl Nitrogen
- Total Nitrogen (Calculation)
- Specific Conductance
- pH
- Turbidity

In addition

- Water temperature
 - Dissolved oxygen and
 - Water clarity
- are measured at key sites



Our sampling shows an ecosystem with somewhat elevated nutrient content, especially in spring and summer. The water is safe for human activities, but with somewhat reduced water transparency indicative of algae growth, though not yet excessive "blooms". Residential development, however, is continuing to disturb natural ground cover, while adding sediments, nutrients, and toxins to runoff. Decorative landscaping and lawns that replace native vegetation are less efficient in absorbing rain and runoff and its pollutant load, and less useful to wildlife for food, cover, and reproduction.

Our water quality data is available on the HPWA web site <http://www.theherringpondswatershed.org/water-quality.html> as well as the Town of Plymouth Department of Marine and Environmental Affairs site <https://www.plymouth-ma.gov/natural-resources/pages/pond-and-river-information>. The latter site also carries information about a large number of other Plymouth ponds.

HPWA relies on volunteers for water quality monitoring and all other watershed stewardship activities— we have no paid staff. We rely 100% on people just like you. Sometimes we can't find enough volunteers. Do consider joining our efforts. Joining means you also will be shaping these efforts, and that can bring great satisfaction.

Too Much Phosphorus

In freshwater lakes, miniscule amounts of phosphorus determine the growth rates of aquatic plants and algae. Phosphorus is often found to be the growth-limiting nutrient, because it occurs in the least amount relative to the needs of plants. But too much phosphorus is harmful. If excessive amounts of phosphorus and nitrogen are added to the water, algae and aquatic plants can be produced in large quantities. When these algae die, bacteria decompose them and use up oxygen.

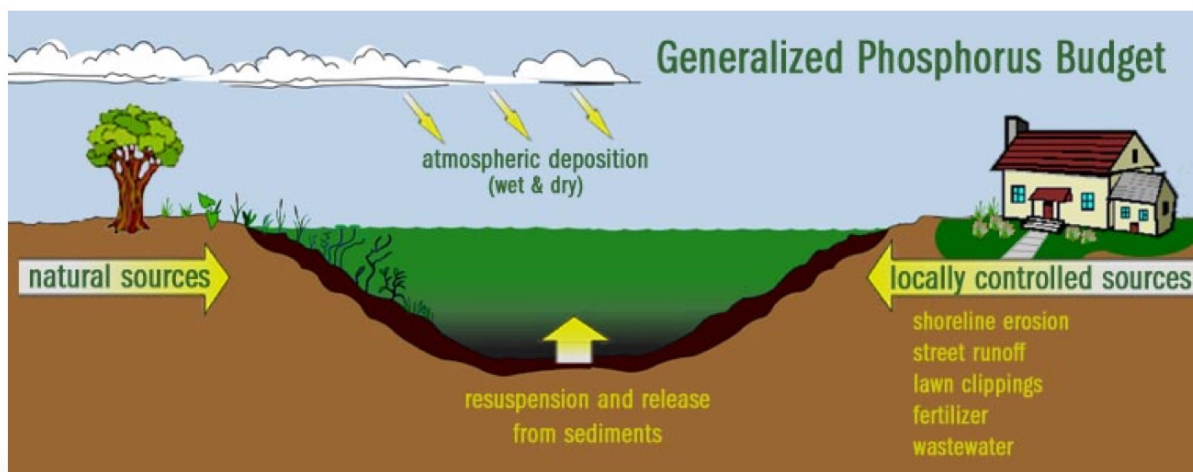
Fish, mussels, and plants require the oxygen dissolved in water in order to live. But the amount of oxygen dissolved in water is very, very small, an astonishingly tiny 1/1000%. Decaying algae or aquatic plants can use up that small amount of oxygen quickly. Dissolved oxygen concentrations can drop too low for fish to breathe, leading to fish kills. The loss of oxygen in the bottom waters can free phosphorus previously trapped in the sediments, further increasing the available phosphorus.

For a lake or pond in healthy equilibrium, the amount of phosphorus present in the water should be no more than about 0.03 parts per million. That would be roughly 675 pounds for all of Great Herring Pond; a truly small amount for a 376-acre pond two miles long, with an average depth of about 22 feet.

In the past, common lawn fertilizers contained phosphorus (recently banned), so 100 homes (less than half the number around the immediate shoreline) each applying 50 pounds of "complete" fertilizer with 2% phosphorus could add 100 pounds of phosphorus to surrounding lawns each season. (More comes from dishwashers, septic systems, and more distant residential lawn runoff.) This is one example of how residents of the watershed directly affect the quality of the water.

Sources of Phosphorus

- Septic Systems
- Runoff
- Sediment (Internal)
- Feeder Streams
- Adjacent Properties
- Ground Water
- Slow Migration
- Atmospheric



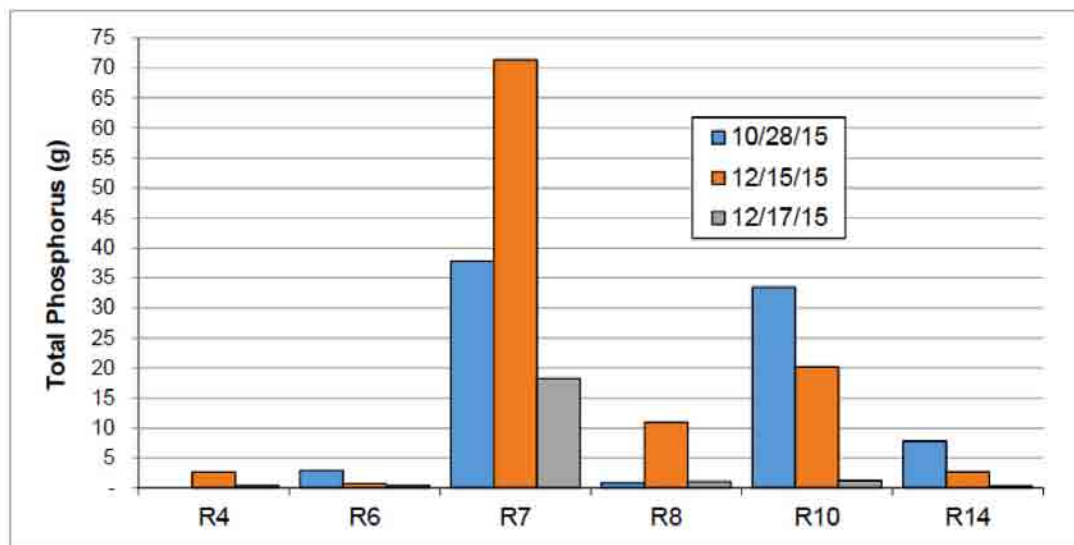
Runoff

Continuing land development means increased coverage of the watershed with roofs, roads, and parking lots, all of which are surfaces that block absorption of rain into the soil and increase the volume, speed, and pollutant load of runoff. Trees, brush and herbaceous plants that slow down and naturally filter rain runoff have often been removed. These effects, plus every additional septic system and newly fertilized lawn, increase the challenge of maintaining watershed health.

A pond and its surroundings, its vegetation, its animal life, is a living ecosystem in delicate balance. This balance can be disturbed easily, by seemingly benign actions and events. For example, a rainstorm might carry fertilizer, spread on a lawn some time before, into a pond. There it can increase nutrients for algae and aquatic plants, causing them to multiply excessively. Salt spread on roads for winter traction that finds its way into ponds alters pond acidity and adversely affects water hardness.

Dirt, grime and oils washed off a car might find their way down a driveway and street sewer grate into a pond. Defective septic systems might seep raw sewage that could end up in the water.

The Town of Plymouth provided funds for a comprehensive water sampling program to assess the amount and locations of pollution carried by rain into the ponds. The results are quite different than for samples taken during non-rain events. As expected, the rain scours the land and carries a huge amount of pollution and sediments into the ponds. Consequently *E.coli* and undesirable nutrients in rain runoff are very high compared to regular pond samples.



