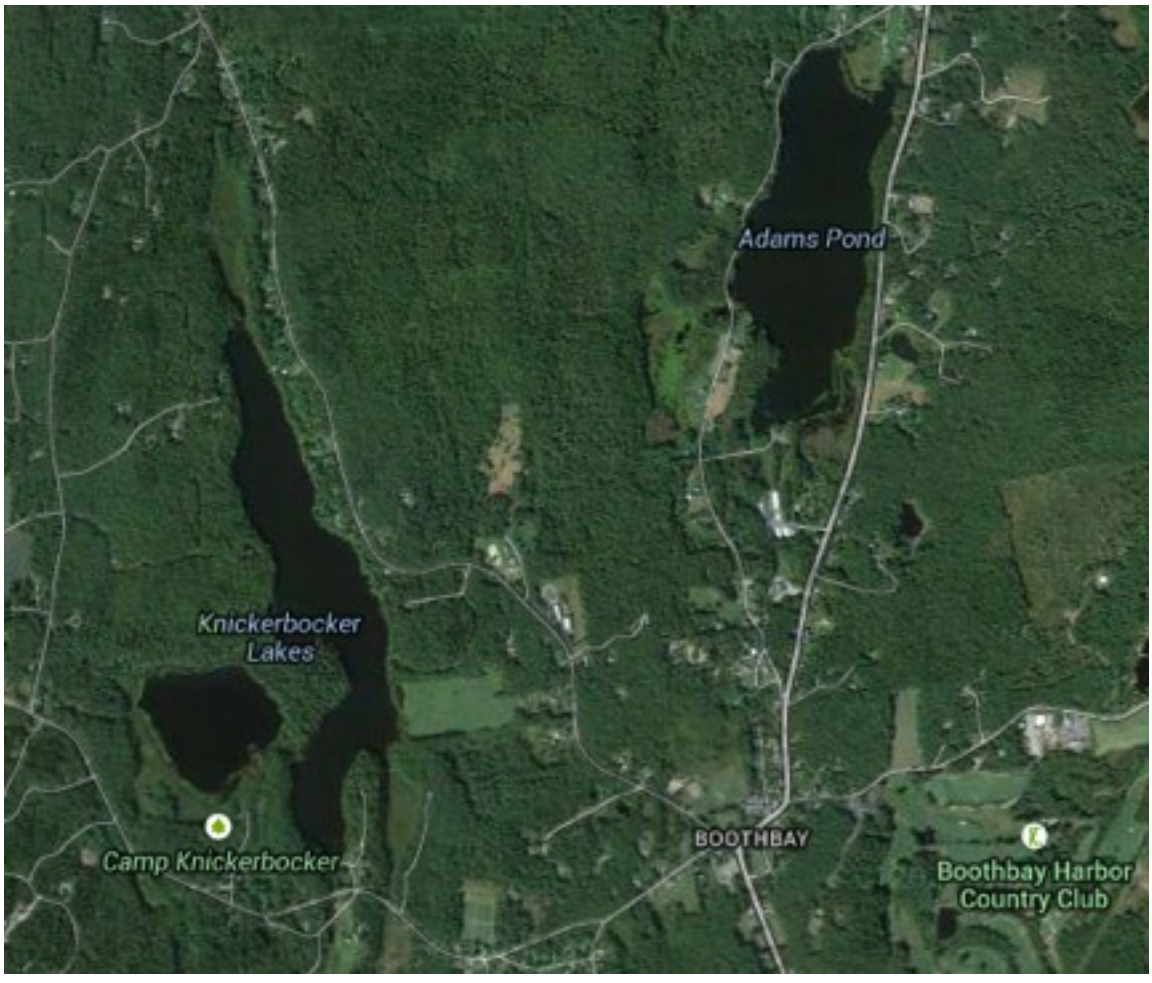
Adams Pond and Knickerbocker Lake Watershed Survey



BOOTHBAY REGION WATER DISTRICT

Prepared by

Sue Mello September 2014

Acknowledgments

The Adams Pond and Knickerbocker Lake Watershed Survey was accomplished with the guidance and technical assistance of :

Kristin Feindel	Maine DEP
Wendy Garland	Maine DEP
Laura Crossley	Americorps/Maine Conservation Corps
Rebecca Jacobs	Knox Lincoln Soil and Water Conservation District

The following community volunteers donated their time to the survey:

Nancy Adams	Gary Arnold	Rita Arnold
Alan Barker	Lois Jean Berry	Elder Daniels
Svend Jorgensen	Rose Mooney	Leigh Reinecke
Ron Reinhart	Elder Stallings	Leslie Volpe

The following Boothbay Region Water District employees participated in the survey:

Clarence Campbell	Sue Mello
John Orne	Matthew Wade

The following local organizations were participating partners in the survey:

Boothbay Region YMCA	Boothbay Region Land Trust
Knickerbocker Lake Association	West Harbor Pond Watershed Association

Kristin Feindel and Rebecca Jacobs were invaluable sources of information, advice and oversight from the initial stages of planning to final development of the survey report.

