

Water Quality Overview of the Pemaquid Ponds

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Prepared for the Pemaquid Watershed Association (PWA)

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About this Report

This report is intended to provide an overview of the historical water quality data for six bodies of water in the Pemaquid River watershed¹: Biscay, Boyd, Duckpuddle, McCurdy, Paradise, and Pemaquid Ponds. The report also considers the implications of a number of water-quality-related ratings and designations for each of the water bodies.

The data upon which this document is based have been gathered by trained volunteers who have participated in the Maine Volunteer Lake Monitoring Program (VLMP), and by staff from the Maine Department of Environmental Protection. Volunteers have contributed the largest percentage of the data for the Pemaquid ponds, without which much less would be known about the waterbodies.

The volume of information available for the individual ponds varies significantly, as do the methods that were used to obtain and analyze samples. These factors have been taken into account in the assessment process. However, in general, the degree of certainty regarding any assessment of lake water quality increases with the volume of credible data collected over a period of time.

¹ Appendix A defines the Pemaquid River watershed.

Water Quality Assessment Background

Lakes and ponds are complex ecosystems, consisting of interacting physical, chemical and biological components. A pond is essentially a shallow lake, where light is able to penetrate to the bottom throughout. However, many Maine lakes have conventionally been referred to as ponds, as is the case with the six bodies of water discussed in this overview. Some of the Pemaquid ponds are, in fact, lakes.

Although they share many common features, each body of water is a unique entity due to variations in the length, width, and depth (morphometry) of their basins, the surface area, topography and geochemistry of the watershed, the orientation of the waterbody to the forces of wind and sunlight, as well as many other factors that are less well measured and recognized. Our understanding of the ways in which these ecosystems function and respond to these influences is improving but is nonetheless limited. Lakes and ponds are integrally connected to the land areas (watersheds) that surround and drain into them. The watershed must be considered to be a functional part of any aquatic system.

Because this report is a “water quality” overview for each of the ponds, it is important to begin by establishing a framework of understanding about how the term is to be used. Many factors and influences affect the quality of lakes and ponds. Some occur naturally, while others are linked to human activity in and on the water, and throughout the watershed. While this overview takes into account natural influences, the focus is on the human factor, because for an increasing number of waterbodies, the effects of people on water quality far outweigh all other factors.

Of all the possible ways in which people can influence lakes, the most pervasive at this time is the cumulative degradation of water quality resulting from watershed development. Unless development takes place through careful, protective conservation planning, such impacts will almost certainly occur. The process is relatively simple: development causes changes in the quantity and quality of stormwater runoff. Runoff from developed and disturbed areas in the watershed is the vector by which pollutants are transported to lakes via streams, ditches and overland flow.

Two of the pollutants of greatest concern for lakes and ponds are sediment particles from soil erosion, and the nutrient phosphorus. Sediment that washes into lakes and the streams that feed them can alter or destroy sensitive habitat for a broad range of aquatic plants and animals, ranging in size from microscopic to the largest inhabitants of the aquatic community. In high concentrations sediment can kill aquatic insects, fish and others. Other types of pollutants may readily attach to sediment particles.

Lakes and ponds are particularly sensitive to the nutrient phosphorus, as the addition of relatively small amounts of phosphorus to the water stimulates the growth of algae, resulting in reduced water clarity, lower concentrations of oxygen in the water, changes in the structure and composition of food webs, and more. Because algae are at the base of the lake food web, an increase in the concentration of algae in the water generally results in increased biological productivity in the lake ecosystem, causing overall instability in the system. Studies conducted in Maine by the Department of Environmental Protection have shown that phosphorus concentrations in stormwater runoff from developed residential areas may contain from five to ten times more phosphorus than runoff from

undeveloped forested watersheds (Dennis, J. 1985. "Phosphorus Export from a Low Density Residential Watershed and an Adjacent Forested Watershed", in Proceedings of 5th Annual Conference, North American Lake Management Society, Lake Geneva, Wisconsin, pp. 401-407, November 1985).

