Colby Outing Club Cabin Site Plan
Summer 2011

In June of 2011 the Maine DEP evaluated the Colby Outing Club Cabin, COC, against the Maine Lakesmart Program. This document details the site upgrades proposed to meet the Lakesmart Standards.

List of Attachments:

1) DEP Lakesmart Evaluation.
2) Site Plan with locations of proposed work (items A-D)
3) Descriptions of proposed work (items A-D).
4) Appendices 1-8
5) Site photographs
Property Evaluation Form For Lakesmart Awards Program

The following evaluation and recommendations are based on commonly accepted Best Management Practices. The intent of this program is to improve or maintain the property for water quality. In most cases, award properties should exceed the minimum shoreland zoning regulations. This evaluation covers only areas that were visually inspected and is based on site conditions apparent at the time of inspection.

Please look out for violations of Environmental Law. We can not give a LakeSmart award unless the violation is fully remediated. It is the evaluator's prerogative to withhold a LakeSmart award for properties that have been recently altered in a way that negatively affects water quality. If in doubt, hold off making an award. Consult the lake association for more information. This program should not be linked to enforcement action. If you have any question about the award qualifying score, do not give out the sign; wait for DEP confirmation.

Body of Water/Watershed: Great Pd
Evaluator Shannon, Welch Date 1 June 11
Property Owner(s) Colby College
Mailing Address 5000 Mayflower Hill
Telephone number(s) 207-859-5000
Email address c/o Whitney King: dwking@colby.edu
Own for # Yrs ? Year round or seasonal? seasonal
Town: Belgrade Road Name or Fire Lane# 80 Snug Harbor Ln, Belgrade

Permission to post name on web and newspaper? Yes ☑ No ☐
Award winners will receive a framed certificate.
Send signs (circle one): ☐yes, send 1, ☑yes send 2 ☐no, gave them 1 ☐no, gave them 2 ☐

<table>
<thead>
<tr>
<th>Lakesmart Award Status:</th>
<th>Score</th>
<th>Recognition?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 Driveway... (11/15 to qualify)</td>
<td>12</td>
<td>yes</td>
</tr>
<tr>
<td>Section 2 Structure... (13/18 to qualify)</td>
<td>14</td>
<td>yes</td>
</tr>
<tr>
<td>Section 3 Yard... (22/33 to qualify)</td>
<td>21</td>
<td>no</td>
</tr>
<tr>
<td>Section 4 Shore... (25/37 to qualify)</td>
<td>14</td>
<td>no</td>
</tr>
<tr>
<td>(For shoreline properties only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sections 1-4 = LAKESMART AWARD</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Section 5 Undeveloped land (11/15 to qualify)</td>
<td></td>
<td>no</td>
</tr>
</tbody>
</table>

Comments (successes or other news worth story):

PLEASE make a copy and return original with a copy of recommendations with invoice within 2 weeks to Barb Welch either electronically to barb.welch@maine.gov or snail mail to Maine DEP, 17 State House Station, Augusta, ME 04333-0017.
# Section 1: Driveway and Parking Areas

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking System</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>The driveway and parking area are defined and minimized</td>
<td>0 = undefined and/or excessive</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1 = somewhat defined and/or excessive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = mostly defined, slightly excessive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = well defined and minimal in size</td>
<td></td>
</tr>
<tr>
<td>Driveway and parking surfaces are stable with no signs or erosion</td>
<td>0 = &gt; 10% eroding</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1 = between 5% and 10% eroding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = between 1% and 4% eroding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = no erosion</td>
<td></td>
</tr>
<tr>
<td>Shoulders and ditches are stable with no signs of erosion</td>
<td>0 = &gt; 10% eroding</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1 = between 5% and 10% eroding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = between 1% and 4% eroding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = no erosion</td>
<td></td>
</tr>
<tr>
<td>Stormwater moves as sheet flow over driving surfaces (Except when</td>
<td>0 = mostly channelized</td>
<td>3</td>
</tr>
<tr>
<td>channelized due to water bars or other BMPs designed to move water off</td>
<td>1 = more channelized than sheet flow</td>
<td></td>
</tr>
<tr>
<td>road surface)</td>
<td>2 = more sheet flow than channelized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = entirely sheet flow</td>
<td></td>
</tr>
<tr>
<td>Stormwater flow from road surface is directed to an effective vegetated</td>
<td>0 = None</td>
<td>1</td>
</tr>
<tr>
<td>buffer or other BMP</td>
<td>1 = Some</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = Most</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = All</td>
<td></td>
</tr>
</tbody>
</table>