Executive Summary

Adams Pond and Knickerbocker Lake, located in the town of Boothbay, are the primary public drinking water sources for the towns of Boothbay, Boothbay Harbor and Southport Island. These waterbodies are also a year round recreation destination for residents and visitors.

Nonpoint source pollution, also called runoff, from developed areas is considered to be the highest threat to the water quality of Adams Pond and Knickerbocker Lake and other Maine lakes. Because of the serious threat runoff poses, identifying runoff sites that are likely to contribute sediments to these surface waters and developing plans to remediate these sites is essential to maintaining lake water quality.

On June 7, a watershed team surveyed the developed portions of Adams Pond and Knickerbocker Lake watersheds to identify and rank runoff sites. Surveyors identified 46 erosion sites within the Adams Pond and Knickerbocker Lake watersheds that are directly linked to either waterbody through ditches, streams or the shoreline. Each site was revisited by Boothbay Region Water District staff and all data were entered into Fulcrum Mobile Location Leverage software application dataset.

A total of 21 erosion sites were identified within the Adams Pond watershed and 25 sites within Knickerbocker Lake watershed. Although the number of medium and low impact sites was similar between the two watersheds, Knickerbocker Lake had substantially more high impact sites, 8 versus 2 in Adams Pond watershed. Almost half of the sites were associated with town, state and private roads and one quarter were associated with private residences.

At several sites, notably along Back River Road and Adams Pond Road, development on steep slopes that did not incorporate stormwater management design resulted in onsite erosion and in some cases, serious effects to downstream properties.

Although some sites, particularly those associated with roads, culverts and driveways, will require technical expertise and a substantial commitment of money to correct, many of

the problems found during the survey could be corrected at low cost or prevented through education programs.

The survey pointed out a clear need to better educate property owners about buffer zones, low impact development options, and sedimentation control practices for construction and for the Town to revise and update its watershed protection zoning ordinances.

Introduction

Adams Pond and Knickerbocker Lake, located in the town of Boothbay, are the primary public drinking water sources for the towns of Boothbay, Boothbay Harbor and Southport Island. These waterbodies and their watersheds are also used recreationally year round by residents and tourists and provide essential habitat for fish and wildlife species.

Both Adams Pond and Knickerbocker Lake watersheds are listed on the Maine Department of Environmental Protection's (MDEP) Nonpoint Source Priority Watershed list. The Town of Boothbay's Comprehensive Plan, currently being updated, recognizes protection of Adams Pond and Knickerbocker Lake water quality and watersheds as of paramount importance to the community's health and economic well being.

Since 2002, the Boothbay Region Water District (BRWD), MDEP, Maine's Drinking Water Program, Knox Lincoln Soil and Water Conservation District (KLSWCD), the Maine Volunteer Lake Monitoring Program, the Town of Boothbay and community organizations have worked cooperatively and individually to gather data and to establish programs to foster protection of Adams Pond and Knickerbocker Lake water quality and watershed.

Overview of water bodies and watersheds

Adams Pond

Adams Pond has a surface area of about 80 acres, a mean depth of 12 feet, a maximum depth of 22 feet, and a watershed of about 1.5 square miles, about 90 percent of which is forested (Maine Office of GIS Land Characterization Data). Adams Pond is fed by several small streams, as well as groundwater recharge, and discharges at its northern end into a tidal tributary of Cross River. Its flushing rate has been estimated at 2.54 flushes per year (www.maine.gov/dep/ftp/vlmp/5366).

Two roadways, Route 27 and Adams Pond Road, border the eastern and western shores of the Pond. Topography to the east and west of the pond is steep, with highly erodible soils in areas. Most development occurs to the east and south of the Pond and along a stream that enters the pond from the south. Residential development predominates throughout the watershed, but there are also commercial, municipal and industrial sites.

Boothbay's watershed zoning ordinances, adopted in 2004, limit development types and locations within a buffer zones around the pond, its associated wetlands and the southern inlet stream. Large portions of the watershed outside the buffer zone are presently undeveloped and are zoned for residential and commercial use. Recreational use of Adams Pond is prohibited but fishing along its shoreline does occur.

MDEP and BRWD, as part of the the Maine Volunteer Lake Monitoring Program, have monitored Adams Pond's water quality since 1977 . Adams Pond's water quality is considered below average based on measures of Secchi disk transparency depth, total phosphorus and chlorophyll-a. Based on these data, MDEP concluded the potential for nuisance algal blooms in Adams Pond is low to moderate and the potential for phosphorus to leave the bottom sediments and become available in the water column is low. Algal blooms have occurred in Adams Pond in the past, but not in recent years.

Most of the shoreline of Adams Pond is owned by the BRWD for conservation purposes. BRWD owns 106 acres in the Adams Pond watershed, most undeveloped.