The process just described is referred to as "cultural eutrophication". It is a widespread phenomenon for water resources that varies in intensity and effect, depending primarily on the degree to which development has occurred in the watershed, the natural vulnerability or sensitivity of the individual water body to pollutants, and the characteristics of the watershed, including the geochemistry of the soils, the topography and hydrology of the land, and other factors.

Over long periods of time, lakes and ponds become filled with sediment and accumulated organic matter through natural processes. Cultural eutrophication is an acceleration of this phenomenon. It can bring about a measurable decline in water quality in only a few decades, where natural processes might take thousands of years.

Although phosphorus and sediment are the primary lake pollutants associated with watershed development, the potential for other forms of contaminants to find their way into the water and cause problems is almost unlimited, depending on how land is used throughout the watershed. These include gas and oil residue, pesticides, toxic substances such as paints, chemical solvents, bacteria and other pathogens resulting from human and animal waste products, and more. All water movement in a lake watershed ultimately travels to the low point in the terrain: the lake basin.

Some pollutants from outside of the watershed have the potential to reach lakes and ponds. Mercury is one such toxic substance. It is thought that mercury is transported, in part, to lakes via air currents from sources that may be several hundred to thousands of miles from the watershed. In recent years, unhealthy levels of mercury have been found in fish tissue in virtually all lakes and ponds in Maine that have been sampled, resulting in a statewide posting of "fish consumption advisories" for all Maine waters by the Maine Department of Human Services. (DiFranco, J., L. Bacon, and D. Courtemanche, 1995. Fish Tissue Contamination in Maine Lakes. Data Report. Regional Environmental Monitoring and Assessment Program. Maine Department of Environmental Protection, Augusta, ME, *and* Mower, B., DiFranco, J., L. Bacon, D. Courtemanche, V. Schmidt, and J. Hopek, 1995, Fish Tissue Contamination in Maine Lakes, Final Report, Maine Department of Environmental Protection, Augusta, ME). Sources of mercury transported through the atmosphere include coal burning power plants, municipal incinerators, and others.

Physical Characteristics of the Pemaquid Ponds

As stated previously, the physical characteristics of lake basins and their watersheds have much to do with the ways in which each body of water responds to internal and external stresses. Table 1 lists some of the common morphometric attributes of the Pemaquid lakes. This information is useful in assessing their water quality.

Table 1. Morphology of the Pemaquid Ponds.

Pond	Surface (acres)	Maximum Depth (feet)	Average Depth (feet)	Flushes per year	Watershed (square miles)	Elevation above sea level (ft)
Biscay	358.3	61	39	3.12	3.90	76
Boyd	56.8	21	15	~93	36.3	40
Duckpuddle	242.2	23	16	3.10	7.78	77
McCurdy	205.1	41	18	0.40	0.75	76
Paradise	148.3	11	8	1.80	1.10	115
Pemaquid	1,440.6	61	20	1.10	9.38	77

Source: Maine DEP and Maine VLMP Lake Data Reports

“Flush/yr” is the number of times per year that the volume of water in the lake/pond is replaced, or flushed, through natural processes. The flushing rate is determined by the volume of water in the lake basin, the size of the watershed, and the average rainfall for the watershed area. For example, McCurdy Pond, with a flushing rate of 0.40, takes nearly 2.5 years to completely flush (on average).

Lakes and ponds with slow flushing rates are generally thought to be more sensitive to the effects of some incoming pollutants, like phosphorus and sediment, because the residence time of the pollutant is longer than bodies with faster flushing rates, where the pollutants pass through the system relatively quickly. McCurdy Pond has the slowest flushing rate in the group, as well as the smallest watershed. Pemaquid and Paradise Ponds are somewhat average compared to other Maine lakes and ponds. Biscay and Duckpuddle have relatively fast flushes, and Boyd Pond, because it is at the low point in a large (36.3 square mile) watershed, has a very high rate, in which the water in this small pond is exchanged approximately 93 times per year. Because of this, Boyd has characteristics of both lacustrine (lake) and riverine systems.

