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Can the past inform us about Sebago Lake's future?

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SEBAGO LAKE

WATERSHED NEWS

SUMMER/FALL 2013

Photo Credit: Claire Crocker

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Can the Past Inform Us About Sebago Lake's Future?

By Firooza Pavri, Associate Professor of Geography, USM; Jean MacRae, Associate Professor of Civil and Environmental Engineering, UMO; and their students, Anna Springsteen and Abraham Dailey

Scientists often consider past population trends to make predictions about future growth.

Can we do the same with landscapes? Is there a way to examine how land has changed in the past twenty years? And can that help us predict how the land will look in twenty more? The answer to these questions is yes. Landscape trends are important because the quality of water in any lake is influenced by the condition of the land around it. Most important is green space - forested or vegetated land not broken by human development. The simple rule: more green space means more clean water.

Remote sensing technologies using satellite images now allow us to examine landscape trends over time. This technology can provide insights into future patterns. Satellite images, which allow a bird's eye-view of the Sebago Lake watershed with a simple mouse click on Google Maps, can provide detailed information about the condition of the watershed. Faculty and students from the University of Southern Maine and the University of Maine at Orono received a National Science Foundation grant to study landscape patterns. Using NASA's Landsat imagery, they are studying changes in green space across the Sebago Lake watershed and evaluating the lake's water quality over the past two decades.

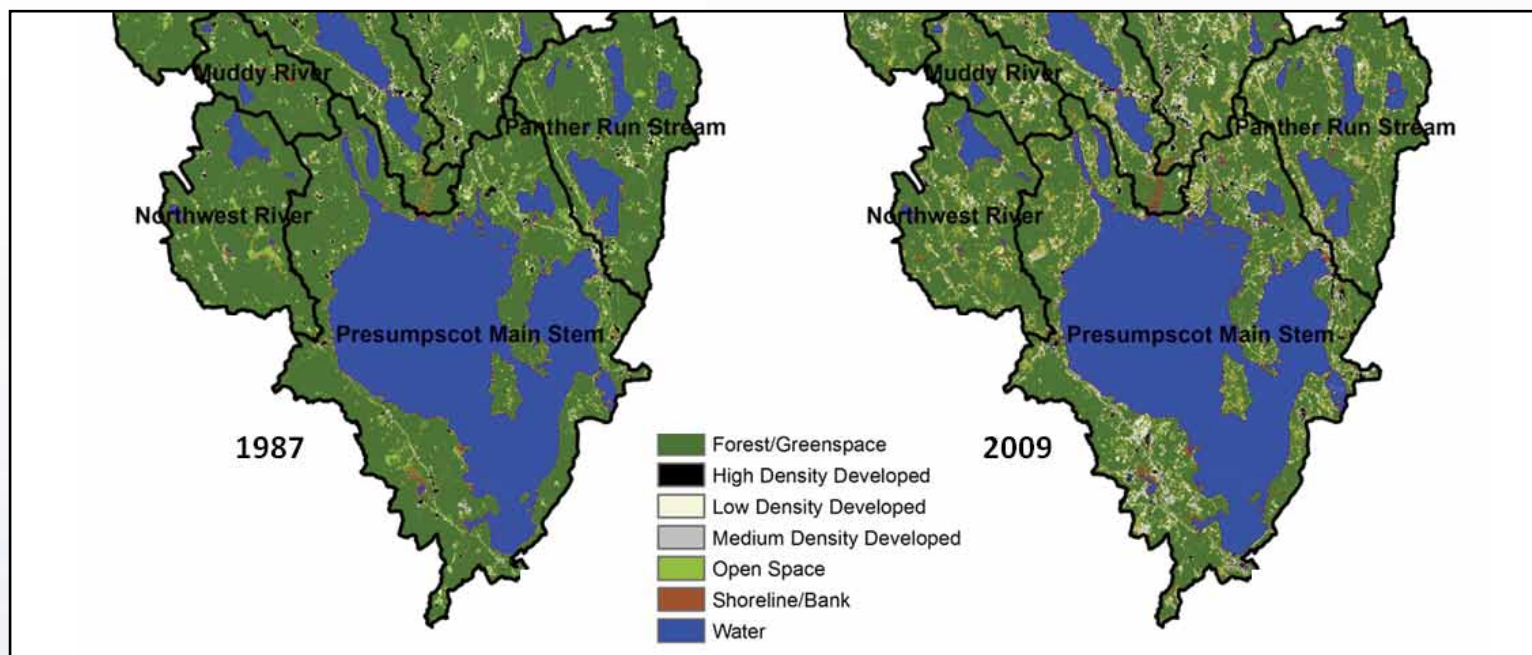
Both environmental and social processes influence lakes. Environmental factors like climate change, new precipitation patterns, and earlier spring thaws and ice-out dates can affect lake water quality. For instance, heavy rainfall events can cause severe erosion, which transports pollutants to the lake and affects its ecology. Similarly, human development of land can impact water quality. As trees are cut and buildings are built, runoff into streams and rivers may increase. This runoff carries soil particles and other pollutants into the lake. Human development also breaks up the landscape. This fragmentation reduces huge forested areas into smaller bits and pieces of woods. The areas are now broken into different segments - some with forest, others with no trees, and some that are paved - where before only forest stood. This separation impacts water quality because water is naturally cleaned while moving through forested landscapes. Fragmentation also impacts wildlife - some plants and animals need large, unbroken areas to survive.