Knickerbocker Lake

Knickerbocker Lake has a total surface area of about 110 acres, a mean depth of 15 feet, a maximum depth of 32 feet, and a watershed of about 1.6 square miles, about 90 percent of which is forested. Its flushing rate has been estimated at 1.29 flushes per year ((www.maine.gov/dep/ftp/vlmp/5368).

Knickerbocker Lake, fed by small inlet streams and groundwater recharge from the watershed, discharges at it southern end into Campbell Creek and West Harbor Pond.

Much of the immediate shoreline of Knickerbocker Lake is not serviced by public roads. Back River Road stretches along part of the lake's eastern shoreline and numerous private roads and driveways provide access to the shoreline for property owners.

Most development in the watershed is residential, but a few municipal and commercial properties exist. Boothbay's watershed zoning ordinances, adopted in 2004, limit development types and locations within a buffer zone around the lake, its associated wetlands and two inlet streams. Large areas of the watershed remain undeveloped.

Knickerbocker Lake's water quality has been monitored since 1991. Based on measures of Secchi disk transparency depth, total phosphorus and chlorophyll-a, MDEP has concluded that Knickerbocker Lake's water quality is slightly below average for the state.

Recent dissolved oxygen profiles in Knickerbocker Lake show high DO depletion in deep areas of the lake, which increases the potential for phosphorus to leave bottom sediments and become available to algae in the water column. The potential for nuisance algal blooms is considered moderate and the potential for phosphorus to leave the bottom sediments and become available in the water column is high.

Knickerbocker Lake is the only publicly accessible freshwater recreation spot in Boothbay and the Town of Boothbay maintains a public access off Barter's Island Road. The lake is used extensively for boating, swimming, and fishing in the summer by both residents and visitors and for ice skating, snowmobiling, cross country skiing and ice fishing in winter.

Most of the Knickerbocker Lake shoreline and watershed is in private ownership. The Boothbay Region YMCA, which operates a day camp on the lake's south shore, is the largest individual property owner on the shoreline. BRWD owns 16 acres within the Knickerbocker Lake watershed and along its shoreline, where its water intake facility is located.

No land parcels have been acquired specifically to protect the Knickerbocker Lake watershed.

Table 1. Assessment of water quality data for Adams Pond and Knickerbocker

	Adams Pond	Knickerbocker Lake
Water quality (compared to other state lakes/ponds)	Below average	Below average
Potential for nuisance algal blooms	Low to moderate	Moderate
Potential for phosphorus to leave bottom sediments and become available	Low	High

Nonpoint source pollution

Nonpoint source pollution (NPS), also called runoff, from developed areas is considered to be the highest threat to the water quality of Adams Pond and Knickerbocker Lake and other Maine lakes.

In undeveloped areas, precipitation and runoff is intercepted and slowed down by trees, shrubs, ground cover. As water travels over the surface of plants and organic debris on the forest floor, sediment and other particles in stormwater have the opportunity to settle out. Given adequate time, stormwater also seeps into the soil, where it is naturally filtered. In natural systems under typical storm conditions, sediment is mostly trapped before reaching surface waters.

In developed areas, stormwater moves quickly over hard surfaces, such as roofs, roadways ands areas of compacted soil, often converging as it exits these surfaces and causing soil erosion. As stormwater speeds its way uninterrupted to surface waters over hard surfaces, it carries along with it eroded soil. When it reaches surface waters, this eroded sediment may deposit in large quantities, smothering native plant and animal communities and increasing water turbidity.

Erosion of this private road on Knickerbocker Lake has resulted in sediments and phosphorus entering the lake.

Runoff may also carry nutrients to surface waters, increasing the risk of algal blooms. Phosphorus, an essential nutrient for plants, is attached to eroded soil and sediment particles. In natural watershed systems, phosphorus is in limited supply and this limited availability keeps algae growth in check. However, in developed systems excess sediments in runoff can tip a lake's phosphorus balance.

When too much sediment and phosphorus enter lakes, the phosphorus stimulates plant growth, which can lead to algae blooms. Algae blooms not only make lakes unsuitable for swimming and recreation, they affect water quality and can cause fish kills.

Unfortunately, once this enrichment cycle begins, it can be extremely difficult, and costly, to correct. Increased algae growth and the resulting accumulation of dead algae and other organisms on the bottom can deplete the lake's bottom oxygen reserves. Once the lake's bottom water becomes anoxic, a chemical reaction allows phosphorus previously tied to bottom sediments to be released to the water column. An internal recycling of phosphorus within the lake begins, which continues the downward spiral in lake water quality.

Because of the serious threat runoff poses to lake water quality, identifying runoff sites that are likely to contribute sediments to surface waters and developing plans to remediate these sites is essential.

Why protect Adams Pond and Knickerbocker Lake?

• Adams Pond and Knickerbocker Lake are the primary public water supplies for the Boothbay Region. Better water quality means lower treatment costs, which translates to lower costs to ratepayers and taxpayers.