Narrative Water Quality Summaries for the Pemaquid Ponds²

Biscay Pond

- Water quality data for Biscay Pond are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1974 through 2006.
- Most of the data are for Secchi transparency (water clarity); however, 7 years of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.
- Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for Biscay Pond is “average”, with historical average Secchi transparency of 5.2 meters (17 feet), average total phosphorus concentration of 7 parts per billion (ppb) and average chlorophyll-a concentration of 3.8 ppb. However, late summer dissolved oxygen profiles for the pond show moderate oxygen loss, which increases the potential for phosphorus to be released from the bottom sediments.
- Although the present potential for nuisance algae blooms on Biscay Pond is low, an increase in the rate and extent of the oxygen loss could also increase the potential for algal blooms. The present potential for an algal bloom to occur in this pond is “low”.
- Low dissolved oxygen levels during the summer reduces available habitat for sensitive coldwater fish. Biscay Pond is presently managed for both warm and coldwater species.

Boyd Pond

- Water quality data for Boyd Pond are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1988 through 2006.
- Most of the data are for Secchi transparency (water clarity), however, 5 years of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.
- Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for Boyd Pond is “slightly below average”, with a historical average Secchi transparency of 4.0 meters (13.1 feet), average total phosphorus concentration of 14 parts per billion (ppb) and average chlorophyll-a concentration of 5.3 ppb. Transparency (water clarity) may be reduced in this pond as a result of the moderate concentration of natural water color, caused by humic acids that leach from watershed vegetation.

² Narrative and data summaries are based on reports produced by the Maine Department of Environmental Protection and the Maine Volunteer Lake Monitoring Program. Additional detailed information is available online at www.mainevolunteerlakemonitors.org and www.mainedep.com. Tables 2 and 3 at the end of this section present a synopsis of this section.

- The shallow nature of Boyd Pond limits the extent to which dissolved oxygen loss occurs during the summer, although recent dissolved oxygen profiles show low to moderate oxygen depletion in the deepest areas of the pond. The present potential for a nuisance algal bloom to occur in this pond is “moderate”.
- Additional chemical data for this pond would be helpful in determining the potential for future water quality problems to occur.

Duckpuddle Pond

- Water quality data for Duckpuddle Pond are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1976 through 2006.
- Most of the data are for Secchi transparency (water clarity), however, more than 9 years of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.
- Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for Duckpuddle Pond is “below average”, with a historical average Secchi transparency of 2.7 meters (8.9 feet), average total phosphorus concentration of 19 parts per billion (ppb) and average chlorophyll-a concentration of 12.6 ppb.
- Late summer dissolved oxygen profiles show very high oxygen loss in the deepest areas of the pond, which increases the potential for phosphorus to be released from the bottom sediments, which, in turn contributes to a high potential for nuisance algae blooms on Duckpuddle Pond. This pond has experienced nuisance algal blooms during the 1990’s, and as recently as 2006. The potential for future blooms to occur is “high”.
- The concentration of natural color in Duckpuddle Pond is sufficiently high to significantly reduce water clarity and raise concentrations of total phosphorus. The primary source of the humic acids which cause the “root beer” color of the water is a large wetland bog system in the Duckpuddle watershed. High natural water color in lakes and ponds can interfere with the normal relationship between phosphorus levels and the growth of algae. In such cases, including Duckpuddle, chlorophyll-a is the most reliable indicator of algal growth and overall productivity.
- A survey to identify sources of polluted stormwater runoff in the Duckpuddle Pond watershed was conducted in 1995. The cumulative impact to this pond from phosphorus and other pollutants is considered the primary threat to water quality. The Maine DEP has developed a Phosphorus Control Action Plan and a Total Maximum Daily Load report to serve as a basis for reducing the impact of watershed sources of phosphorus and sediment to the pond.