Satellite images from 1987 and 2009 help reconstruct what the landscape looked like at these two points

in time. Patterns of development or fragmentation of green space can be studied using these images. Over the past 22 years, Landsat data analysis indicates development of the watershed has increased from approximately 5.4% to 8.9%. Analysis also indicates green space in the Sebago Lake Watershed has decreased by over 3.5%. This result is consistent with a previous aerial photo analysis commissioned by the Portland Water District. The earlier study used lower altitude images and classified land use types differently but also showed the watershed became less forested through the 1990s.

The development of the Sebago Lake watershed follows a distinctive rural sprawl pattern typical of New England and other parts of the United States. Development occurs along existing road networks like Routes 114, 117, 35, and 302 and expands from historically developed areas. Census and housing data

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Forest/Greenspace in the Sebago Lake watershed declined as developed area increased between 1987 and 2009

from 1987 to 2009 aligns with watershed development trends. The populations of towns in the Sebago Lake watershed increased, as did both residential and commercial development. These trends are not surprising because the watershed is close to the most populated parts of southern Maine.

Satellite images also show noticeable fragmentation of green space over time, a trend that can negatively impact water quality. Increased development typically also leads to increased storm water runoff, more paved surfaces such as roads and parking lots, and clearing of trees and vegetation along lake and river shorelines. All of these changes can harm water quality over the long term.

Sebago Lake is known for its high water quality, which supports a cold water salmon fishery and supplies clean drinking water. Water quality testing over the past 35 years shows that water clarity, algae populations, and oxygen levels are stable. However, total phosphorous levels have been higher since 2006, and the highest phosphorus readings ever taken have occurred in the past five years. Phosphorous, a nutrient found in high concentrations in soil and fertilizer, can cause algae blooms in lakes. While at this point the phosphorus readings are not cause for alarm, it will take the continued vigilance of residents, resource managers, land trusts, public interest groups, government agencies, and other stakeholders to maintain the high quality of Sebago Lake's water.

What does this mean for Sebago Lake's future? Since population is likely to grow does this mean that water quality must decline? It doesn't have to. Development can occur in a way that minimizes impacts to water quality. Towns can adopt ordinances that encourage "greener" designs with compact housing and preserved green space. Ecologically significant areas can be conserved through conservation easements or land trust purchases. Towns can identify and conserve green spaces. This will lessen fragmentation while also providing public recreation areas. Adopting green strategies today will mean cleaner water tomorrow.