Total Phosphorus loads in stormwater runoff at six sites during three 2015 storms at Great Herring Pond. *Sites R7 and R10, both off Eagle Hill Drive, generally had the highest loads during all three storms. Based on this data the Twon of Plymouth applied for grant funding and completed design and construction of runoff mitigation measures.*

In 2012 and in 2017, the Town of Plymouth undertook major mitigation at the site of greatest runoff in the northwestern shore area of Great Herring Pond and on Eagle Hill Drive. A system of water traps, oil/water separators, and a rain garden were installed. Subsequent test results confirmed the effectiveness of the mitigation.

The study that was funded by Plymouth identified six Great Herring Pond runoff sites needing remediation. The Town of Plymouth has already received grants for design and construction for two of these sites; the plan is to obtain funding for the remaining four sites. It is hoped that these runoff initiatives will significantly reduce algae blooms and improve pond clarity without undertaking more drastic, expensive measures.



Surfrider Foundation

Watershed Management Plan

The HPWA Board of Directors is taking a number of pro-active steps beyond just monitoring pond water quality. HPWA hopes to improve watershed water quality and to monitor the aquifer water beneath us, from which we all get our water via private or public wells. Great Herring Pond is fully recreational and an important river herring run. The Town of Plymouth is working with HPWA and UMass Dartmouth to develop a grant-funded Watershed Management Plan that will quantitatively identify the sources of phosphorus pollution (septic, sediment, runoff), and suggest methods to significantly reduce it. Nitrate is also an indicator of adverse human impact on fresh water. Since Little Herring Pond is spring-fed and is the source of most of the water in Great Herring Pond, tracking nitrate levels from LHP feeder springs will provide valuable information on pollutants entering the watershed via the aquifer.

Although previous testing has not revealed a problem with *E.coli* human or animal fecal bacteria, periodic monitoring is considered a valuable service to provide for watershed residents. When these bacteria exceed recommended levels, they can cause severe gastrointestinal discomfort. Sources of *E.coli* can include improperly working septic systems, waterfowl, and runoff from pet, livestock, horse, and wildlife fecal matter. HPWA has tested 13 major beach areas on Great and Little Herring Ponds for *E.coli* bacteria during summer swimming months. Samples have not triggered alarms.

The presence of cyanobacteria has at times caused the Massachusetts Board of Health to restrict usage of several Plymouth ponds. These bacteria are more serious threats to health than *E.coli*, causing the Federal EPA to develop a monitoring website. The Town of Plymouth has purchased the necessary equipment and HPWA volunteers are using it to detect this dangerous, toxic bacterium. Humans can experience severe toxic reactions, and dogs on Cape Cod have died drinking infected water.

Everyone can help make changes within our watershed that will keep our water clean. One thing you might do is to join the Herring Ponds Watershed Association and volunteer for the Water Quality Committee. Also, the following are very helpful:

- Maintain your septic system health by pumping out the tank every 3 to 5 years.
- Maintain vegetation (preferably native species) near the edges of ponds, to catch runoff.
- Do not pour chemicals, medicines, or cleaning or personal care products down drains.
- Wash cars and boats on grass rather than driveways that drain to ponds.
- Limit use of chemicals and fertilizers on lawns.

Great Herring Pond Stormwater Management Project

Complete

2012 - Pond Rd/Shore Rd



In 2012, the Department of Marine & Environmental Affairs received \$103,969 from Energy and Environmental Affairs as part of the Coastal Pollution Remediation grant for the construction of the stormwater system. The project includes installing a stormwater system with extensive treatment, bioretention area (rain garden) as well as improvements to the roadways. The Town DPW is matching these grant funds with Town Staff time to construct the project as well as capital funding.

\$45,980 from Energy and Environmental Affairs as part of the Coastal Pollution Remediation grant for assessment and design to manage roadway and residential runoff from an



approximately 10-acre drainage area discharging into Great Herring Pond. The grant award enabled the Town to engage a consulting firm to conduct the necessary assessment including a watershed drainage area delineation, inventory of existing stormwater practices, field survey, assess soil characteristics and lastly perform design for Best Management Practices for the drainage area.

Final Design plans are available for download (5MB), [click here](#).

2017 Eagle Hill Drive Runoff Remediation Project

The Town of Plymouth applied for and received design and construction grants for remediation of two runoff sites on Eagle Hill Drive.

The initiative will prevent runoff of 48% of the solids currently entering Great Herring Pond from these sites.



Kids' Pages

Water Cycle Activity

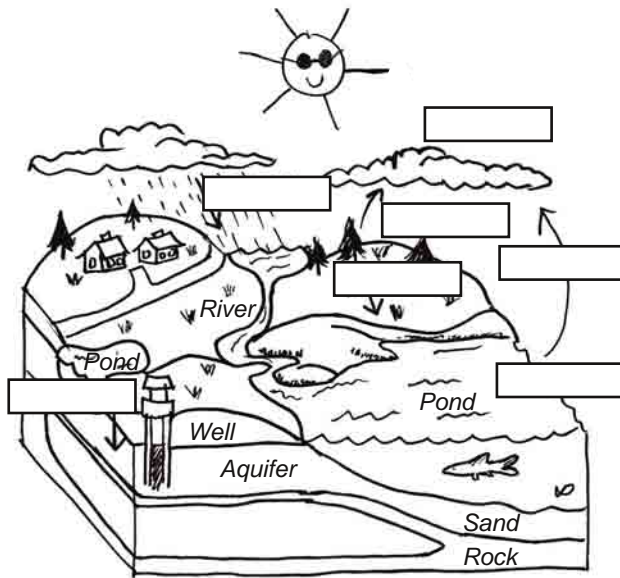
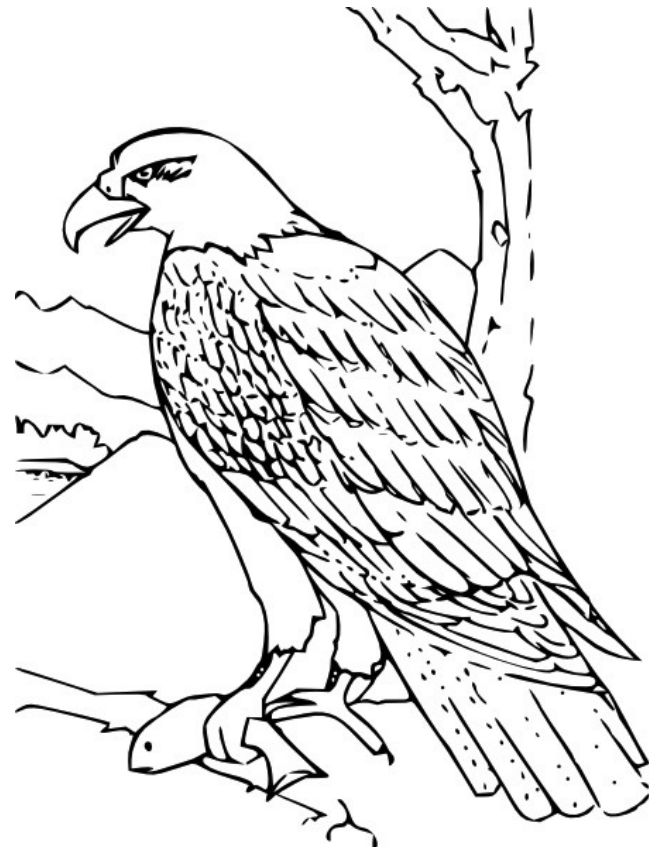


Diagram adaptation by Claire Esterman

In boxed spaces near arrows label the diagram with water cycle terms: **Evaporation**, **Condensation**, **Precipitation**, **Runoff**, **Percolation**, and **Collection**. Color the sun yellow as the heat engine driving the cycle. Draw a tree and add an arrow labeled **Transpiration**.

For an interactive diagram of the water cycle see:
http://www.epa.gov/ogwdw/kids/flash/flash_watercycle.html



Bald Eagle Coloring Fun

Credit: <http://www.openclipart.org>

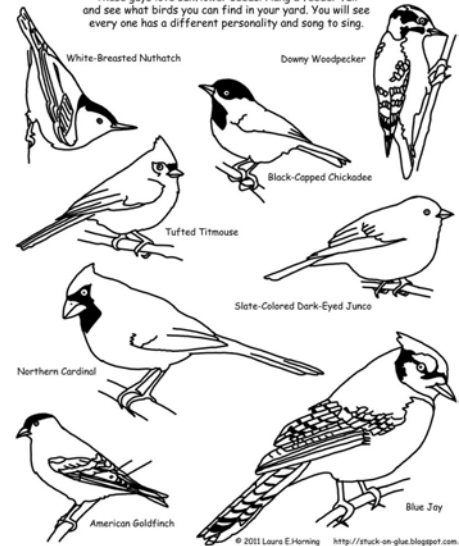
The Water Cycle Song

Sung to the tune of *She'll Be Coming Round the Mountain*

Water travels in a cycle, yes it does.
 Water travels in a cycle, yes it does.
 It goes up as evaporation,
 The clouds make condensation,
 It rains down precipitation, yes it does!