Total Available Points = 15 (11 to qualify)  Total = 12

**Recommended Action(s):** Driveway is stable and you passed this section but if you want to go beyond to be a model property, plant some groundcover & shrubs where runoff from the driveway is going (at the bottom of drive by chain) to treat the stormwater. A rubber razor blade could be used at the base of the driveway to divert water to the right and into the well vegetated buffer. I am unsure of the exact way the drive sloped but if it slopes to the left the razor could still be used.
### Section 2: Structures and Septic System

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking System</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof runoff is infiltrated or directed to rain garden, barrel or stable outlet</td>
<td>0 = None, 1 = Some, 2 = Most, 3 = All</td>
<td>2</td>
</tr>
<tr>
<td><em>Pet wastes are not a threat to water quality (Do you have a pet?)</em></td>
<td>0 = much waste evident, 1 = some waste evident, 2 = no waste evident, 3 = no pets</td>
<td>3</td>
</tr>
<tr>
<td><em>No evidence of septic system malfunction (What is the age of your septic system?)</em></td>
<td>0 = significant evidence of malfunction, 1 = no knowledge of system design and/or location or system installed pre-1974 and potential evidence of malfunction, 2 = Post-1974 system and potential evidence of malfunction, 3 = no evidence of malfunction</td>
<td>3</td>
</tr>
<tr>
<td>Septic system free of woody vegetation so system is not threatened by roots</td>
<td>0 = much vegetation, 1 = some vegetation, 2 = threatened by encroaching vegetation, 3 = free of woody vegetation</td>
<td>3</td>
</tr>
<tr>
<td><em>Septic system regularly pumped and maintained (How often do you pump your septic system?)</em></td>
<td>0 = more than 5 years, 1 = every 4 to 5 years, 2 = every 3 to 4 years, 3 = every 2 to 3 years or less</td>
<td>1</td>
</tr>
<tr>
<td>Home heating oil tank or exterior toxic chemical storage (like gas, pesticides...) does not pose a threat</td>
<td>0 = exterior tank or toxic chemical container is leaking or rusty or not covered and where snow/ice cascading off roof would hit it, 1 = exterior tank not covered, but not located where it could be hit by cascading ice, 2 = exterior tank has valve cover, 3 = exterior tank is completely covered or there is no exterior tank or toxic chemicals</td>
<td>3</td>
</tr>
<tr>
<td><em>! Decks, stairs, ... meet the setback requirement of 100 feet unless grandfathered (What is age of structure?)</em></td>
<td>Refer to Shoreland Zone Decision Tree for help. Eligible – OK for award, Ineligible – no award allowed</td>
<td>![ ] no</td>
</tr>
<tr>
<td><strong>Total Available Points = 18</strong></td>
<td><strong>(13 to qualify)</strong></td>
<td><strong>Total = 14</strong></td>
</tr>
</tbody>
</table>

---

A LakeSmart award cannot be issued if there is a malfunctioning septic system.

* Means this is a question to ask owners.

**Recommended Action(s):** Many portions of the property are very good and you passed this section but if you want to go beyond to be a model property, figure out where the sink grey water is going and if necessary treat through stone trench or fabric covered pipe drain or other practice. Since the water is not under pressure, it is not necessary to build a true grey water system (small septic system with leach bed). Outhouse is good way to deal with black water.
### Section 3: Yard, Recreation Area and Footpaths

*(Immediate area around home 1 acre or less)*

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking System</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil erosion is not occurring on site</td>
<td>0 =&gt; 10% eroding 1 = between 5% -10% 2 = between 1% - 4% 3 = no erosion</td>
<td>2</td>
</tr>
<tr>
<td>Stormwater flow goes to an effective vegetated buffer or other BMP</td>
<td>0 None 1 Some 2 Most 3 All</td>
<td>1</td>
</tr>
<tr>
<td>*Use of pesticides and herbicides are omitted or minimized. <em>Pests are only spot treated as needed.</em> <em>(Please tell me how you control pests?)</em></td>
<td>0 Never 1 Sometimes 2 Mostly 3 Always</td>
<td>3</td>
</tr>
<tr>
<td>*Use of fertilizer is minimized and only used based on soil test. <em>How often do you fertilize your lawn or plants?</em></td>
<td>0 Areas fertilized yearly 1 Areas fertilized less than 1/year 2 areas fertilized based or soil test 3 fertilizer is never used</td>
<td>3</td>
</tr>
<tr>
<td>Lawn area is minimized</td>
<td>0 Excessive 1 Moderate 2 Minimized 3 No lawn</td>
<td>1</td>
</tr>
<tr>
<td><em>Turf is maintained at 2.5 to 3.5 inches and Clippings are left on lawn</em> <em>(What do you set your mower height at?)</em></td>
<td>0 Never 1 Sometimes 2 Mostly 3 Always</td>
<td>2</td>
</tr>
<tr>
<td>Duff layer is maintained wherever possible</td>
<td>0 None 1 Some duff and/or mulch 2 Most areas with duff and/or mulch 3 All areas with duff</td>
<td>1</td>
</tr>
<tr>
<td>Natural uneven topography is maintained, restored or enhanced</td>
<td>0 None 1 Some 2 Most 3 All</td>
<td>1</td>
</tr>
<tr>
<td>Cultivated areas are properly mulched</td>
<td>0 None 1 Some 2 Most 3 All mulched or no cultivated areas</td>
<td>3</td>
</tr>
<tr>
<td>Recreation areas are defined and limited</td>
<td>0 None 1 Somewhat 2 Mostly 3 All</td>
<td>2</td>
</tr>
<tr>
<td>Paths are limited, defined, curved and do not convey runoff directly into lake.* <em>(Receives full points if there are no paths but there is no obvious need or observed foot traffic.)</em></td>
<td>0 None 1 Somewhat 2 Mostly 3 All</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total Available Points = 33**