McCurdy Pond

- Water quality data for McCurdy Pond are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1975 through 2006.
- Most of the data are for Secchi transparency (water clarity), however, 3 years (very limited) of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.
- Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for McCurdy Pond is “above average”, with a historical average Secchi transparency of 6.0 meters (20.2 feet), average total phosphorus concentration of 6 parts per billion (ppb) and average chlorophyll-a concentration of 2.4 ppb. However, late summer dissolved oxygen profiles for the pond show moderate oxygen loss in deep areas, which increases the potential for phosphorus to be released from the bottom sediments and become available to algae. There is some evidence that this is taking place in McCurdy Pond. Although the present potential for nuisance algae blooms on this pond is low to moderate, an increase in the rate and extent of the oxygen loss could significantly increase the potential for algal blooms.
- Low dissolved oxygen levels during the summer also reduces available habitat for sensitive coldwater fish. McCurdy Pond is presently managed for both warm and coldwater species.

Paradise Pond

- Water quality data for Paradise Pond are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1978 through 2006 (with a large gap in data from 1979-1987).
- Most of the data are for Secchi transparency (water clarity); however, 4 years of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.
- Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for Paradise Pond is “slightly below average”, with historical average Secchi transparency of 3.5 meters (11.5 feet), average total phosphorus concentration of 18 parts per billion (ppb) and average chlorophyll-a concentration of 3.7 ppb. However, Secchi transparency readings for this pond are limited by shallow depth (3.5 meters/11 feet maximum). The water in Paradise Pond also has a moderate concentration of natural color.
- Between the limited depth and moderate color levels, the most reliable water quality indicator of algal growth in the pond is chlorophyll-a (CHL). But with only four individual CHL samples taken for Paradise Pond in nearly three decades, the ability to accurately assess the water quality of this pond is limited.

- The shallow nature of Paradise Pond limits the extent to which thermal stratification takes place during the warm summer months. This, in turn, reduces the possibility that oxygen will be depleted from the water during the period. However, the shallow depth of Paradise Pond does increase the potential that wind-mixing could cause phosphorus from the bottom sediments to be swept-up (“resuspended”), and become available to the algae. The potential for a nuisance algal bloom to occur in this pond is “moderate”.

Pemaquid Pond (Station 01 – South)

- Water quality data for Pemaquid Pond at Station 01 (see bathymetric map in Appendix B) are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1975 through 2006.
- Most of the data are for Secchi transparency (water clarity); however, 6 years of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.
- Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for Pemaquid Pond (01) is “average”, with historical average Secchi transparency of 4.9 meters (16.4 feet), average total phosphorus concentration of 10 parts per billion (ppb) and average chlorophyll-a concentration of 3.9 ppb.
- However, late summer dissolved oxygen profiles for Pemaquid Pond (01) show moderate oxygen depletion, which substantially increases the potential for phosphorus to be released from the bottom sediments. Although the present potential for nuisance algae blooms on Pemaquid Pond is low, an increase in the rate and extent of the oxygen loss could significantly increase the potential for algal blooms.
- Low dissolved oxygen levels during the summer also reduces available habitat for sensitive coldwater fish. Pemaquid Pond is presently managed for both warm and coldwater species.

Pemaquid Pond (Station 02- North)

Water quality data for Pemaquid Pond – Station 02 are available from the Maine DEP and the Maine Volunteer Lake Monitoring Program from 1981 through 2006.

Most of the data are for Secchi transparency (water clarity); however, 4 years of additional chemical data (total phosphorus, chlorophyll-a, color, pH, alkalinity, conductivity) are included in the data set.