Common Feeder Birds of New England

These guys love sunflower seeds! Hang a feeder full and see what birds you can find in your yard. You will see every one has a different personality and song to sing.



Full-size print at Source: <http://www.stuck-on-glue.blogspot.com/2011/02/birds.html>

Can You Find These Words?

(Circle each one)

Nonpoint Source
 Runoff
 Watershed
 Monitoring
 Conservation
 Environment
 Water
 Pollution
 Low Impact

Source: US EPA
 Office of Wetlands,
 Oceans,
 and Watersheds

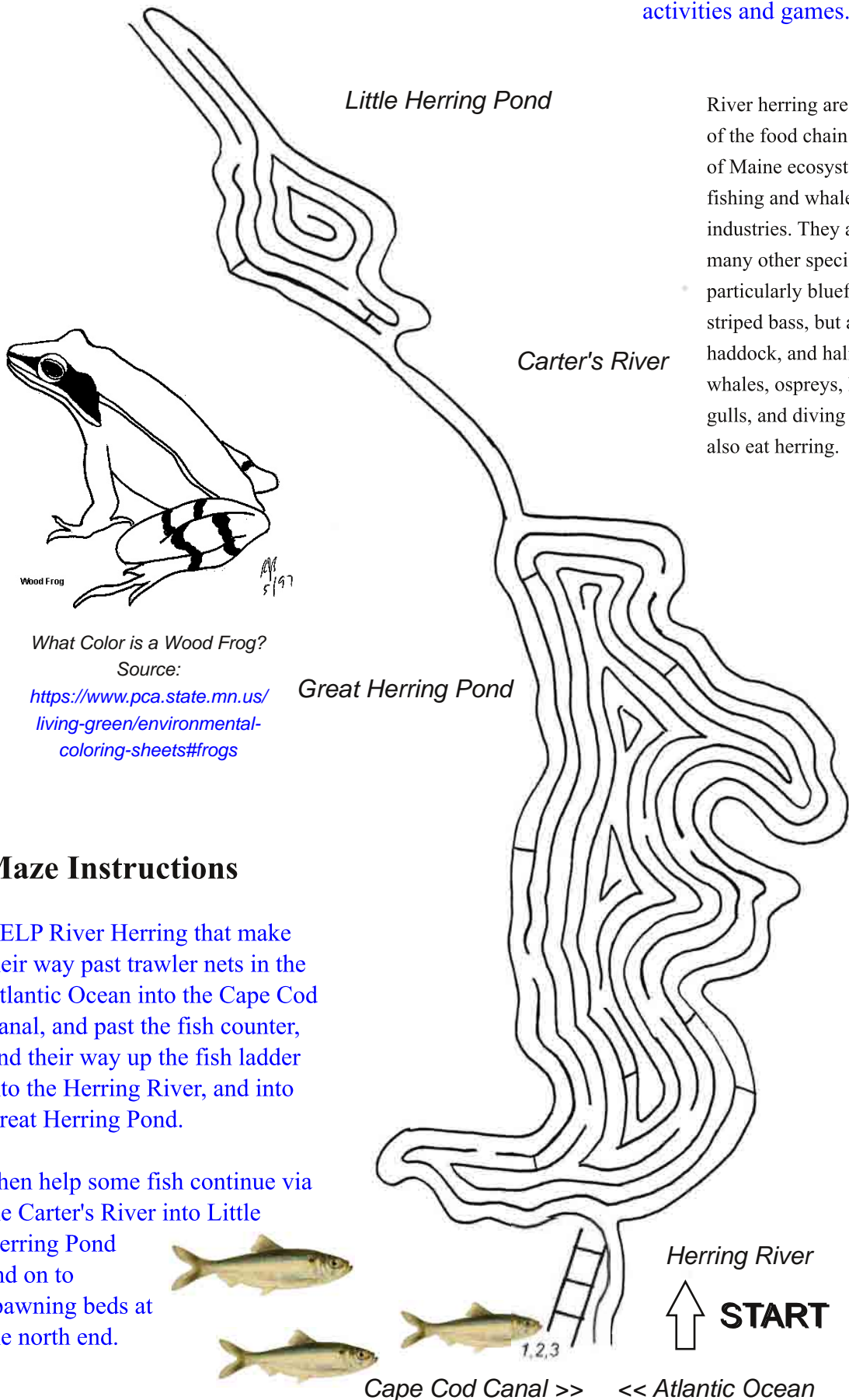
Rain Gardens
 Nutrients
 Sediment
 Pesticide
 Fertilizer
 Xeriscape
 Riparian
 Erosion



Watershed Maze

**END
X**

See links in the Resources section for more online kids' activities and games.



River herring are a key part of the food chain in the Gulf of Maine ecosystem, and its fishing and whale watching industries. They are food for many other species, particularly bluefish and striped bass, but also cod, haddock, and halibut. Seals, whales, ospreys, herons, gulls, and diving waterfowl also eat herring.

Maze Instructions

HELP River Herring that make their way past trawler nets in the Atlantic Ocean into the Cape Cod Canal, and past the fish counter, find their way up the fish ladder into the Herring River, and into Great Herring Pond.

Then help some fish continue via the Carter's River into Little Herring Pond and on to spawning beds at the north end.

Wildlife

The diversity and health of watershed populations of mammals, fish, reptiles, amphibians, insects, and birds are dependent on the quality of natural habitats and unbroken interconnections of their food chain relationships.

Black Bear, Fisher, River Otter

In 2012 there was a confirmed Black Bear sighting in the watershed. Scat had previously been found near a reverted bog close to the southwest end of Great Herring Pond. Fisher and River Otter are also occasionally seen. All had long been absent. Red (Pine) Squirrels and Flying Squirrels are present along with more common Gray Squirrels, Raccoons, O'possums, Red Foxes, Gray Foxes, and Coyotes.



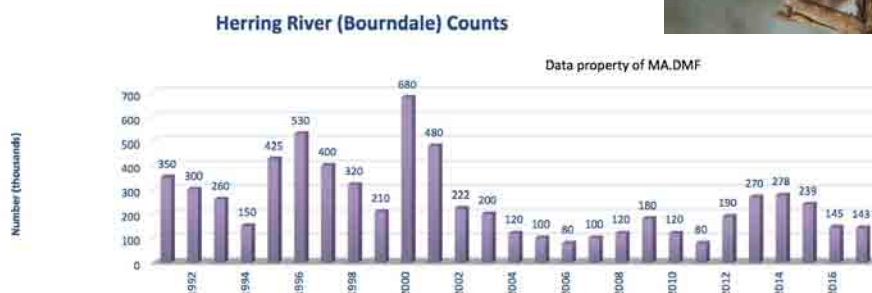
Fisher



Pine Squirrel

Herring runs

Perhaps our most important fisheries resource is the herring run in two of the watershed's larger lakes, Great and Little Herring Ponds. The state Division of Marine Fisheries tracks the number of Herring migrating into our watershed each spring with an electronic counter near the canal in Bourne. More than half a million herring passed the counter in 2000, one of the highest counts recorded for this run. More recently the population is in serious decline.



Monument River Fishway – Bournedale This system supports one of the Commonwealth's most productive river herring populations. Because of its size and accessibility, this population is the primary source of mature adult alewives for Marine Fisheries's stocking program."

Source: <https://www.mass.gov/files/2017-07/river-herring-viewing-guide.pdf>

In 2006 a moratorium was placed on all harvest of river herring in Massachusetts state waters. Population trends slowly improved in some runs thereafter, but even some of these are again in decline.