(22 to qualify) Total = 21

* Means this is a question to ask owners

**Recommended Action(s):** You are very close to an award here! Reduce the lawn area a little - so there is still room for frisbee, etc but so not whole front of camp is lawn. Leave the duff - don't rake. Delinate paths to lake using vegetation or erosion control mulch; currently there are no clear paths so the area is trampled. Also mulch a path from driveway to camp and camp to lake. Extend buffer garden creating 10’ of plantings for the entire water front while leaving a small opening for access to the lake.

LakeSmart Property Evaluation Form  May 2010
## Section 4: Shorefront and Beach Area

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking System</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer is properly sited along shoreline including drainage ditches</td>
<td>0 = None, 1 = Some, 2 = Most, 3 = All</td>
<td>1</td>
</tr>
<tr>
<td>! Buffer contains 5 tiers of vegetation: canopy, shrub, understory, ground cover, duff that are effective in filtering stormwater</td>
<td>0 = no tiers effective, 1 = 1 tier effective, 2 = 2 tiers effective, 3 = 3 tiers effective, 4 = 4 tiers effective, 5 = 5 tiers effective or all possible tiers as occur naturally</td>
<td>!1</td>
</tr>
<tr>
<td>Buffer vegetation is composed of native or native friendly species</td>
<td>0 = mostly invasive plants, 1 = mostly native friendly, 2 = both native friendly and native, 3 = all native plants</td>
<td>2</td>
</tr>
<tr>
<td>Buffer is receiving sheet flow, not channelized, concentrated flows</td>
<td>0 = all flow concentrated, 1 = most flow concentrated, 2 = most flow is sheet, 3 = all flow is sheet flow</td>
<td>3</td>
</tr>
<tr>
<td>! Buffer is sufficiently wide to filter stormwater effectively. (The steeper the slope, the wider buffer needs to be. The widths given assume a relatively flat area. The larger the area draining to the buffer, the wider the buffer needs to be.)</td>
<td>0 = less than 10 feet in width, 1 = 10 to 20 feet, 2 = 21 to 30 feet, 3 = 31 to 40 feet, 4 = 41 to 50 feet, 5 = over 50 feet in width, negative slope or natural ice berm intact</td>
<td>!0</td>
</tr>
<tr>
<td>Duff layer is maintained wherever possible (duff layer is thick &amp; deep; mulch is a secondary solution)</td>
<td>0 = None, 1 = Some duff and/or mulch, 2 = Most areas with duff and/or mulch, 3 = All areas with duff</td>
<td>1</td>
</tr>
<tr>
<td>Natural uneven topography is maintained, restored or enhanced</td>
<td>0 = None, 1 = Some, 2 = Most, 3 = All</td>
<td>1</td>
</tr>
<tr>
<td>Shoreline is stable</td>
<td>0 = mostly unstable, 1 = moderately unstable, 2 = mostly stable, 3 = totally stable</td>
<td>3</td>
</tr>
<tr>
<td>Shoreline is natural. Where riprap or concrete is used, it is vegetated and limited in size or appropriate to location as a BMP</td>
<td>0 = 100% vegetated, 1 = 33% to 99% vegetated, 2 = 1% to 33% vegetated, 3 = Totally naturalized shoreline or appropriate with location</td>
<td>2</td>
</tr>
<tr>
<td>Pathway and dock area designed to compliment buffer (least impairment to buffer)</td>
<td>0 = Effectiveness of buffer is compromised, 1 = some buffer still functioning, 2 = most buffer still functioning, 3 = Design of pathway and dock totally compliments buffer</td>
<td>0</td>
</tr>
<tr>
<td>Beach or swimming access is stable and designed to prevent runoff</td>
<td>0 = No, 1 = Somewhat, 2 = Mostly, 3 = Yes</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total Available Points = 37**

(25 to qualify) Total = **14**

! A buffer of 3 tiers, at least 10 feet wide (even if berm or neg. slope), and an effective width required for LakeSmart award regardless of score.