Compared to other Maine lakes, and based on the three primary trophic state indicators of biological productivity, the water quality for Pemaquid Pond at station 02 is “slightly below average”, with historical average Secchi transparency of 4.2 meters (13.8 feet),

average total phosphorus concentration of 12 (moderately high) parts per billion (ppb) and average chlorophyll-a concentration of 4.7 ppb.

However, late summer dissolved oxygen profiles for Pemaquid Pond at station 02 show moderate oxygen depletion, which *substantially* increases the potential for phosphorus to be released from the bottom sediments. The present potential for nuisance algae blooms on Pemaquid Pond is moderate. An increase in the rate and extent of the oxygen loss could significantly increase the potential for nuisance algal blooms, which is already “moderate”. Low dissolved oxygen levels during the summer also reduces available habitat for sensitive coldwater fish. Pemaquid Pond is presently managed for both warm and coldwater species.

Table 2. Narrative Water Quality Summary for the Pemaquid Ponds.

Pond	Water Quality	Trophic State	Summer Dissolved Oxygen Loss	Coldwater Fishery Impacted?	Potential for Internal Phosphorus Recycling	Algal Bloom Potential
Biscay	Average	Moderate	Moderate	Possible	Moderate	Low
Boyd	Slightly Below Average	Moderate	Moderate/High	N/A	Low	Moderate
Duckpuddle	Below Average	High	High	N/A	High	High
McCurdy	Above Average	Low-Mod	Moderate/High	Possible	Moderate	Low-Moderate
Paradise	Slightly Below Average	Moderate	Little	N/A	Moderate	Moderate
Pemaquid 1	Average	Moderate	Moderate/High	Possible	Mod-High	Low
Pemaquid 2	Slightly Below Average	Moderate	Moderate/High	Possible	High	Moderate

Source: Maine DEP and Maine VLMP Lake Data Reports

“N/A” designation under Coldwater Fishery Impact indicates that the body of water is not a designated coldwater fishery due to insufficient depth.

Table 3. Summary of Water Quality Data through 2006 for the Pemaquid Ponds.

Pond	Historical Secchi Average in Meters	Historical Total Phosphorus Average (Water Column)	Historical Chlorophyll Average (Water Column)	Summer Oxygen Loss	Color SPU (Standard Cobalt/Platinum Units)
Biscay	5.2	7 (limited data)	3.8 (limited data)	Moderate	30*
Boyd	4.0	14	5.3	Low/Moderate	31*
Duckpuddle	2.7	19	12.6	High	63*
McCurdy	6.0	6	2.4	Moderate/High	16
Paradise	3.5**	18	3.7	Low/None	37*
Pemaquid 1	4.9	10	3.9	Moderate	25
Pemaquid 2	4.2	12	4.7	Moderate/High	23

Source: Maine DEP and Maine VLMP Lake Data Reports

*Indicates that natural color concentrations are high enough to reduce water clarity/transparency somewhat. Therefore, water clarity as a single indicator may underestimate water quality. High concentrations of color may also be a natural source of phosphorus in the water body. The higher the average color level, the more likely that color is an influence. Under such circumstances, chlorophyll-a is the most reliable indicator of algal growth.

** Indicates that at times the Secchi disk was visible on the lake bottom. When this occurs, water clarity/transparency underestimates water quality. Alternative indicators (total phosphorus and chlorophyll-a) are more reliable in such circumstances.

Summary and Recommendations

A substantial amount of water quality data have been gathered through the years for the Pemaquid ponds, mostly through volunteer efforts. This has been augmented by periodic baseline sampling for a broad range of lake water quality indicators by the Maine DEP. However, given the existing conditions for each of the ponds, the sensitivity of lakes to the effects of watershed development, and the relatively small amount of historical baseline data available for each pond, the following recommendations are offered as ways to increase confidence in the conclusiveness of the data and to help ensure long-term protection and stewardship of the resources.

1. Work with volunteers and the Maine Volunteer Lake Monitoring Program (VLMP) to ensure that each pond is monitored annually at the recommended frequency. Consider increasing the frequency of baseline monitoring of all of the ponds, but especially those that appear to be most at risk based on existing data and vulnerability assessments.