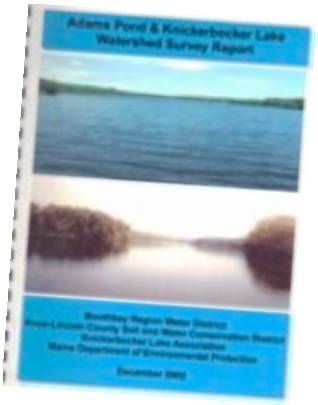
• Adams Pond and Knickerbocker Lake and their associated streams and wetlands are important habitats for fish, birds, wildlife and native aquatic plants.

• Adams Pond and Knickerbocker Lake provide freshwater recreational opportunities for residents and visitors that rely on good water quality.

• Research shows that water quality is closely tied to property value. As water quality declines, so do property values.

Assessing non-point source pollution

In 2002, BRWD, with the help of the MDEP and the Knox-Lincoln County Soil and Water Conservation District (KLSWCD) and local volunteers, conducted the first Adams Pond and Knickerbocker Lake watershed survey to identify the major runoff sites within the watersheds and to develop plans to remediate them.



The 2002 survey identified 106 NPS sites that were impacting or had a high potential to negatively impact water quality. The watershed report was followed by a successful grant application in 2004, which provided funding to address major erosion sites along Adams Pond and Knickerbocker Lake.

In 2009, BRWD resurveyed the shorelines of both Adams Pond and Knickerbocker Lake and their contributing streams to identify both point and NPS pollution. The 2010 report showed that significant NPS sites along Adams Pond and Knickerbocker Lake remain.

In early spring of 2014, BRWD began planning another watershed survey to get an up-to-date assessment of the current NPS problems in both watersheds and to develop

recommendations for addressing these. Survey plans were developed in coordination with the MDEP and KLSWCD. Volunteers were sought from local organizations and the community, and every property owner within the watershed was contacted and given the opportunity to have their property removed from the survey area.

June 2014 survey goals

The Boothbay watershed survey had four general objectives:

First, to document the most significant erosion sites within the watershed that could be adversely affecting water quality of Adams Pond and Knickerbocker Lake.

Second, to rank these sites relative to their severity and prioritize them for remediation work.

Third, to begin to develop recommendations and plans to remediate the most serious runoff sites and to gather essential information to support future work and funding requests.

Fourth, to raise public awareness of the link between human activities in the watershed and water quality.

Information gathered will be used by BRWD to develop plans to help protect Adams Pond and Knickerbocker Lake from the adverse effects of runoff. All plans will be developed in consultation with private landowners, local organizations, MDEP, KLSWCD and the Town of Boothbay.

Survey Methods

On the morning of June 7, watershed survey volunteers assembled at the Boothbay Region Water District office on Adams Pond Road for MDEP watershed survey training.

After the morning training session, three technical advisors from MDEP and one from KLSWCD, led four teams, consisting of 12 community volunteers and four BRWD employees, in surveying the developed portions of both Adams Pond and Knickerbocker Lake watersheds.

Prior to the survey, the watershed had been divided into four sectors and each team surveyed one sector , using maps, digital cameras, standard forms and BRWD Samsung Tablets.

Surveyors at site in Adams Pond watershed

During the survey, data, including GIS position and photographs, were logged into the Fulcrum Mobile Location Leverage software application, specifically modified for the project by Wright-Pierce, as well as on standard forms. This was the first time a Maine watershed survey used the Fulcrum app and tablets in the field to enter survey data and pinpoint locations.

Surveyors documented erosion sites throughout the day and those areas not surveyed on June 7, were surveyed on June 23 by MDEP and BRWD staff.

After the survey was completed, all sites were revisited by BRWD staff to verify data collected and data were compiled and maps and reports generated using the Fulcrum App.

MDEP returned to Boothbay on July 10 to assist BRWD staff in obtaining pollutant load estimates for high impact and medium impact sites. Measurements taken provide an estimate of the amount of phosphorus each identified site is contributing to Adams Pond and Knickerbocker Lake and will help prioritize sites for remediation.

Summary of Findings

Volunteers identified 46 erosion sites within the Adams Pond and Knickerbocker Lake watersheds that are directly linked to either waterbody through ditches, streams or the shoreline. Erosion sites without a direct connection to waterbodies were not included.

A total of 21 erosion sites were identified within the Adams Pond watershed and 25 sites within Knickerbocker Lake watershed. Although the number of medium and low impact sites were similar between the two watersheds, Knickerbocker Lake had significantly more high impact sites, 8 versus 2 in Adams Pond watershed (see map, pg. 12).

Town roads, residences and roads and driveways in general were most frequently associated with erosion sites identified during the survey.

Table 2. Adams Pond and Knickerbocker Lake erosion sites by land use type and impact level.