! All decks, stairs, etc. whether temporary or permanent, must meet the setback requirement of 100 feet unless grandfathered (built before 1986) in order to receive a LakeSmart award. Refer to Shoreland Zone Decision Tree for help.

LakeSmart Property Evaluation Form  May 2010
Recommended Action(s): Some of your practices are lake friendly but to do more to protect the lake and receive an award: Need to create an effective buffer along shore that is at least 10’ wide and has 3 effective tiers - could be erosion control mulch, blueberries, small trees. (can purchase blueberry sod that creates a buffer quickly) Suggest moving fire ring away from shore to allow buffer to expand there. Delineate paths as mentioned in yard section. Riprap could be placed along the shoreline where boats have been brought in and out. There is some undercutting and bare dirt which could be held in place with a small riprap job and make the area look nice.

Section 5 Undeveloped Land (Bonus Recognition)
All areas in excess of the one acre immediately around the home

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking system</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low % of impervious surfaces</td>
<td>0 = &gt; 10%</td>
<td>1 = between 5% and 10%</td>
</tr>
<tr>
<td>Low % of lawn and cleared areas</td>
<td>0 = &gt; 30%</td>
<td>1 = between 15 and 30%</td>
</tr>
<tr>
<td>Paths or road through undeveloped land is stable</td>
<td>0= numerous eroding roads</td>
<td>1 = a few eroding roads</td>
</tr>
<tr>
<td>Condition of undeveloped land is undisturbed</td>
<td>0 = recently cleared or graded with little vegetation</td>
<td>1 = several recently cleared or graded plots</td>
</tr>
<tr>
<td>Conservation Easement on land</td>
<td>0 = no 1 = considering 2 = In process 3 = Yes</td>
<td>0</td>
</tr>
</tbody>
</table>

Total Available Points = 15
(11 to qualify) Total = | 0 |

Recommended Action(s): ___
Thank you for participating in the LakeSmart Program!

The following recommendations are based on commonly accepted Best Management Practices. The intent of this program is to encourage people to maintain properties that protect lake quality. This evaluation covers only areas that were visually inspected and is based on site conditions apparent at the time of inspection.

Lake: Great Pond
Owner: Colby Outing Club

Recommendations:
Many portions and practices on the property are very good and protective of the lake. The shoreline and yard need more lake friendly practices to qualify for a LakeSmart Award. And if you want to go beyond to be a model property, here are some suggestions.

Driveway: Passed this section but if you want to go beyond to be a model property, plant some groundcover & shrubs where the runoff from the driveway is going - at the bottom of drive by chain - to treat the stormwater. A rubber razor blade could be used at the base of the driveway to divert water to the right and into the well vegetated buffer. I am unsure of the exact way the drive sloped but if it slopes to the left the razor could still be used.

Structures & septic: Passed this section but if you want to go beyond to be a model property, figure out where the sink grey water is going and if necessary treat through a stone trench or fabric covered pipe drain or other practice. Since the water is not under pressure it is not necessary to build a true grey water system (small septic system with leach bed). A infiltration trench could be used under the porch drip line which is located on the lake side of the house. This would allow the water from the roof to be directly infiltrated into the ground.

Yard: You are very close to an award! Reduce the lawn area a little - so there is still room for frisbee, etc. but not so whole front of camp is lawn. Leave the duff - don't rake. Delinate paths to lake using vegetation or erosion control mulch; currently there are no clear paths so the area gets trampled. Also mulch path from the drive way to the house and one leading to the lake would help to centralize foot traffic. Extend buffer garden creating 10' of plantings for the entire water front while leaving a small opening for access to the lake.

Shorefront: Need to create an effective buffer along shore that is at least 10' wide and has 3 effective tiers - could be erosion control mulch, blueberries, small trees. (can purchase blueberry sod that creates a buffer quickly) Suggest moving fire ring away from shore to allow buffer to expand there. Delinate paths as mentioned in yard section. Riprap could be placed along the shoreline where boats have been brought in and out. There is some undercutting and bare dirt which could be held in place with a small riprap job and make the area look nice.