Pemaquid ponds that are presently on the "Most at Risk" list³ under the Maine Stormwater Management Law (DEP) are:

- Boyd Pond
 - Duckpuddle Pond
 - Pemaquid Pond
 - Paradise Pond
2. Present water quality information to municipal planners in the watershed communities. Encourage local government to support efforts to monitor and protect the ponds. This could be in the form of towns providing increased financial assistance to the PWA for the purpose of increasing the frequency of baseline monitoring, or supporting volunteer monitoring through an annual donation to the Maine VLMP, or both. It is essential that town officials be kept informed of efforts to monitor the ponds, the resulting information, and the significance of the findings.
 3. Use what is known about the quality of each of the Pemaquid ponds to support volunteer watershed non-point source (NPS) pollution surveys to identify specific problems that may be contributing to water quality degradation of the ponds and their watersheds. Assistance in the training of volunteers for lake watershed NPS projects is available from the Maine DEP and County Soil and Water Conservation Districts.

The Duckpuddle Pond watershed has already been surveyed through a Maine DEP "TMDL" (total maximum daily load) project. However, residential and commercial development in lake watersheds is an ongoing threat that continually

³ Whether or not a lake makes this list is dependent on how long it will take (based on modeling predictions of vulnerability and watershed development rate) for the lake to experience a significant (1 ppb total phosphorus) increase in phosphorus. Lakes that are on the list are projected to experience the increase within 20 years unless significant measures are taken to protect the resource from both existing and new development in the watershed.

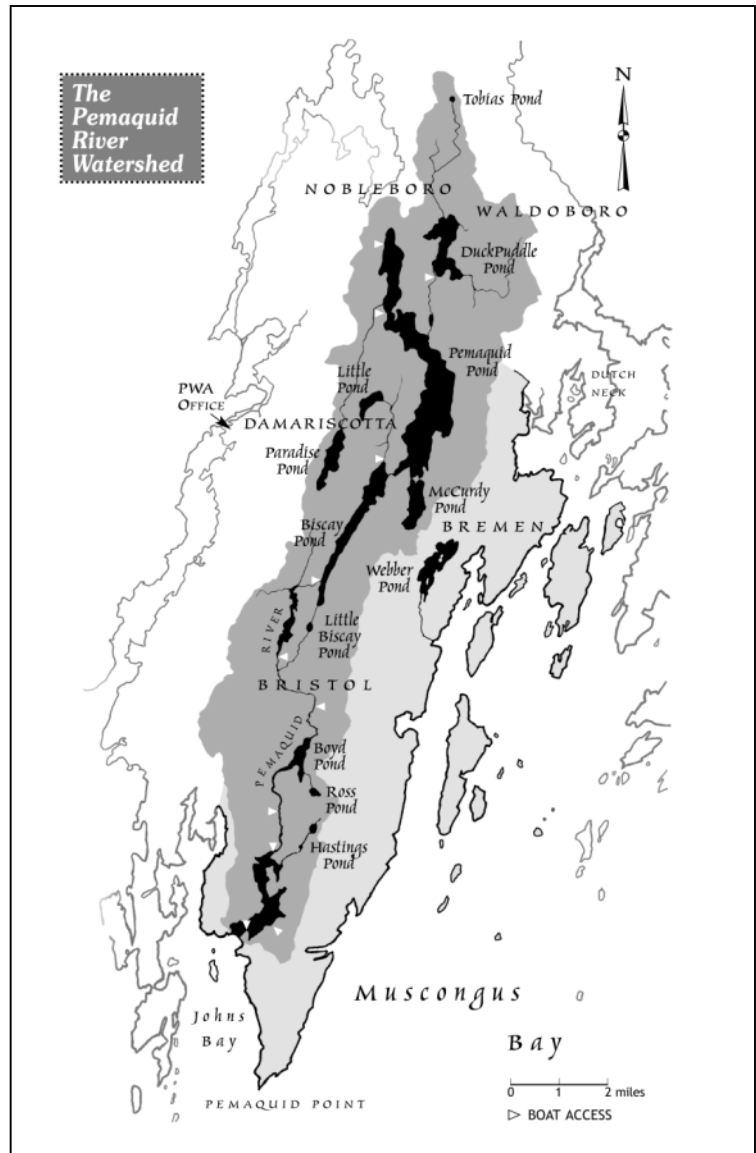
presents new threats to water quality, which warrants the repeated monitoring of NPS pollution.