Site category	High Impact	Medium Impact	Low Impact	Total
Beach/Shore Access	1	2	3	6
Commercial	0	2	0	2
Driveway	2	2	0	4
Municipal	1	0	0	1
Residential	3	4	3	10
Private Road	2	2	0	4
Town Road	1	9	2	12
Trail/Path	0	2	0	2
State Road	0	2	3	5
Total	10	25	11	46

Land use: The following pie chart shows the breakdown of all identified erosion sites by land use category. Town roads and residences were the most frequently identified land use category and about half of the erosion sites were associated with roads.

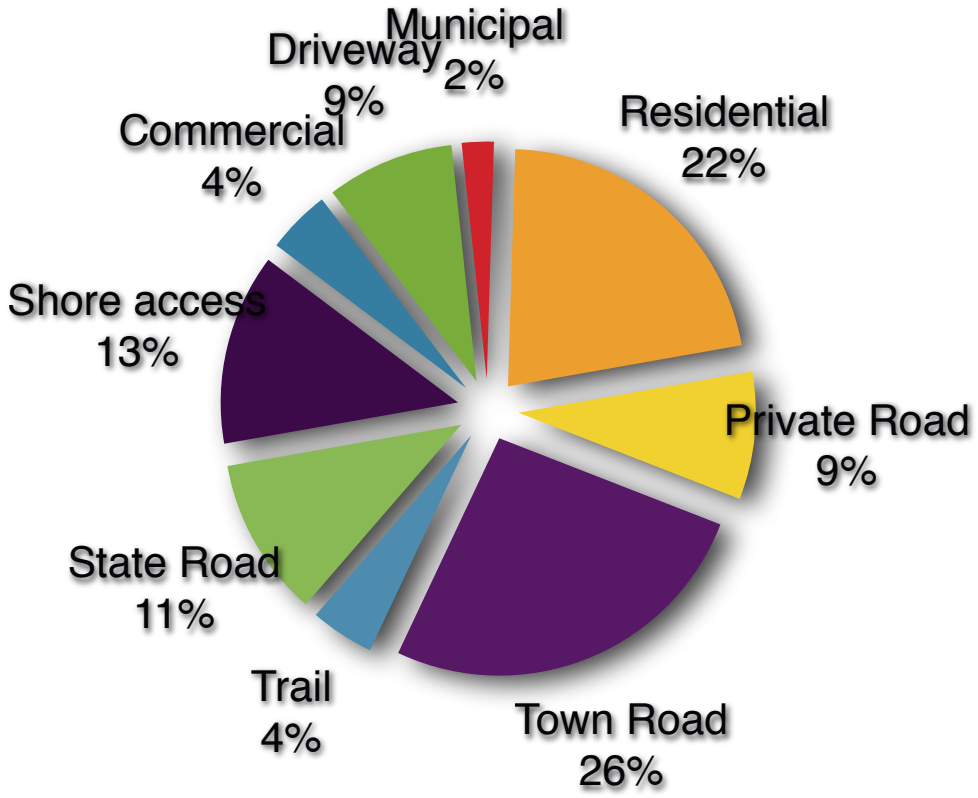


Figure 1. Land use associated with each erosion site identified in June 7 survey, as a percentage of the total.

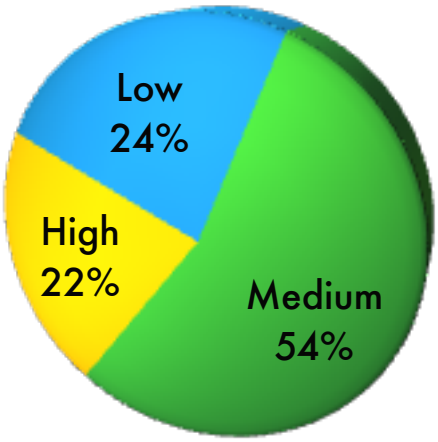
Impact: The potential impact of each identified runoff site to lake water quality was assessed in the field.

At each site, surveyors documented the type and severity of the erosion, the size of the eroded area and the presence and extent of a vegetative buffer between the erosion site and the lake that might trap sediments.

Most sites identified during the survey were assessed as having medium impact.

Although the overall number of erosion sites identified during the survey were relatively few, 76% were judged as having the potential to be moderate to high contributors of sediment to the lake.

Most sites (76%) identified had more than one erosion problem and 47% had three or more problems.