---

Lakesmart Award Status:
SECTION 1 Driveway and Parking: Yes
SECTION 2 Structures and Septic: Yes
SECTION 3 Yard, Recreation and Paths: No
SECTION 4 Shorefront and Beach Area: No
(For shorefront properties only)
LAKESMART AWARD: No, not yet
SECTION 5 Undeveloped Land

Reviewer: Shannon, Welch Date: 1 June 11
LakeSmart Property Evaluation Form May 2010
Reviewer contact info  Maggie Shannon 207-242-6368 or msshannon@roadrunner.com or Barb Welch: 287-7682

For more information on LakeSmart, check out our web site at www.MaineDEP.com, click on DEP Home page and put LakeSmart in Search DEP.
A. Open Box Culvert
An open box culverts will be installed on the road next to the outhouse. See A on site map. See Appendix 1 for more information on open box culverts.
1. A ditch 8” x 6” x 25’ will be dug. The ditch will start at the cedar tree and continue across the road and upward at approximately a 30° angle.
2. A box with 2x8’s for the base board and 2x6’s for the sides will be assembled with galvanized nails with pipe spacers placed every four feet along the culvert.
3. The culvert will flow into a small plunge pool lined with unwoven filter fabric and covered with crushed rock followed by angular granite.

B. Rip Rap
Rip rap will be installed in two locations on the shoreline at the locations. See B on site map. See Appendices 2-4 for site location, construction cross-section, and DEP datasheet on rip rap.
1. Geotextile will be installed in location A on site map from the lake bottom to the base of the tree (Appendix 3).
2. The geotextile will be covered with crushed rock to secure the fabric.
3. Crushed rock will be covered with 12” angular granite to create the final armored barrier.
4. Location B on Appendix 2 is already well armored with natural lake boulders. The last foot of this location will be reinforced with 12” angular granite.

C. Infiltration Ditch
An infiltration ditch will be installed in front of the porch of the cabin facing the water. See C on site map and Appendix 5 for details. This ditch will improve the buffer capacity of the property by decreasing the kinetic energy of the water falling from the roof. See Appendix 6 for DEP datasheet.
1. A ditch 1’ x 2’ x 20’ will be dug. Soil from the excavation will be used in other plantings on the site.
2. The ditch will be lined with unwoven filter fabric and filled with crushed rock according to the cross sectional drawing in DEP datasheet.

D. Buffer
The buffer will encompass the green box shown site map labeled D. For information please Appendix 7 for DEP datasheet.
1. The fire pit will be moved back toward the house about 10 to 15 feet. See the red circle on site map.
2. 12 bayberry bushes and 6 high bush blueberries will be planted in the buffer zone. For more information about these plants see Appendix 8. The buffer zone will be covered with erosion control mulch.
Also Called: Box culverts

Purpose: Open-top culverts collect and divert water off a camp road or driveway and discharge it to a vegetated or other stable area. By getting stormwater off the road, open-top culverts reduce erosion of the road surface, while allowing easy movement of vehicles across the structure. Open-top culverts are inexpensive to build and relatively easy to install. They can be built from lumber with common hand tools.

Open-top culverts can be used on seasonal camp roads and driveways that receive little or no winter plowing.

Installation: Open-top culverts can be constructed of pressure treated lumber or cedar timbers. Using pressure treated lumber will considerably extend the life of the structure. Spacers placed in the open-top culverts will hold the shape of the culvert and strengthen the structure.

Open-top culverts will vary in length, depending on the width of your road. When sizing an open-top culvert, remember that it should be installed at an approximately 30° angle down slope. Take this added length into consideration when purchasing materials.

The following is a guideline for materials you will need:
- 2" x 6" pressure treated lumber for the sides (twice the total length as that for the bottom)
- 2" x 8" pressure treated lumber for the bottom
- Galvanized nails (approximately 3") to secure the base to the sides of the structure
- Spacers to maintain the structure of the culvert (spikes, washers/bolts/nuts, pipe, or 1" pieces of wood and galvanized nails)
Install the culvert flush with the surface of the road. If placed too high, stormwater will not enter the structure; if placed too low, it may quickly fill with road material and sediment loosened during installation.

The outlet of the open-top culvert should extend beyond the edge of the road. Remove any plowing berms or other debris that could interfere with water flowing from the outlet. Diverted water should flow into a stable area away from the road or open water to allow for infiltration. A stone-lined outlet or vegetated area is an acceptable way of reducing erosion at the culvert outlet.

**Materials:** All materials needed to construct an open-top culvert can be purchased from lumber and hardware stores.

**Maintenance:** Open-top culverts need to be cleaned regularly to remove sediments, gravel, leaves, and twigs. Check after storm events for accumulated sediment. A child’s toy hoe fits easily into the culvert and can be used for cleaning.