Fish species in LHP and GHP

(Blue text indicates a pictured species)

American eel

Alewife

Blueback herring

Chain pickerel

Golden shiner

White sucker

Brown bullhead

Pumpkinseed

Smallmouth bass

Largemouth bass

Tesselated darter

Yellow perch

White perch



Brown Bullhead



Smallmouth Bass



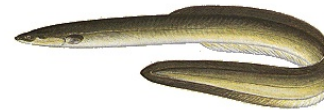
Yellow Perch



White Sucker



Alewife



American Eel

Reptiles and Amphibians

Reptiles in the area are noteworthy for some endangered and threatened species of turtles, and the woodlands are populated with salamanders, frequently found under logs on the ground.



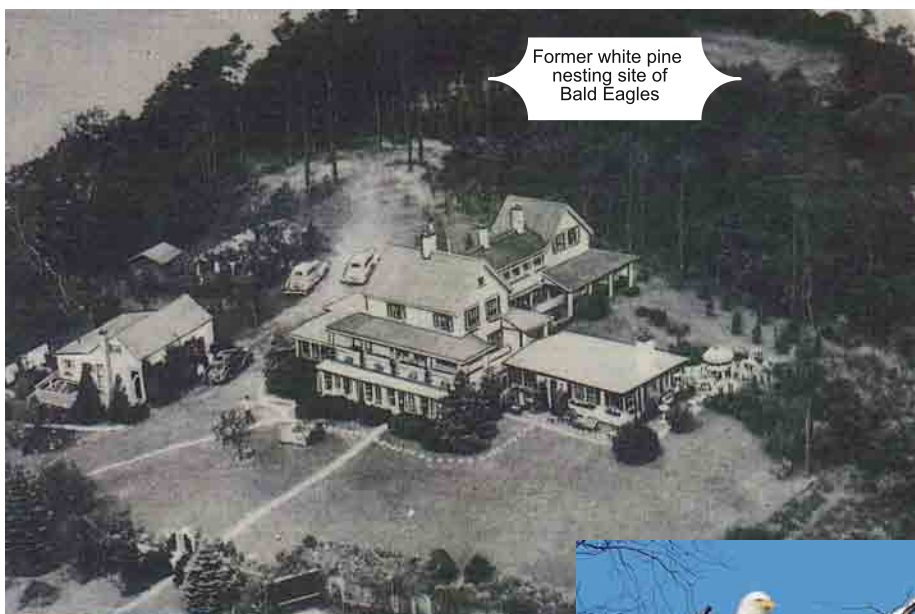
*Spotted Salamander
by Lee Pulis*

Birds

Bald Eagles have recently returned to the area. One adult and five immatures were counted on Great Herring Pond in the 2012 Audubon Christmas Bird Count. Through the early 1900's there was a nest in tall white pines on the peninsula that is now Eagle Hill Drive. In those days the Eagle Hill Inn (originally a farm established in 1880) was the only residence on the peninsula. There has been a known nesting just north of the watershed since 2012.

Ospreys also nest in the ACEC in summers, as do Turkey Vultures, kingfishers and herons. In winter, the ponds host a diverse array of overwintering ducks and coots.

Species checklists for the area are available from the Manomet, Inc., Audubon Christmas Bird Counts, eBird.org, Cornell University's Project Feederwatch, and Mass Audubon.



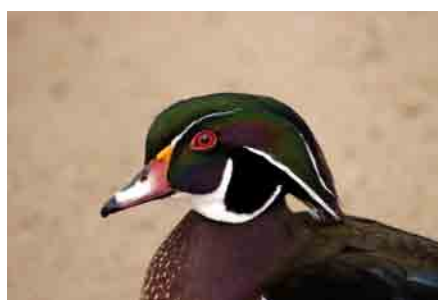
The Eagle Hill Inn



Bald Eagle



*Wild Turkey
photo by Dave Clark*



*Wood Duck © Moodville
Dreamstime Stock Photos*



*Osprey - Source:
<http://maggiesfarm.anotherdotcom.com/>*



Towhee



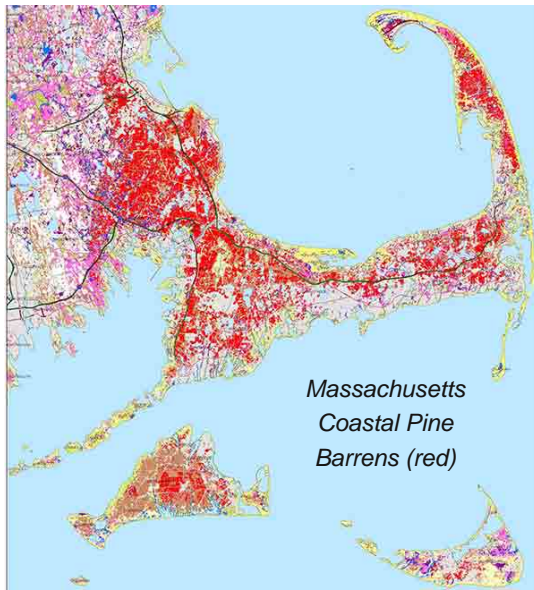
Ovenbird - Wikimedia commons



Northern Oriole

Plant Life

Our watershed is part of the globally rare Atlantic Coastal Pine Barrens ecoregion called **Pitch Pine-Scrub Oak Barrens**. The underlying deposits of sand from glaciers are acidic with little calcium or



buffering capacity; they hold little nutrient and quickly drain water from rain and melting snow. The closeness to ocean waters to the east (Cape Cod Bay) and south (Buzzards Bay) moderates temperatures on land. The USDA plant hardiness climate zones (6b & 7a) for the entire Boston-South Shore area are milder than the rest of Massachusetts.



New England Aster

Source:

<http://thegreatestgarden.com/>

in fall. Pond and river plants range from "Duckweed" (the group includes the smallest flowering plant known) to towering red maples. Swamp Azalea and Sweet Pepper Bushes on our pond and stream shores add sweet scents to our early summer breezes. High Bush Blueberries and Huckleberries, abundant on uplands, provide late-summer treats for birds, mammals, turtles, and adventuring children.

Native Species

The Herring River Watershed ACEC is an important, globally rare, and still healthy landscape within the second largest expanse of **Pine Barrens** in the world. This wonderful circumstance could change quickly through continuing development, habitat fragmentation, pollution, and innocently conceived and/or inconsiderate actions. HPWA monitors and is proactive in protecting native species, not just for our enjoyment, but also because they provide important, albeit not fully understood, ecosystem functions.

To increase awareness and to educate residents and visitors about key Pine Barrens plant species, HPWA volunteers teamed with Harvard Arnold Arboretum curatorial assistant Irina Kadis and entomologist Alexey Zinovjev to create a labeled **Plant Identification Trail at the David E. Alper Nature Preserve**.

The plant labels are QR-coded to display descriptive information and photographs from the Internet on visitors' own handheld mobile smart phones or digital tablets. An [interactive map](#) and [instructive video](#) are also provided.



Sweet Pepper Bush



Indian Pipe



Pink Lady Slipper Orchid

Invasive species

The list of organisms we call “invasive” includes aggressively reproducing terrestrial and aquatic plants and animals introduced from other ecosystems - including trees, shrubs, weeds, algae, rooted aquatics, diseases, parasites, snails, mollusks, fish, insects, birds, and mammals. Introduction of non-native species to our region, without natural competitors or predators to control their populations, allows them to increase their abundance and spread their range, outcompeting, eating, or otherwise displacing various native species.

Exotic non-native plant species (aquatic or terrestrial) introduced into an area usually create unintended consequences. Ornamental species planted in yards may have little value to wildlife as food, and may spread into wild areas, displacing native species that wildlife depend on. One example is Purple Loosestrife, a wetlands invasive <https://www.massaudubon.org/learn/nature-wildlife/invasive-plants/purple-loosestrife>.



Aquariums dumped into storm sewers or natural water bodies can introduce exotic algae, floating, and rooted plants. Boaters can unintentionally introduce invasive species into ponds when they launch without cleaning boat hulls of hitchhikers that attached in another pond. It is important to thoroughly clean your boat hull, motor, and bilge before launching.

Although all invasive species are of concern to HPWA, our current priorities focus on aquatic and shoreline plants. These categories of invasives are most likely to impact the water quality, recreational, and aesthetic aspects of our ponds.



Eurasian Watermilfoil is a non-native submerged plant with a "raccoon tail" appearance. Plants can grow in over ten feet of water, spread rapidly from fragments, and produce dense mats which intercept sunlight needed by other vegetation. It displaces native species, reduces biodiversity, hampers recreational uses, and reduces property and aesthetic values. It slows water movement which traps sediments and depletes dissolved oxygen levels needed by fish when the plants die and decay.