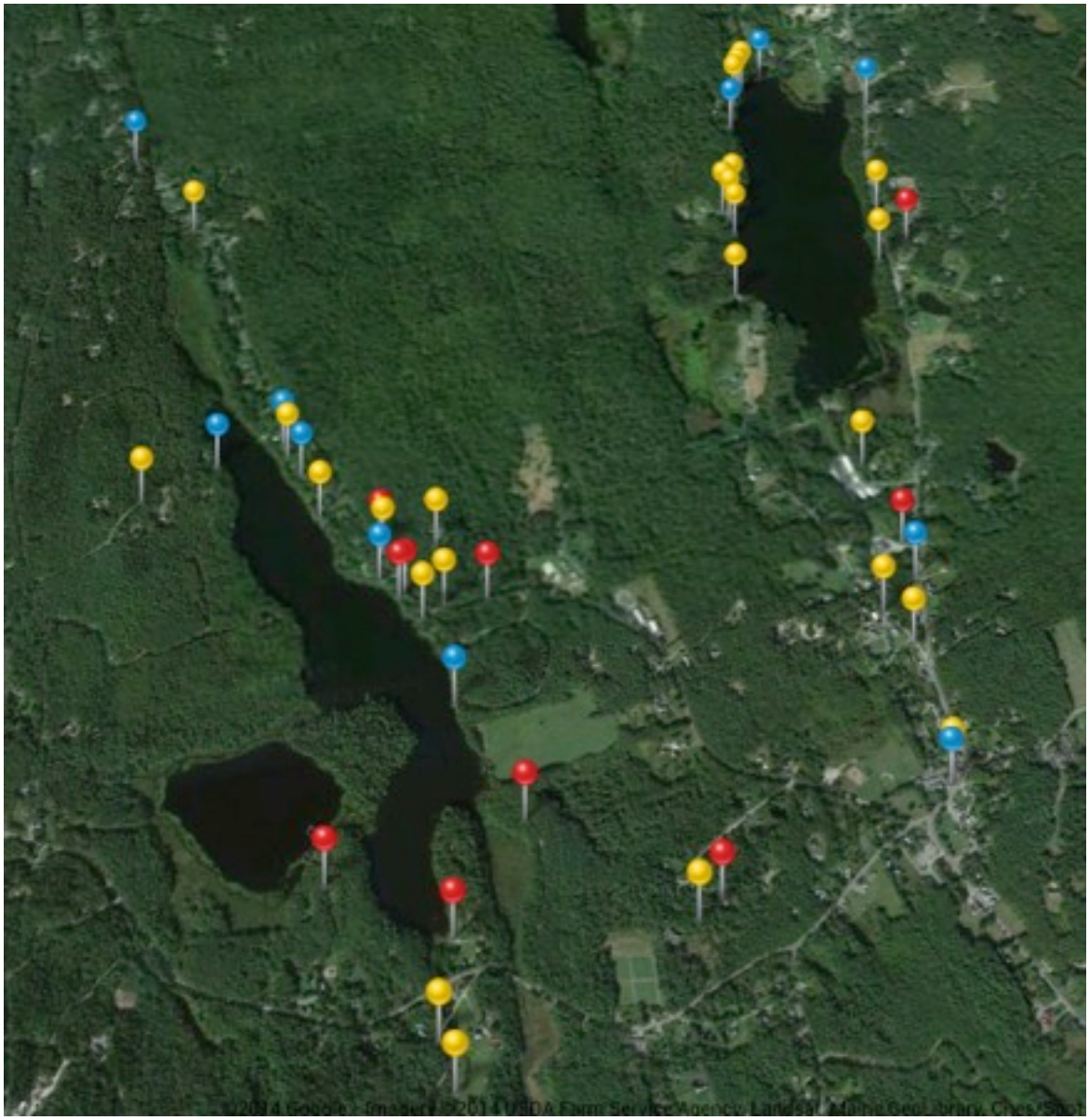


Low impact sites are those with limited soil transport off site.

Medium impact sites are those where sediment is transported off site but not in a high volume.

High impact sites are sites where a significant volume of sediment leaves the site and enters the waterbody.

Fig. 2. Impact type as percentage of total. Medium impact sites were most commonly reported during the survey, with similar numbers of low and high impact sites



Location of erosion sites identified during Adams Pond and Knickerbocker Lake watershed surveys. Red dots signify high impact sites; yellow dots medium impact and blue dots are low impact sites.

Cost to fix erosion problems: At each site, surveyors not only documented problems, they estimated the cost and technical expertise needed to fix the problem.

Surveyors estimated that most erosion sites in the watersheds would cost between $500 and $2,500 to fix. Five sites would require investments greater than $2,500 to repair and nine would cost under $500.