Open-top culverts are not generally recommended for camp roads that get plowed in the winter. Winter snowplowing can easily destroy this type of culvert and result in even greater erosion problems in the spring. However, some people have had success with open-top culverts if the road is not plowed until the ground is frozen and have an attentive plow driver. If you choose to plow a road with an open-top culvert, you may want to flag both end of the culvert to alert the snow plow drivers.
Cross section drawing for proposed plant rip rap.

Site of erosion

Tree A

Boat ramp

1920s old dock

6ft

10ft
LAKE SHORELINE RIPRAP
~stabilizing severe erosion on lakefronts~

**Purpose:** Riprap is heavy, irregular-shaped rock fit into place, without mortar, to manage severely eroded lake banks or shorelines. Yet, controlling shoreline erosion often does not require the use of riprap. Instead, shoreline erosion problems can frequently be addressed by limiting foot traffic, diverting upland runoff, and stabilizing banks with native vegetation. These are more affordable, lower-impact solutions that still protect water quality and property values. Riprap should be used only where necessary and never to replace a stable, naturally vegetated shoreline.

**Note:** A Maine Department of Environmental Protection (DEP) permit is required to install or repair riprap along lakes and other water bodies. If the installation or repair does not qualify for Permit-by-Rule (Natural Resources Protection Act, Chapter 305, Section 8) an individual permit under the NRPA must be obtained from DEP. Local permits may also be required; contact your local Code Enforcement Officer about shoreland zoning requirements.

**Installation:**
Riprap may only be utilized on lake shorelines where eroded bank slopes exceed 3 horizontal (h) feet to 1 vertical (v) foot—a 33% slope (NRPA Ch. 305, Section 8). To control bank erosion where slopes are shallower than these dimensions, vegetation must be used in place of riprap.

Appropriate Stone Size is Important

*Consider the site's exposure to wave action when choosing riprap stones.*

Stones are available as graded mixes. For conditions around smaller lakes and ponds, a riprap mix with a mean diameter (D50) of 10 to 12" should remain stable in most circumstances. For larger lakes with higher wave action or more ice scour, a larger stone mix may be necessary. Note that a 12"-round stone weighs roughly 100 pounds, so hand-placing large stone mixes may not be possible.

1. If necessary, excavate the bank so that the final riprap slope will be no steeper than 1(h):1(v) and no shallower than 3(h):1(v). Do not remove existing vegetation. Create a trench in the bank toe that is at least as deep as the height of your largest riprap stone (Figure 1).
2. Place a filter layer on top of the exposed slope to prevent soil movement under the riprap. If filter fabric is used, it should be followed by a 3" thick layer of clean ¾" crushed stone. Key in filter fabric at the top of the riprap edge and extend it into the toe trench. If filter fabric is not used, a 6" layer of crushed stone ranging from ¾" to 3" must be placed.
3. Immediately install the riprap layer. First place an anchoring row of large rocks in the trench at the toe of the bank. Riprap stones should then be hand-placed or very carefully dumped so that smaller stones fill the voids between larger ones. The riprap layer should be at least twice as thick as the average rock diameter.
4. Ensure that the riprap extends up the slope no more than 2' above the normal high water line.
5. **Native trees and/or shrubs should be planted above the riprap.** Vegetation provides habitat...
and can filter nutrients and pollutants from runoff. Planting non-native plants in the disturbed area is not permitted.

6. Disturbed soil above the riprap should be immediately stabilized with seed and hay mulch or permanently mulched, preferably with Erosion Control Mix (ECM).

Materials:
- Riprap: Purchase large angular stones from your local quarry or gravel pit. Do not take them from the shoreline (because they help prevent erosion) or from below the normal high water line (because they provide habitat for aquatic life).
- Filter fabric (also known as a geotextile): Contact your local Soil and Water Conservation District for local suppliers.
- Crushed stone may be purchased from your local quarry or gravel pit. Do not use unashed stone.
- Buffer plants can be purchased at garden centers. See DEP/PWD’s Conservation Practices Factsheets on native plants, which list suitable plants for different site conditions.
- Erosion Control Mix (ECM): See DEP/PWD’s Conservation Practice Factsheet on ECM for more information about this type of mulch and local suppliers.

Figure 1. Riprap installation

Maintenance:
Some displacement after frost heaving or severe storms is expected; return stones to their original positions as necessary. Monitor for slumping, and erosion behind the riprap.

References and Resources:

**Purpose:** Infiltration trenches collect and infiltrate runoff from paved driveways, rooftops and other areas. Infiltration trenches work best in well-drained soils like sands and gravels. Due to their relatively small size, they can effectively handle only smaller rainfall events. Infiltration trenches are not well suited for areas that receive large amounts of sediment (e.g., gravel driveways) as they will fill in quickly.