Firooza Pavri is an associate professor of geography at the University of Southern Maine.



Jean MacRae is an associate professor of civil and environmental engineering at the University of Maine in Orono.

This edition of the Sebago Lake Watershed News is the third in a three-part series focusing on Sebago Lake's past, present and future. You can read about Sebago Lake's past and present here: www.pwd.org/news/publications.php We hope you will learn more about Sebago Lake's future in the pages that follow.

Native Plant Spotlight: **HOBBLEBUSH** (*Viburnum latanoides*)



Size: Shrub that grows 3 to 10 feet tall.

Foliage: Leaves are round with a pointed tip and are opposite on the stem. Flowers are flat clusters of white flowers, appearing in early spring. Fruits in clusters are red to dark purple in color and develop in the late summer.

Soil conditions:

Prefers cool, moist soils.

Light: Part sun to shade.

Zones: 3-6

Visit the Sebago Lake Ecology Center to see examples of native plants!

WATER WATCH

Oxygen in Sebago Lake

By Nate Whalen



Background photo by Bob and Marian Wright

Fish breathe oxygen from the water just as we breathe oxygen from the air. Obviously we use lungs and fish use gills, but the idea is similar. Living things need oxygen to survive. Portland Water District (PWD) scientists measure the amount of oxygen in the water to see how healthy the lake is. The more oxygen in the water, the healthier the lake.

In deep lakes during the summer, cold water at the bottom does not mix with the warmer water at the top. The bottom of the lake is a confined space with a barrier between the top and bottom of the lake. These lake layers mix only twice a year when water temperature is equal from top to bottom during what is called spring and fall turnover. Lake

turnover allows oxygen in the lake to be replenished from the air. By the end of the summer, however, there is a limited supply of oxygen for living things to breathe at the bottom of the lake.

Lakes lose oxygen when there are too many living things breathing in a small space. Fallen leaves and dead algae (organic matter) that sink to the bottom get decomposed, or eaten, by bacteria. When bacteria eat they breathe in oxygen and exhale carbon dioxide, just like humans. Oxygen gets used up when there is a lot of organic matter on the lake bottom for bacteria to eat.

Scientists at PWD measure the rate of oxygen loss in Sebago Lake May through September.

We can calculate how fast the oxygen gets depleted at the bottom of the lake. Sebago Lake typically has between 10 and 12 mg/L of oxygen at the bottom of the lake in September. Lake trout or “togue,” for example, require a minimum of 7 mg/L of oxygen while landlocked salmon require levels above 8 mg/L. The good news is that Sebago Lake has plenty of oxygen for all living creatures, even at the end of the summer.



Nate Whalen is a water resources specialist at the Portland Water District. He can be reached at nwhalen@pwd.org.