The most effective method for controlling invasive plants is to prevent their introduction. HPWA's Invasive Species Committee makes periodic surveys of Great and Little Herring Ponds to monitor the need for action.

A special concern is the potential for blue-green algae (also called Cyanobacteria) to increase, sparked by nutrient runoff into pond water. High concentrations (called a “bloom”) can affect esthetics, impact property value, produce toxins, and disrupt the normal activities of wildlife. When opportunistic, undesirable species become established, it is very difficult and expensive to control or eradicate them. Another priority concern is any foothold of aggressive Japanese Knotweed, Purple Loosestrife, and Phragmites, each of which can be nipped in the bud, but if ignored, can form monoculture colonies displacing the diversity of native shoreline and wetland plant communities.

Residents' interests and efforts to address other invasive species and issues in additional ponds and surrounding backyards, roadsides, and properties within the ACEC are welcome. Join the Invasive Species Committee, and/or report outbreaks you see to help ensure early remediation. Example species and issues include: Gypsy Moths damaging deciduous trees; English (House) Sparrows competing for nest cavities against native Bluebirds and Tree Swallows; boat ramp invasives hitchhiking on hulls and in bilges; spread of introduced landscape plants (such as Oriental Bittersweet, Burning Bush, Privet, Glossy Buckthorn) into surrounding forests and open space.

WANTED!

Invasive Species May be lurking in your back yard! Dead or Bagged



Oriental bittersweet



Asian
lady
beetle



Japanese knotweed



Purple loosestrife



Asian long-horned beetle



Gypsy moth
caterpillar



Burning
bush
escaped
into forest



Black swallow-wort



Phragmites

Recreation

Great Herring Pond is "fully recreational", providing clean cool water for fishing, swimming, kayaking, sailing, rowing, canoeing, motor boating, and water and jet skiing. A public access boat launch (with limited parking) is located at the southeast end in the Town of Bourne. Fishing requires a license available at Town Hall or by Internet.

Boat operation and safety rules and regulations are governed by the Town of Plymouth Harbormaster:

<https://www.plymouth-ma.gov/harbormaster/pages/boating-safety>

§ 134-2. Operation at safe distance.

All motorboats must be operated at a safe distance to prevent their wash from being thrown into or causing excessive rocking to other boats, rafts, floats or bathing beaches. For purposes of enforcement, a safe distance is considered 150 feet. This regulation shall apply to boats, barges, water skiers or other devices being towed by power, and the operator of a towing boat shall be responsible for compliance therewith.

For additional information on Massachusetts boating laws regarding proper speed and distance, as well as personal water craft (jet skis), visit

<https://www.boat-ed.com/massachusetts/handbook/book.html>

Little Herring Pond, being only four feet deep, is limited to non-motor boating. Public access for fishing and kayak and canoe launching is at the southwest end in the David E. Alper Nature Preserve, via a 1/4 mile trail off the end of Little Herring Pond Road.



Fall Fishing - photo by Brian Harrington



One Day at MMA - photo by Ulla Dagert Muther



*Sailing at
Massachusetts
Maritime
Academy
photo courtesy
of Tom Clarke*



Ice Fishing on Great Herring Pond - Photo by Brian Harrington

Safety Concern - Cold Shock

- MA State regulations require life jackets be worn in kayaks and canoes between September 15th and May 1st.
- Cold water removes heat from the body 25 times faster than cold air. Survival time can be reduced to minutes. Strong swimmers have died before swimming 100 yards in cold water.
- Exposure of the head and chest to cold water causes sudden increases in heart rate and blood pressure that may result in cardiac arrest.
- Without a life jacket, a victim may inhale while under water (involuntary gasping reflex) and drown without coming back to the surface.
- This can only be prevented by wearing a life jacket at all times on the water in the off-season.
- There is no second chance.

HPWA Activities



Annual **Spring Bird Walks** in different habitat areas* educate members while the resulting eBird.org species checklists add to the documented bioinventory of the ACEC.

**Bournedale Herring Run Park,
David E. Alper Nature Preserve,
and Great Herring Pond*

Annual August **Pot Luck Picnics** at Weston Bogs provide members, friends and families a chance to socialize and cool off in Great Herring Pond.



HPWA Annual Pot Luck Picnic



Newsletters and Internet Presence

HPWA Worldwide Web Home Page

Each year HPWA offers public educational programs and publishes a quarterly e-Newsletter to members and friends.



Visit HPWA on the Internet at:
<http://theherringpondswatershed.org>

and on Facebook at:
<https://www.facebook.com/HerringPondWatershedAssociation/>



HPWA Facebook Home Page



Facebook is the social media platform on which HPWA posts and shares weekly photos, videos, news, announcements, events and related items of interest. All HPWA posts, photos and videos are public; you do not need to have a Facebook account to view them. If you do have an account you are welcome to contribute photos, videos, and comments on posts.

Committee Fun

Pond shore invasive species
survey 2016



Standing Committees

Following is a list of 2018 Committee chairs. Committees are always looking for new volunteers with fresh ideas, time, and energy. Visit our web pages to get more details and updates, then contact the committee chair in your area of interest or expertise to join the fun.

Education and Outreach, Chair: Lee Pulis lee@theherringpondswatershed.org

Government Liaison, Chair: Dennis White horseandboat@aol.com

Invasive Species, Chair: Jerry Levine jersail123@gmail.com

Membership, Chair: Martha Sheldon martha.sheldon205@gmail.com

Newsletter, Editor: Geri Williams geri3williams@comcast.net

Water Quality, Co-chairs: Don Williams donald_r_williams2003@yahoo.com
Jack Kedian jkedian1@hotmail.com

Water Safety, Chair: Paula Kuketz kuketz33@verizon.net

Web Services, Chair: ([Volunteer opening](#))



Tess Ann Goldmann
Social Media/Webmaster Assistant
Spring 2018 Senior Intern
Rising Tide Charter Public School



Volunteer/Join

HPWA Accomplishments

HPWA has conducted various activities over the years to further our goals of Monitoring, Education, and Protection. Members and Friends have generously donated time and treasure.

- Public Educational Programs - 4 per year
- Newsletters to Members and Friends - 3-4 issues per year
- Water Quality Sampling on Great and Little Herring Ponds – 8 years of data
- Storm Water Runoff Sampling and partnership with Town of Plymouth to support remediation projects on Pond Rd/Shore Rd and Eagle Hill Drive
- "Shed Faire" watershed fundraiser
- Post Card Mailer to watershed residents
- *Watershed Stewardship Guide* creation and distribution - Makepeace Neighborhood Fund grant.
- HPWA Photo Contest and 18-month calendar fundraiser
- Annual Members Picnics 2013-2017
- Annual Bird Walks with Brian
- **Land Protection** vs Development - Parcel 15 along Carter's River (purchased by Plymouth CPC for conservation restriction)
- *Run, Herring, Run* mighty river herring superhero comic creation - NEGEF grant funded printing
- *Go, Herring, Go* superhero comic
- Joint print run of 17,000 superhero herring comics with Middleborough-Lakeville Herring Fishery Commission and North and South Rivers Watershed Association for distribution through environmental festivals and schools
- Draft Citizen's Nomination of ACEC for River Herring research and NOAA protection
- Volunteer citizen science Herring Count in partnership with Town of Plymouth at Herring River outflow from Great Herring Pond 2015-2018
- Kids Table Activities (Decorate-a-Herring) at annual SEMPBA Pine Fest, Plimoth Plantation Herring Run Festival, and Friends of Myles Standish State Forest Fishing Derby
- Strategic **Land Protection** (and Clean-up) of Little Herring Pond/Triangle Pond isthmus.
Voted at Oct 2015 Plymouth Town Meeting for protective purchase of 43.6 acres with funds from CPC and HPWA donor. Deed recorded in Spring 2016. Dedication as David E. Alper Nature Preserve on July 21, 2017
- Screech Owl and Bluebird nest box workshop at Tidmarsh Farms (100 boxes built)
- Networking and letters of support as members with Watershed Action Alliance (WAA), Pew Charitable Trusts Herring Alliance, and Southeastern Massachusetts Pine Barrens Alliance (SEMPBA)
- QR-coded Pine Barrens Plant Identification Trail at David E. Alper Nature Preserve
- Second edition updated and combined *Stewardship and Volunteer Action Guide* 2018

[Join Us!](#) Become a member and support HPWA's mission through your membership.