4. Encourage towns in the Pemaquid River watershed (Appendix A) to adopt lake-specific protective standards that will be used to review and assess proposed new development in lake watersheds. This is particularly critical for relatively small projects that may not be subject to the permit requirements of the Maine Stormwater Management Law. The DEP has developed a methodology for assessing the impacts of phosphorus in stormwater from new development in lake watersheds. Local communities can adopt the lake-specific standards of this methodology. Technical support to local planners is available through the Maine DEP, and through the NEMO program (Non-point Source Education for Municipal Officials http://nemonet.uconn.edu/programs/about_members/me/maine.htm).
5. Encourage watershed landowners to use lake-friendly conservation practices on their properties. Many of the individual existing problems that threaten the Pemaquid ponds are relatively small in nature. However, the cumulative impact to individual bodies of water from hundreds of such problems can be very significant. Simple conservation practices — such as the diversion of stormwater runoff from camp roads, driveways and lawns into areas of buffer vegetation — can substantially reduce the impact of development on water quality.

Appendix A: The Pemaquid River Watershed⁴

A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. The Pemaquid River watershed (shown in dark gray on the map to the right) is located in Lincoln County, Maine, with the river starting at Tobias Pond in Waldoboro (Latitude: 44.134167 N Longitude: 69.439444 W) and ending at Johns Bay in Bristol. The watershed is situated among the towns of Bristol, Bremen, Damariscotta, Nobleboro, South Bristol, and Waldoboro.

The Pemaquid River watershed is 46.9 square miles in size, of which 5.4 sq miles is water and 41.5 sq miles is land. The Pemaquid River watershed on the map includes the sub-watersheds that flow into the Pemaquid River or into Pemaquid Harbor (including Little Falls Brook, which flows into Pemaquid Harbor, and Beaver Dam Brook, which flows into Duckpuddle Pond). It also includes the coastline down to Pemaquid Point on Johns Bay on the west side of the peninsula. Because Pemaquid Harbor is included in the watershed, 427.1 acres (0.7 sq miles) of the water acres are salt water.



TOWN	TOTAL ACRES	WATERSHED TOTAL ACRES	WATERSHED WATER ACRES	TOTAL SQ MILES	WATERSHED TOTAL SQ MILES	WATERSHED WATER SQ MILES
Bristol	23157.9	12559.4	838.9	36.2	19.6	1.3
Bremen	11647.6	4508.5	896.1	18.2	7.0	1.4
Damariscotta	8843.9	4537.6	878.9	13.8	7.1	1.4
Nobleboro	14576.4	3923.5	640.0	22.8	6.1	1.0
Waldoboro	46540.6	4179.3	181.8	72.7	6.5	0.3
South Bristol	<u>8398.8</u>	<u>333</u>	<u>0</u>	<u>13.1</u>	<u>0.5</u>	<u>0.0</u>
Totals	113,165.2	30,041.3	3,435.7	176.8	46.9	5.4

⁴ Watershed acreage data and map prepared by Paul Hoffman, Sheepscot Valley Conservation Association, GIS Support Center, March 2007.

Appendix B: Bathymetric maps showing the location of monitoring/sampling station(s), as determined by the Maine Volunteer Lake Monitoring Program and the Maine Department of Environmental Protection