Sebago Lake Land Reserve: Trail Day 2013

By: Rod Beaulieu and Sarah Plummer



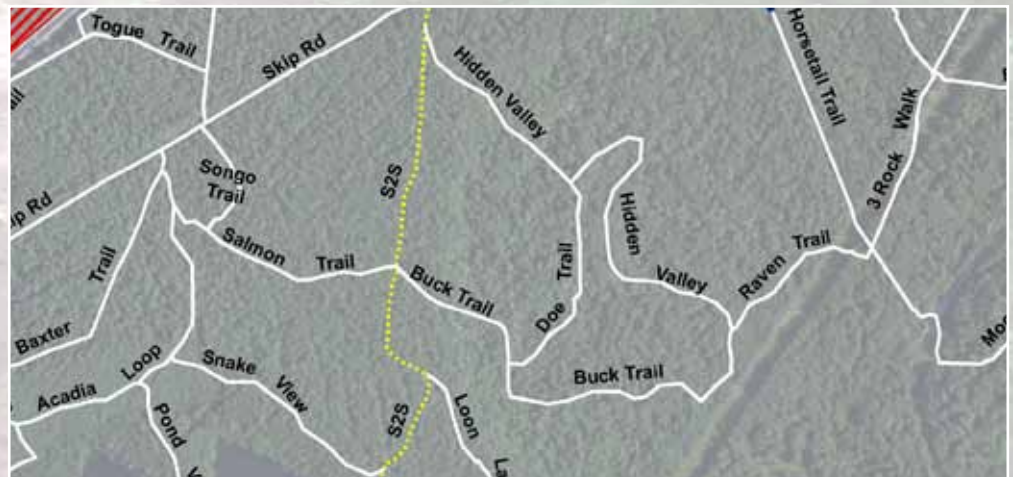
The Portland Water District has trails . . . LOTS of them! The District owns over 1,700 acres of land with public access for outdoor recreational opportunities. These trails, located on the Sebago Lake Land Reserve, are intended for low impact recreational activities such as hiking, trail running, cross country skiing, horseback riding, mountain biking, fishing in the stocked Otter Ponds for trout and bass, or simply exploring and enjoying this natural resource.

This summer the Portland Water District will complete a three-year trail improvement project, which includes the installation of signs to mark a network of trails on the Otter Pond parcel of the Sebago Lake Land Reserve in Standish. Trails within this area have been restored and enhanced. The completion of the project includes a new trail map that corresponds with the recently installed trail

signs. These maps are now available at the Sebago Lake Ecology Center and at all of the permitting kiosks.

Join us to celebrate the new signs, trail map, and user-friendly trails of the Sebago Lake Land Reserve! The Portland Water District will host their first Trail Day the morning of Saturday, September 21st. Guided activities will begin at four different locations, with groups joining together mid-morning for snacks provided by the District. Activities will include a mountain bike ride, trail run, nature hike for adults, and family nature hike (designed for families with children ages ten and under). Participants must provide their own equipment. Reservations are required and space is limited. To reserve your spot, contact sebagolake@pwd.org or 774-5961 x 3324.

Trail Day • Sept 21 
Reserve Your Spot Now!



Rod Beaulieu is chief of security operations at the Portland Water District. He can be reached at rbeaulieu@pwd.org



Sarah Plummer is the environmental education coordinator at the Portland Water District. She can be reached at splummer@pwd.org

What's Making Waves Around Sebago Lake?

By Kirsten Ness

L.E.A. Launches Three New Programs to Assess the Impact of Climate Change on Lakes

The Lakes Environmental Association is expanding their water testing program to include three new criteria in several water bodies within the upper Sebago Lake watershed. The parameters include sampling for an algae species called *Gloeotrichia*, sediment analysis for iron and aluminum concentrations and installing in-lake temperature sensors. These new tests will help assess lake vulnerability and the impact of climate change.



Bates Research Assistant Laurie Griesinger pulls up a zooplankton net to study *Gloeotrichia* on Long Lake as part of a pilot project with L.E.A.

District Approves \$50,000 Conservation Grant

In March the PWD Board of Trustees unanimously approved a \$50,000 conservation grant to Loon Echo Land Trust for the purchase of the 1,455-acre Perley Mills parcel located in the towns of Bridgton and Denmark. The parcel is partially located in the Sebago Lake watershed and will become a community forest managed by the Town of Denmark. The \$50,000 pledge marks the largest grant made under PWD's Watershed Land Conservation Policy to date.

L.E.A.'s Seventh Season of Milfoil Control



A member of the L.E.A. milfoil control team removes milfoil at the Sebago Lake State Park boat launch.

2013 marks the Lakes Environmental Association's seventh season of milfoil control work on the Songo River and in Brandy Pond. This summer the LEA team will continue to focus on the Sebago Lake State Park boat ramp and the remaining patches just north of the launch. LEA's milfoil season began May 15th with removal, repair, and redeployment of last season's benthic barriers followed by full surveys of the Songo River and high-risk areas in Brandy Pond.