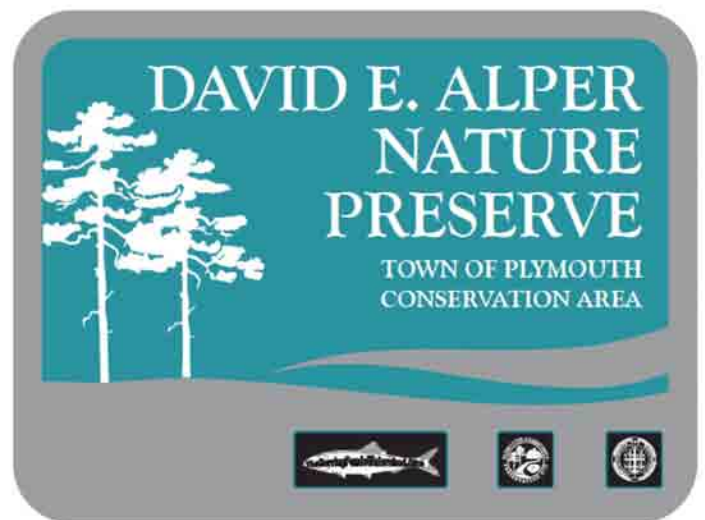
David E. Alper Nature Preserve



HPWA clean-up crew pulled two truckloads of litter and dumped debris from the newly purchased Town property in October 2015.



HPWA advocated purchase, helped clean up, created a [QR-coded Pine Barrens Plant ID Trail](#), and assists with continuing stewardship of this parcel critical to water quality and species habitats.



Dedication/Ribbon Cutting of 43.6-acre Town preserve was held July 21, 2017.



Special Projects



HPWA CommuniTree Ornament

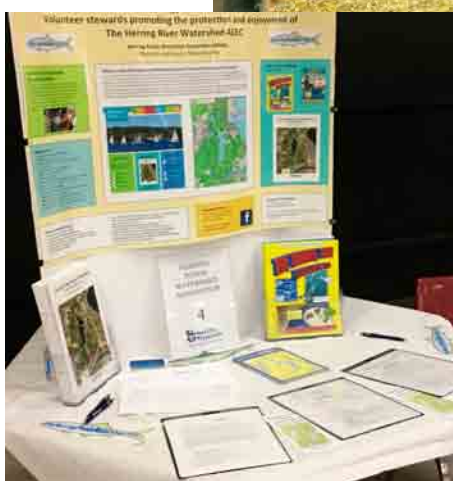


*Bluebird/Tree
Swallow boxes and
poles for Tidmarsh
Sanctuary and White
Cliffs Golf Course
<<<<*

*Screech Owl/Kestrel
nest box placement
>>>>*



Above, 50 Screech owl boxes assembled at HPWA's workshop were placed as part of statewide Project HOOT! Occupancy is monitored and reported. Tidmarsh Farms, Mass Audubon, SEMPBA, and Wildlands Trust participated as partners.



HPWA/Healthy Plymouth Volunteer and Community Service Opportunities table at Plymouth South High School event

River Herring Outreach



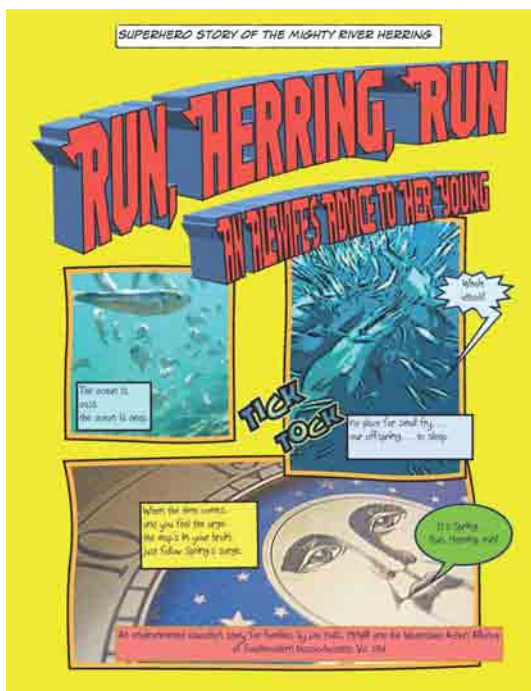
Herring Woman (Nancy Carroll) provides in-school programs at Plymouth elementary schools, with all students receiving free copies of HPWA's mighty river herring superhero comics.



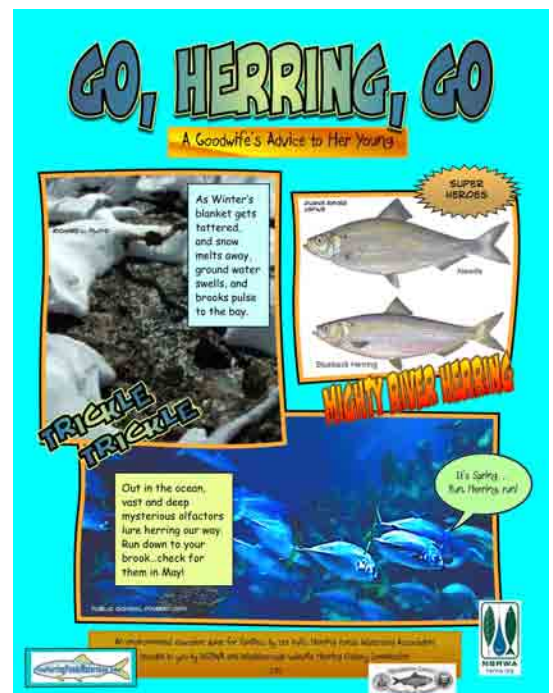
HPWA hosts a Decorate-a-Herring kids' tabling activity at area environmental festivals.



HPWA volunteers at SEMPBA PineFest enjoyed mingling with Frederick Law Olmstead.



In 2017 HPWA, North and South Rivers Watershed Association and Middleborough-Lakeville Herring Fishery Commission jointly printed 17,000 superhero herring comics for distribution to schools and at herring run festivals.



River Herring Facts

A 2012 benchmark stock assessment for river herring found stocks on the Atlantic coast "depleted" to historic lows. The significant decline in numbers of river herring has resulted in continuous extension of a 2005 statewide moratorium on harvesting, possessing or selling river herring from Massachusetts fresh waters.

HPWA volunteers count river herring returning to Great Herring Pond from the sea each year in April & May.

In 2008 the river herring was chosen as the logo/symbol of HPWA. Look for our logo on members' car bumpers and mailbox posts.



While some herring are exclusively marine (e.g. the Atlantic herring), Alewife and Blueback herring (collectively referred to as river herring) are anadromous species, spending the majority of their life at sea, but returning to fresh water to lay their eggs in the same streams and ponds where they were born. In general, spawning is initiated for Alewives when the water temperature reaches 51° F, and for Bluebacks when the water temperature reaches 57° F. Alewives generally spawn in ponds and slow rivers. Bluebacks prefer streams. They do not die after spawning, like salmon, but return year after year as long as they live.



Food Chain Importance Herring play a vital role in the North Atlantic ecosystem, serving as food for tuna, cod, striped bass, seabirds, herons, dolphins and whales. River herring are a key food of Atlantic cod. Recent information suggests that river herring are a vital resource for nearshore cod populations, and that without substantial recovery of river herring, coastal fisheries will remain depleted (Ames and Lichter, 2012).

Threats and Management Herring are threatened by industrial-scale fishing by mid-water trawlers targeting Atlantic herring, while netting river herring and shad as unintended by-catch. Up to 165 feet in length, these ships are the largest fishing vessels on the East Coast. Cape Cod mid-water trawlers are authorized to land more than 32 metric tons of river herring/shad by-catch. Regulators, fishermen, gear manufacturers, and scientists are searching for solutions. Researchers at Woods Hole Oceanographic Institution are currently investigating juvenile herring growth and mortality in Great Herring Pond. In state and federal waters, herring are managed jointly by NOAA, the Atlantic State Marine Fisheries Commission (ASMFC), and the New England Fishery Management Council.