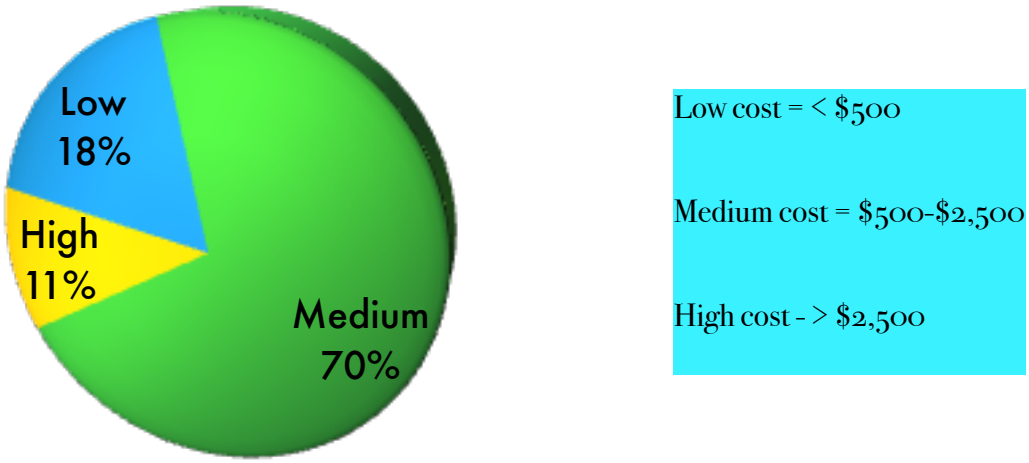


Figure 3. Estimated cost to fix erosion sites identified in June 7 survey.

Roads

Twenty-one erosion sites , almost half, were associated with roads. Twelve with town roads, five with state roads and four with private roads. Most were in the medium to high cost range to fix.

Common problems:

- Undersized, clogged & unstable culverts
- Surface erosion
- Road shoulder erosion
- Road ditch erosion
- Winter sand buildup
- Filled plunge

Common recommendations:

>Armor or replace culverts

>Add material to road surface

>Install runoff diverters

>Vegetate road shoulders

>Install/maintain plunge pools

Inadequate culverts and maintenance problems

This unstable, poorly designed and maintained culvert has caused significant erosion of a residential property on Knickerbocker Lake. Culvert replacement with proper design to slow and intercept flows is needed.

When plunge pools become filled with sediment they are incapable of trapping more.

Routine maintenance can ensure plunge pools continue to capture sediments.

Road surface erosion

Steep gravel roadways are susceptible to road surface erosion.

Properly installed runoff diverters can minimize erosion of road surfaces.

Road culvert and ditch problems

Erosion around culverts and roadway ditches was seen at several road sites during the survey.

Recommendations to address these problem sites include armoring culverts and ditches, reshaping ditches and vegetating road shoulders and ditches.

Residential sites

Ten erosion sites were associated with residential properties. Three were rated as high impact, four as medium and three as low impact.

Common problems:

- Surface erosion
- Bare soil
- Roof runoff erosion
- Inadequate shoreline vegetation
- Unstable shore access

Common Recommendations:

>Mulch or vegetate bare soil

>Create or add to shore buffer

>Infiltration trench at roof drip line

>Establish vegetated buffer

>Stabilize paths

Surface erosion and bare soils on shoreline properties contribute runoff to lake. Mulching or vegetating problem areas and creating defined foot paths can help solve these problem areas.

Erosion along this shoreline could be addressed by planting native plants and by not mowing to the shoreline.

Leaving a natural unmowed buffer along the shore can help solve erosion problems and trap runoff.

Shore Access

Five sites erosion sites were associated with shore access points. One was assessed as high impact, two as medium and two as low impact.

Common problems:

- Lack of shoreline vegetation
- Surface and shoreline erosion
- Bare soil
- Unstable access

Common recommendations:

>Mulch, vegetate bare soil

>Define/stabilize foot path

>Define parking area

>Install runoff diverters

Undefined foot paths can lead to bare soil and erosion.

Creating a defined trail and revegetating areas could resolve erosion at this and other access points on Adams Pond.

An eroded gully along this shore access point could be addressed by placing check dams and armoring the ditch with stone.

Driveways

Four erosion sites were associated with driveways. Two were high impact sites and two were medium.

Common problems:

- Surface and shoulder erosion

Common recommendations:

>Install runoff diverters & turnouts

>Add new surface material/reshape

Severe surface erosion was observed on steep driveways in both watersheds.

Resurfacing and installing runoff diverters and turnouts can reduce erosion problems and keep gravel on driveways and out of the lake.

Other impacts

Trails and commercial sites were associated with two medium impact sites. Construction and landscaping without proper sedimentation controls attributed to onsite erosion and downstream impacts at two sites.

A crushed culvert at this stream crossing means a flooded trail and eroded sediment entering a stream that flows into Knickerbocker Lake.

Landscaping at this residential site without the use of best management practices resulted in sedimentation into this ponded stream and downstream to Knickerbocker Lake.

Although individually each runoff site may appear small, it is the cumulative impact of many sites that leads to water quality degradation.

Conclusions and next steps

The June 7 survey documented 46 erosion sites within the Adams Pond and Knickerbocker Lake watersheds. Almost half of the sites were associated with town, state and private roads and one quarter were associated with private residences. At several sites, notable along Back River Road and Adams Pond Road, development on steep slopes did not incorporate stormwater management design and erosion with effects to downstream properties was the result.

Although some sites, particularly those associated with roads, culverts and driveways, will require technical expertise and a substantial commitment of money to correct, many of the problems found during the survey could be corrected at low cost or prevented through education programs. The survey pointed out a clear need to better educate property owners about buffer zones, low impact development options and sedimentation control practices for construction.