2014 Images of Sebago Lake Calendar

This fall, the District will publish the ninth Images of Sebago Lake Calendar. The calendar includes shots of Sebago Lake, taken by amateur and hobbyist photographers. The calendar will be available for free in December. Stop by the Sebago Lake Ecology Center to pick up a copy! Supplies are limited; one copy per person please.



Calendar submission by Wendy Rosenberg



Kirsten Ness is a water resources specialist with the Portland Water District. She can be reached at kness@pwd.org.

Funds for Land Conservation in the Sebago Lake Watershed

By Laurel Jackson

The Portland Water District Board of Trustees recently approved a change to its land conservation policy which will allow PWD to contribute more money to conservation projects. The new policy underscores the Board's interest in conserving more forested land within the Sebago Lake watershed.

Forested land acts as a natural filter by keeping soil and other pollutants out of water bodies. Recognizing the value of forested land, the land conservation policy states that PWD supports the conservation of land within the Sebago Lake watershed when the goal of conserving the land is consistent with protecting water quality. Because the watershed is so large- 300,000 acres- and almost entirely privately owned, PWD partners with land trusts and landowners to help with their conservation efforts.

Over the years, the Board has approved contributions to a number of conservation easements and land acquisitions within



Pickerel Pond within the Perley Mills property

the watershed. These past contributions represented a very small fraction of the total value of the easement, often less than 1%. While the PWD contributions were valuable in securing the easement or acquisition, the Board feels that investment in the watershed is becoming more important as the percent of forested land in the watershed declines. PWD contributions may now more than cover the value of an easement, depending on the property's proximity to water bodies

and other factors. The hope is that increasing the available funding to land trusts and landowners will spur more people to conserve their land.

Between 2000 and 2013 PWD contributed \$45,000 towards easements on over 800 acres within the watershed. In March of 2013, with the new policy in place, the Board approved a contribution of \$50,000 to the Perley Mills land acquisition in the towns of Bridgton and Denmark, the largest such contribution to date. See the "What's Making Waves" section of the Watershed News for more information on this project. If you are interested in conserving your watershed land, please contact us at sebagolake@pwd.org or 774-5961 ext.3659.



Laurel Jackson is a water resources specialist at the Portland Water District. She can be reached at ljackson@pwd.org

10 Things You Can Do to Protect the Lake

1. Request a FREE Lakescaping Site Visit from PWD.

Is your property within 250 feet of Sebago Lake or one of its tributaries?

PWD provides free site visits and reports on how to make your property more attractive and lake friendly. You may even be eligible for a matching grant for implementing the recommendations! Contact us at sebagolake@pwd.org.



2. Minimize your lawn – plant shrubs on your shoreline.

Roots are the best defense against soil erosion. The deeper root systems of shrubs and trees hold soil in place and absorb pollution that lead to declines in water quality.



3. Follow Yardscaping principles instead of fertilizing!

If you must have some lawn, learn how to make it healthy and attractive without using fertilizer at www.yardscaping.org.

4. Protect footpaths from erosion.

Use Superhumus mulch or pea stone on gently sloping foot paths or install infiltration steps on steeper slopes.



5. Don't rake leaves.

The natural duff layer of decaying leaves and organic material that accumulates under trees acts like a sponge to soak up and slow down runoff, protecting soil from erosion.

6. Pump your septic tank at least every 3 years.

It's important to have the solids removed from the tank before they overflow into your leachfield, where they can cause the system to malfunction and require a costly replacement.

7. Be mindful of what you pour down the drain.

Don't pour cooking grease or oil down the drain, use chemical drain openers for a clogged drain, or pour oil-based paints, solvents, or large volumes of toxic cleaners down the drain. Learn more tips on how to be SepticSmart at www.epa.gov/infrastructure/septic/septicsmart.cfm.