**Installation:** Dig a trench that is 18” wide and at least 8” deep. Make sure to dispose of the soil in a flat area where it cannot be washed into the lake. The front and sides of the trench may be edged with stone or lumber to hold the stones in place.

Extend the life of the infiltration trench by lining the sides with non-woven geotextile fabric. Fill to within 3” of the ground level with ½” to 1½” crushed stone. Fold a flap of non-woven geotextile fabric over the top of the trench and top off with additional stone.

**Materials:** Crushed stone can be purchased at your local gravel pit. Contact your local Soil and Water Conservation District for suppliers of non-woven geotextile fabric. Other geotextiles, including landscaping weed barrier, can be substituted for smaller projects.

**Maintenance:** To maintain these structures, periodically remove accumulated debris and weeds from the surface. Non-woven geotextile fabric will extend the life of these structures, however, they will eventually clog over time and the stone will need to be removed and washed to clean out the accumulated sediment and debris.


May 2006 DEPLW0775
Also Called: ECM, Slope Stabilizer, Erosion Control Mulch, Superhumus™, Wood Waste, Stump Grindings

Purpose: Erosion Control Mix is a kind of mulch made of partially composted bark, sand, gravel, stone and wood fragments. It is much heavier than other types of mulch and its mixture of elongated fibers, gravel and soil lock together to protect the underlying soil from erosion. Like other mulches, it also retains moisture, controls weeds and improves the soil as it decomposes. It can be used on paths, slopes and between plantings.

Installation: ECM should completely cover areas of bare soil to a thickness of 3 to 4 inches. Keep an inch or two of space between the mulch and base of plants. Erosion Control Mix should not be used in areas with concentrated water flows or on slopes greater than 2:1 (27°).

ECM often comes in a fine grade (such as Superhumus™) that works well in a more landscaped setting and a standard, more “chunky” grade that is less composted and holds up better on steeper slopes and paths. Some people choose to top-dress the chunky ECM with a few inches of Superhumus™ or regular bark mulch for a more finished appearance. If the ECM is going to be used to naturalize an existing lawn or grassy area, a weed barrier such as several layers of newspaper should be placed down before the mulch is added.

Materials: Locating this relatively new product can be difficult. However, many contractors are starting to use it on construction sites in place of a silt fence. Contact your local contractor or gravel pit and ask for Erosion Control Mix or the other names mentioned above. Make it clear that you are not looking for landscaping bark mulch because it is not the same product and will not be as effective. Some transfer stations also make ECM available to residents.

Maintenance: Mulched areas should be inspected regularly and after each large rainfall. Mulch should be immediately added to washed out areas to maintain the desired thickness. ECM should be left in place, and new plant growth should be promoted. Mulched areas should not be raked.

Drawbacks of Other Mulches: ECM is the most effective mulch for erosion control purposes. If ECM is not available, however, the following other mulches may be suitable. Any mulch is better than bare soil.

- Pine Needles – Washes away easily on slopes. Provides a natural look and is often plentiful and free. Especially good around acid-loving plants like blueberries, azaleas and rhododendrons.
- Bark Mulch – Better than bare soil, but easily eroded. Most popular mulch and readily available.
- Wood Chips – Will float away in rains and does not enrich the soil like ECM.
- Crushed Stone or Pea Stone – Does not allow vegetation to grow, creates an unnatural appearance and may not be allowed by DEP or Town depending on distance to water.


May 2006 DEPLW0772
Although this is not an exhaustive list, the following native plants are carried at local nurseries. If a particular plant is not available at your nursery, ASK for it by name. The more demand there is for native plants, the more likely a nursery is to carry it. Additionally, nursery staff may be able to recommend a suitable, NON-INVASIVE substitute.

**SMALL SHRUBS (<6’)**

**Bush Honeysuckle** (*Diervilia lonicera*) Also called American Fly Honeysuckle. (Do not confuse with European Fly Honeysuckle which is invasive.) Grows 2 to 5 feet high. A straggling shrub with handsome red berries. Sun to shade. Sandy, dry soil. Drought tolerant. Found in cool, rocky woods. Zones 3-7.

**Sheep Laurel/Lambkill** (*Kalmia angustifolia*) Grows from 1 to 3 feet high with a greater spread. Grows best in moist, organic, cool, acidic soils but can tolerate a variety of soil types. Prefers full sun to partial shade. Bright pink flowers bloom in early summer. As the name suggests it is poisonous to livestock. Zones 1-6.