Herring Stock Monitoring There are over 100 separate river herring runs throughout the Commonwealth. The ACEC's Monument (aka Herring) River in Bourne is designated as one of eight "sentinel" herring runs, monitored since the early 1980's for an index of fish abundance, sex composition, length structure, age composition and harvest. Annual electronic counts of migrating herring entering the Monument/Herring River from the Cape Cod Canal are available from 1990 to the present. The MA Division of Marine Fisheries uses herring from this river as donor stock to other river systems.

Owl and Bluebird Nest Box Workshop 2017

45 participants assembled 50 Screech owl and 50 Bluebird boxes on a snowy Saturday in February at Tidmarsh Farms barn.



Lee, Jim, and Phil were in charge of all materials.



Each kit took up to 40 screws to build.



Young, old and in-between enjoyed using the power tools.



Inspection and clean-out doors can be variously designed, but are essential to monitoring success.



Volunteer and Community Service Opportunities

Key Watershed Environmental Issues

- Human impacts on ponds, groundwater and aquifer
- Preventable nutrient and sediment runoff into ponds
- Groundwater extraction and septic system leaching
- Invasive species spread and remediation
- Pervasive large-scale earth removal (sand and gravel)
- Development/fragmentation in priority habitat areas
- Commercial scale solar on globally rare pine barrens
- Bog retirement – development vs habitat restoration
- Mercury bio-accumulation in fish
- Herring run monitoring and restoration of abundance
- Illegal dumping and littering – volunteer cleanup
- Public open space/resource abuse, for example:
 - dumping, litter, drugs, ORVs, poaching, pet waste
- Utility line right of ways: anti-spraying advocacy, etc.
- Plymouth 400 preparations and ACEC eco-tourism
- ACEC and open space signage for awareness/education
- Youth community service project promotion
- Your key issue: _____



What do you love to do? Tell our officers, committee chairs, social media admins, or any member via email, website contact, or phone. **We'll help you get started – joining the fun.**

Example opportunities:

__Pond Water Quality Sampling Join an organized boating party or paddle your own canoe or kayak for serious but enjoyable time on the water collecting periodic grab samples.

__Eliminate and replace invasive landscape plants with native species for wildlife and pollinators.

Provide natural food, cover and water to make your yard a stepping stone or corridor connecting fragmented habitat patches. Register or certify your efforts and spread the word.

__Citizen Science Herring Run Counting Volunteer 10 minutes or more per week in April and May counting migrating river herring that pass HPWA's count station on the Herring River at Sandy Pond Rd bridge.

__Bio-Diversity/Species Inventory Reporting Submit your official wildlife and plant sightings anywhere in the ACEC to eBird, FeederWatch, MA HerpAtlas, Great Backyard Bird Count, Habitat Network YardMap, Monarch Journey North/South, etc. Share your sightings, photographs, anecdotes, etc. for our social media postings, environmental protection advocacy, and youth education efforts.

__In-Kind Organizational Assistance Opportunities abound to apply your talents with HPWA's small but enthusiastic and hard-working group of elected officers and committee chairs, collectively our Executive Committee (aka Board of Directors). You could assist with finance, membership recruitment and communication, fundraising, educational outreach projects and events, media input, grant applications, town department research and interface, public program planning, signage, trail checking, historical research, water safety, etc. **Contact us and help make a difference!**



History of the Herring Pond Wampanoag People

by Billy Hunt, Vice Chairman,
Herring Pond Wampanoag Tribe

1500's The ancestors of Wampanoag people have lived for at least 10,000 years in Southern Massachusetts, on Martha's Vineyard and Nantucket Islands, pursuing a traditional economy based on fishing, hunting and agriculture. Documentation of Wampanoag existence dates back to the 1500's.

1600's The town of Plymouth was settled by the Pilgrims in 1620, centered in what is now Plymouth Center. The area of Plymouth south of the Pine Hills was occupied by the Pokanokets, better known as the Wampanoags, a general term for the Algonquin people who inhabited all of New England. This southern section of Plymouth was opened up to the Pilgrims by the Peace Treaty of 1621 with the Wampanoags. When Europeans arrived in the Cedarville Area, the major Wampanoag settlement, called Comassukumkenet (meaning 'trail going south') was located along the eastern shore of Great Herring Pond and south along the Herring River (Lovell 1984:21)



1637 Sandwich settlers were joining the Wampanoags in the annual taking of Herring on the Manomet River, using a log weir (Lovell 1984:41).

1654 The earliest white settlers in the Herring River area, now Bourne (south of Cedarville), came from the Sandwich settlement.

1669 Deed of conveyance from Sachem Quachetisset of Manomet to the Pilgrims, dated July 21, 1669 founds Cedarville. This deed encompassed "the land at Sandy Sea and Manomet and Herring River", and included a great deal of land besides Cedarville.

1700's The Herring Pond Reservation was laid out by 1700, in three lots of commonly held land totaling 3,000 acres on the eastern side of Great Herring Pond. The three parcels were known as the Great Lot, located north of Great Herring Pond; the Meetinghouse Lot, along the southeastern edge of the Pond; and the Herring River Lot, extending west from the Herring River (Lovell 1984).

1742 The State of Massachusetts passed an act that ordered all remnants of historical tribes within the state to move to one of the four communities that still have functioning Indian governments: the communities of Mashpee, Aquinnah, Herring Pond, or Grafton (although Grafton was actually Nipmuc Nation).

1783 The last minister to the Herring Pond Indians to use the native language was Ephraim Ellis, who died.

1842 By legislative action, 1800 acres of the reservation was divided and each family on the reservation was given a house lot and a woodlot, which they thereafter owned privately. The remaining 1200 acres remained in common ownership, although it was unproductive, the wood having been cut earlier (Earle 1861:68-69).

1850 The Second Meetinghouse was replaced by the meetinghouse now standing on Herring Pond Road, formerly the Pondville Baptist Church.

1869 Massachusetts law eliminated Indian reservations. The remaining common land of the Herring Pond Reservation was divided among the proprietors, and the balance was auctioned off in 1873 (Lovell 1984:364).

1880's While the tribe largely disappeared from historical records from the late 18th century, its people persisted. Survivors remained in their traditional areas and continued many aspects of their culture, while absorbing other people by marriage and adapting to changing economic and cultural needs in the larger society.

1924 Herring Pond tribe helped organize the first pow-wow in over 200 years at the Herring Pond Wampanoag Meetinghouse before growing and moving to Mashpee. The Wampanoag reorganized as the Wampanoag Nation in 1928.

1970's There are currently five organized bands: Assonet, Gay Head, Herring Pond, Mashpee, and Namasket. All have petitioned for federal and state recognition, but only Gay Head (600 members but without a reservation) has been successful (1987). The Mashpee Wampanoag and Herring Pond both petitioned together to the Bureau of Indian Affairs for recognition. Herring Pond and Mashpee were turned down by the federal courts in 1978.

Present Day The Herring Pond Tribe claims as traditional lands territory which ranges from the Plymouth (Plymouth Colony) areas to the upper parts of Cape Cod (Bourne, Sandwich and Plymouth). Many Cedarville residents (with names such as Swift, Harding, Cahoon, Hirsch, Fletcher, and Nickerson among others) are descendants of the Herring Pond Indians. Although the last native speakers of Wôpanâak died more than 100 years ago, since 1993 the tribe has been working on a language revival project that is producing new native speakers, the first time this has been achieved in the US. The project *We Still Live Here: Âs Nutayuneân*, produced a curriculum, teacher development and has hosted numerous classes from beginners to advanced.



Early Colonial History

Source: Bournedale the Forgotten Village, Donald Jacobs, 1996, Wm S. Sullwold Publishing, Taunton, MA

Early European settlement near Plymouth typically occurred in places where rivers sloped towards the coast, and where dams and factories could be built to harness power from the racing water. The Herring River, running south from Great Herring Pond (then known as Manomet Lake) was important to early industry as water power was generated from its 30-foot drop to the Manomet River (later known as the Monument River, and even later becoming part of the Cape Cod Canal). The Herring River was also a center of Wampanoag community and culture, located along the major Wampanoag (and also early European) travel routes between Plymouth, Cape Cod, Massachusetts Bay, and Buzzards Bay with routes to the south.