Two high impact sites were found in the Adams Pond watershed. One involving a stream culvert on municipal property can be fixed by armoring the culvert and stream. The other high impact site, a stream within a residential development that is severely eroded, may be difficult to correct.

Several erosion sites along Adams Pond Road were due to the proximity of the road to the shore, the steep slope adjacent to the roadway and the lack of defined public access sites, which has resulted in several eroded parking spots and foot paths. The Town and BRWD will need to work closely to rectify these sites but where road and shoreline are close, problems are likely to continue.

Knickerbocker Lake had the highest number of high impact sites and a cluster of sites on Back River Road attest to the difficulties that arise when steep slopes are developed. Erosion on these steep sites has not only affected the immediate property, but downstream properties have also been eroded by storm flows carried under the roadway. Addressing these sites will take technical expertise and will be costly.

Moving forward to address the erosion problems in the watershed will take a coordinated effort by BRWD, the Town of Boothbay, MDEP, KLSWCD, Knickerbocker Lake Association, Boothbay Region YMCA, Boothbay Region Land Trust, West Harbor Pond Watershed Association and property owners.

Watersheds and lakes have many users. It will take a coordinated effort by landowners, public agencies and watershed organizations to protect the watershed and surface water quality.

Specific watershed conservation projects and deadlines are proposed below:

Adams Pond and Knickerbocker Lake Watershed partners*

• Meet to prioritize identified sites for remediation and begin developing Watershed Protection Plan (Fall 2014)

• Once prioritized, work with property owners to develop plans to address priority sites (Winter 2015).

• Prepare and submit 319 MDEP grant application to seek funds to mediate high priority sites .

• Develop and share educational materials to help property owners adopt practices to reduce runoff (ongoing).

* BRWD, Town, KLSWCD, KLA, YMCA, BRLT, WHWPA, land owners, concerned citizens

BRWD

• Address erosion sites on BRWD property on Adams Pond Road
• Continue to collect water quality data for Adams Pond and Knickerbocker Lake
• Maintain and update datasets on point and nonpoint source pollution sites within both watersheds
• Develop GIS for both watersheds to improve management and monitoring
• Work with watershed land owners to foster watershed conservation
• Develop watershed education programs
• Develop a conservation land acquisition program and forest management plans for BRWD watershed land.
• Continue to support development and enforcement of watershed protection ordinances

Town of Boothbay

- Conduct regular maintenance of town roads in watershed
- Address erosion sites associated with town roads and municipal properties
- Develop public access plan for Knickerbocker Lake shore access
- Properly remove excess winter sand from roadways within the watershed promptly
- Promote training for road crews, boards and other decisionmakers
- Continue strong enforcement of shoreland, resource area and watershed protection ordinances
- Work with BRWD to update town watershed protection ordinances to promote conservation and protect water quality.

Watershed property owners

- Prevent polluted runoff from entering lake. Collect runoff in depressions or divert to vegetated buffer
- Minimize the amount of cleared land and road surfaces on your property
- Consider less mowing and raking. Let areas, particularly along the shoreline, revert back to native plants
- Call the Code Enforcement Officer before cutting vegetation within 250 feet of the shoreline
- Maintain septic systems properly. Pump septic tanks every 2-3 years for year round residences, 4-5 for seasonal. Upgrade marginal systems.
- Minimize road and driveway runoff by doing regular maintenance.
- For help with landscaping, runoff, native plantings, contact Knox Lincoln County Soil and Water Conservation Distric, Maine DEP, the Boothbay Code Enforcement Officer or BRWD

For more information, contact:

Boothbay Region Water District

184 Adams Pond Road

Boothbay, ME 04537

(207) 633-4723, www.bbrwd.org

Town of Boothbay

Wiscasset Road

Boothbay, ME 04537

(207) 633-2015, www.townofboothbay.org

Knox Lincoln Soil and Water Conservation District

893 West St. #103

Rockport, ME 04856

(207) 596-2040, www.knoxlincoln.org

2014 Adams Pond and Knickerbocker Lake Survey Addendum

On November 17, BRWD staff accompanied by Dirigo Engineering visited each of the watershed survey NPS sites identified for further study. During this site visit, we also looked at two NPS sites on Back River Road that were identified in the 2009 BRWD Source Water Assessment Update but not identified by volunteers in the watershed survey.

At these two locations, large culverts discharge storm water between lakefront residential properties. The November 17 visit confirmed 2009 survey findings that uncontrolled storm water at these culvert outlets is causing erosion and is a significant contributor of NPS pollution to Knickerbocker Lake.

These two sites are added to the total number of sites in the 2014 survey, raising the survey total to 48. They are both high impact sites, raising the total number of high impact sites to 12, 10 of them in the Knickerbocker Lake watershed. Both of these sites are associated with town roads.