8. Fuel your boat before you launch.

Avoid fuel spills in the lake by fueling your boat while it's on the trailer.

9. Take care when checking your boat's engine fluids.

Avoid spills and drips of fuel and oil into the bilge – it often ends up in the lake.

10. Regularly inspect your boat and trailer for plants.

Remove and discard any plants found on your boat or trailer far away from the water.





Watershed Protection Grants and Technical Assistance Available to Sebago Lake and Crooked River Residents

By Heather True

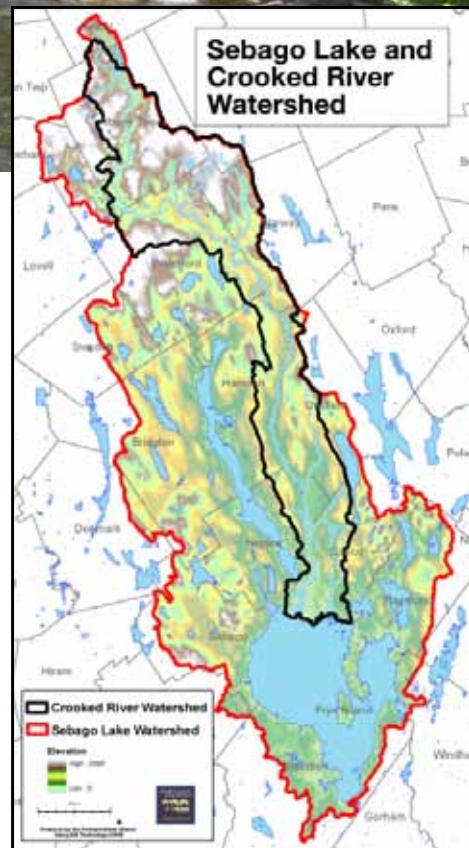
Cumberland County Soil and Water Conservation District (CCSWCD) is working with the Portland Water District and local stakeholders to address erosion problems along Sebago Lake and the Crooked River. Through 2013, these partners will collaborate on a grant funded by the Maine Department of Environmental Protection (MDEP) called the *Sebago Lake Conservation Project – Phase II*. Eleven sites, previously identified as high priorities, in Standish and Frye Island will be addressed through the project. Free technical assistance and water quality improvement workshops will also be provided.

A two year project on the Crooked River began this spring. This collaborative project is also funded by a MDEP grant. The 50 mile Crooked River flows through the towns of Bethel, Albany, Waterford, Norway, Otisfield, Harrison, Casco, and Naples. Its inflow supplies over 36% of Sebago Lake's surface water. The goal of the *Crooked River Protection Project – Phase I* is to reduce erosion and polluted runoff. Conservation practices will be installed at 30 sites

in Otisfield and Norway. The grant also provides free technical assistance for conservation projects. Examples include stabilizing waterfront access paths, planting vegetation, and controlling roof runoff. Engineered designs and oversight will be provided as needed. A minimum of 17 residential matching grants will be awarded. ATV trail maintenance and homeowner conservation practice workshops will also be provided.

Both the *Sebago Lake Conservation Project-Phase II* and the *Crooked River Protection Project – Phase I* are funded in part by the US Environmental Protection Agency under Section 319 of the Clean Water Act. Section 319 grants are administered by MDEP in partnership with EPA in order to prevent or reduce water pollution in Maine.

For more information and to take advantage of free technical assistance and funding to address erosion and runoff issues around Sebago Lake and the Crooked River, contact Heather True of CCSWCD at (207)892-4700 or htrue@cumberlandswcd.org



The 120 square mile Crooked River Watershed supplies over 36% of the surface water inflow to Sebago Lake.



A survey volunteer documents erosion at a stream crossing on Morse Road in Norway



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The Sebago Lake Watershed News is published by the Portland Water District.

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