Peaceful relations between the local Wampanoags and early European settlers gradually led to Colony developments along the Herring River, and especially the section that is now known as Bournedale (but until 1884 was called North Sandwich). Earliest industrial development (~1695) included a grist mill in what is now Bournedale. With subsequent building of dams and water-wheels, industrial development followed through the 1700's and into the late 1800's. The lower parts of the Herring River grew to a thriving business community, including mills and forges serving industries of Sandwich, Cape Cod, and New Bedford. Related industries included saw mills, axe and nail factories, blacksmith shops, railroad and rail-car construction, machine shops, and businesses built on the prolific migrations of River Herring. But with development of steam power in the late 1800's, the manufacturing advantage afforded by water-power began to dwindle. Development of the Cape Cod Branch Railroad preserved a commercial bustle to the village, including its added function as a destination for summer visitors and residents from cities such as Boston and New York.



Photo by Melissa Wakeman

River Herring were a 'life support' to native tribes long before European settlement of the Plymouth region. Indeed, the spring and summer camp of the local Comassakumkanets was near the south end of Manomet Lake (now Great Herring Pond), where herring were taken and dried for later year-round uses, including food (fresh or dried for winter) and as fertilizer for corn. Colonial settlers increased the use of the Herring, but unlike the Wampanoags, took far more than what was needed for local uses (with trade reaching as far as the Caribbean).

Colonial management of the herring fishery was mixed, but generally followed two lines: Prior to 15 April herring could be taken by the general public, but starting the 15th the harvest was given to the 'buyer of the river', a right won by auction sponsored by the Town. These rights allowed for harvesting on three days a week, but residents and auction winners alike found various ways to thwart the conservation limits. A large and often controversial harvest grew through the 1700's and 1800's to a point where the 'flood' of fish that once entered and spawned in Herring Pond had dwindled to a trickle. In modern times fishing boats working far off of Massachusetts shores are thought to be responsible for the increased rate of decline since the start of the 21st Century. A mere remnant of the historical numbers of River Herring now reach our watershed ponds.

Construction of the Cape Cod Canal began in 1909, connecting what had been courses of the Sandwich River from Cape Cod Bay and the Manomet River from Buzzards Bay. Bournedale and the Herring River watershed saw major changes, with homesteads and businesses removed and roads and water-courses altered. At the same time, Bournedale's lifeblood from the railroad was removed to the far side of the canal. Private canal operation ended with its purchase by the US Government in 1928. Widening and deepening, and construction of the route 6 highway alongside, followed between 1934 and 1940. Once again the watershed village had more of its buildings removed, leaving only a small remnant of its former history. The course of the Herring River became channeled under the highway alongside the canal; inclusion of fish ladders preserved the herring run. Much of the remaining Herring River north of Bournedale still originates at the south end of Great Herring Pond and courses along the eastern boundary of lands designated in 1700 for use by Wampanoags.

Resources

Reduce/Reuse/Recycling

<https://www.mass.gov/topics/recycling-waste-management> Disposing of household hazardous materials.

<https://www.mass.gov/safely-dispose-of-prescription-drugs> Detailed info on disposing of unused medications.

<http://www.ecosystemgardening.com/life-in-the-leaf-litter-dont-throw-a-good-thing-away.html> Saving leaves.

Septic System Care

<https://www.mass.gov/guides/caring-for-your-septic-system> Care and maintenance of on-site home septic systems.

<https://www.epa.gov/septic/long-homeowners-guide> EPA: A Homeowner's Guide to Septic Systems.

Water Science and Activities

<http://water.epa.gov/learn/resources/> EPA Water Topics links.

<https://www.epa.gov/ground-water-and-drinking-water/drinking-water-activities-students-and-teachers> and

<https://www.epa.gov/students/lesson-plans-teacher-guides-and-online-resources-educators> and

<https://www3.epa.gov/safewater/kids/index.html> For students and teachers - online games and lesson plans.

http://education.jlab.org/reading/water_cycle.html Water cycle quiz.

Fish/Fishing

<http://www.mass.gov/eea/docs/dfg/dfw/habitat/maps-ponds/dfwlithe.pdf> Little Herring Pond bathymetric map.

<http://www.mass.gov/eea/docs/dfg/dfw/habitat/maps-ponds/dfwgrea.pdf> Great Herring Pond bathymetric map.

<http://www.lake-link.com/learn-to-fish/fish-identification/> Interactive freshwater fish identification chart.

<http://www.fishingnortheast.net/fishing-resources-links/what-how-tos/freshwater-fish-identification/> More fish ID.

<http://www.youtube.com/watch?v=OxTwBE89B-M> Video of 2010 South Shore herring run.

<http://www.lakelubbers.com/great-herring-pond-1833/> Full recreational activities description.

Birds/Birding

<https://feederwatch.org/learn/common-feeder-birds/> Project FeederWatch common feeder bird info by region.

<https://www.manomet.org/publications-tools/landbird-conservation> Manomet banding station records plus Christmas Bird Count tallies for area including ACEC.

<https://www.nwf.org/Garden-for-Wildlife/Certify> Certify school or backyard as wildlife habitat with Na'I Wildlife Fed'n.

<http://ebird.org/> Submit or view electronic records of bird sightings for any area.

<http://www.birdsource.org/gbbc/> Participate in the Great Backyard Bird Count each February.

Kids' Activities

<http://water.epa.gov/learn/kids/drinkingwater/index.cfm> US EPA groundwater and drinking water kids' activities.

<http://northlandnemo.org/images/Watershed%20Game%20Information%20Guide.pdf> Online watershed game.

<http://www.cookie.com/kids/games/hook-the-fish.html> Kids' hook the fish game.

<https://www.epa.gov/nps/nonpoint-source-educational-materials-students> Runoff educational activities for students.

http://www.sheppardsoftware.com/content/animals/kidscorner/kidscorner_games.htm Educational animal games.

<http://www.thewatershed.org/pdf/WaterCalculatorFINAL.pdf> Personal water use calculator.

Boating/Water Safety

<https://www.plymouth-ma.gov/harbormaster> Plymouth Harbormaster site.

<https://www.boatus.org/massachusetts/> Free online Massachusetts boating safety refresher course.

Stewardship at Home

<http://extension.missouri.edu/publications/DisplayPrinterFriendlyPub.aspx?P=EQM101F> Mapping home sites.

<http://content.yardmap.org/explore/the-average-american-yard/> Map your yard with YardMap software.

<http://www.missouribotanicalgarden.org/sustainability/sustainability/sustainable-living/at-home/rainscaping-guide/vegetated-bioswales.aspx> Vegetated bioswales as runoff filters.

<http://greenscapes.org/your-yard/composting/> Composting how-to from Greenscapes.

<https://www.epa.gov/soakuptherain/soak-rain-rain-gardens> EPA Rain Garden links.

Invasive Species

<https://www.invasivespeciesinfo.gov/unitedstates/ma.shtml> State info resources.

<https://www.mass.gov/service-details/invasive-plants> State invasive plant resources.

Native (Indigenous) Plants

<http://www.grownativecambridge.org/whatarenativeplants> Importance of indigenous species.

<http://www.wildflower.org/collections/collection.php?collection=MA> List with images, supplier directory.

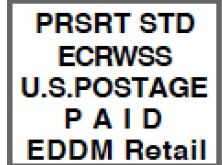
Support Our Friends, too



The Herring Ponds Watershed Association

P.O. Box 522

Sagamore Beach, MA 02562



Local Postal Customer

HPWA is a 501(c)3 Charitable Organization

HPWA Stewardship and Volunteer Action Guide

In 2007 some concerned local residents began meeting to discuss raising awareness of the importance and fragility of the Herring Ponds and Watershed. They formed the Herring Ponds Watershed Association. Since then members, with support of the Town of Plymouth, have been regularly testing the water quality, holding public meetings, conducting education and outreach events, and maintaining a website at: <http://theherringpondswatershed.org>

This guide is intended to assist residents and visitors of the Herring River Watershed ACEC to protect our ponds and watershed through education and volunteer action stewardship.



Swimming, fishing, paddleboarding, tubing...

Join us

We will be delighted if you contact our Membership chairperson through our website or at P. O. Box 522 Sagamore Beach, MA 02562.



Share this Stewardship Guide with others:

The HPWA guide is available for download in PDF format with active hyperlinks to all external resources at <http://theherringpondswatershed.org>