**Fragrant Sumac** (*Rhus aromatica*) Available in standard and ‘Gro-Low’ varieties. Dwarf grows 2 to 3 feet with a 6 to 8 foot spread. A low shrub with compound leaves and small, fragrant, yellow flowers in spring, followed by red fruit. Excellent orange to red fall color. Leaves are aromatic when crushed. Sun to part shade. Dry, sandy to rocky soil. Good as bank covers and in mass plantings. Dwarf variety used as a ground cover. Found in dry, rocky, open woods. Zones 3-9.

**Snowberry** (*Symphoricarpos alba*) Grows 3 to 6 feet high with similar spread. Spreads by suckering so will form thickets, if allowed. Good for erosion control. Blue-green foliage, pink spring flowers and ornamental, white berries in fall. Rapid growth. Sun to part-sun. Moist to dry soil. Adaptable to a variety of soil conditions. Good for birds. Zones 3-7.

**Highbush Blueberry** (*Vaccinium corymbosum*) Grows from 6 to 8 feet in height with a spread of 8 to 12 feet. Typically found near bogs and marshes. Prefers moist, well-drained, acidic soil. Sun to partial shade. White bell-shaped flowers bloom in the spring and are followed by edible dark blue berries. Leaves turn red in the fall. Berries are attractive to birds and other wildlife. Zones 5-7.

**Mapleleaf Viburnum** (*Viburnum acerifolium*) Grows from 4 to 6 feet high with an equal spread. Grows best in well-drained, mildly acidic soil with average moisture but can tolerate drier soils. Prefers shade to partial shade. Similar to other viburnums, a cluster of small white flowers gives way to dark blue/black fruits that are enjoyed by birds and other wildlife. *Mapleleaf Viburnum is susceptible to attack from the Viburnum Leaf Beetle. Check with your local nursery to see if the Beetle is a problem in your area. Zones 4-8.*
TALL SHRUBS (>6')

Black Chokeberry (Aronia melanocarpa) Can grow up to 8 feet high with a spread of 8 feet. Grows best in moist, well-drained, acidic soils but will tolerate drier sandy soils or wet clay ones. Particularly good for soil stabilization. Prefers full to partial sun. White flowers bloom in the spring with black berries appearing in the fall and lasting through the winter. Zones 3-8.

Northern Bayberry (Myrica pensylvanica) Typically grows from 5 to 6 feet high but can reach 10 feet. Spreads easily and forms colonies. Often found in coastal areas. Foliage is semi-evergreen aromatic. Will grow well in dry, infertile, sandy, acidic soils. Grows best in full sun but will tolerate partial shade. Zones 2-6.

Chokecherry (Prunus virginiana) Grows from 25 to 30 feet tall with a spread of 20 feet. Grows best in moist soil but will tolerate drier conditions. Partial to full sun. White flowers bloom in the spring and are followed by bright red berries. Flowers have a strong sweet fragrance. The fruit has an astringent taste but does attract birds. Zones 2-6.

Staghorn Sumac (Rhus typhina) Grows from 10 to 25 feet tall with a spread of 15 to 20 feet. Tolerates a wide range of soils as long as they are well-drained. Grows best in full sun to partial shade. Clusters of fuzzy berry-like fruits are produced in the fall. A popular ornamental shrub due to its showy autumn colors. Zones 3-8.

Nannyberry (Viburnum lento) Grows from 14 to 16 feet with a spread of 6 to 12 feet. Grows well in medium wet to average soil but is tolerant of drier soils. Prefers full sun to part shade. Clusters of white flowers turn into blue/black berry like fruit. Supposedly the fruit is attractive to nanny goats, hence its name. Nannyberry is susceptible to attack from the Viburnum Leaf Beetle. Check with your local nursery to see if it is a problem in your area. Zones 2-8.

TREES

Sugar Maple (Acer saccharum) Grows up to 75 feet with a 40 foot spread. Stunning orange-red fall color. Full sun, but tolerates some shade. Moist, well-drained soil. Does not tolerate wet or compacted soil. Zones 3-8.


VINIES AND GROUNDCOVERS

**Bearberry** (*Arctostaphylos uva-ursi*) Grows from 4 to 6 inches with a spread of 3 feet. Spreads easily to form a mat. Grows best in moist, well-drained, rich, acidic soil. Full sun to partial shade. Light pink, cup-shaped flowers give way to bright red berries in the fall. It is a useful in preventing erosion and is commonly planted along banks. Zones 2-6.

**Virgin's Bower** (*Clematis virginiana*) A climbing vine that can grow up to 20 feet high. Grows best in soil with average to medium moisture and full sun to partial shade. Attractive clusters of silky seeds follow showy white flowers. Grows best on a trellis or fence. Zones 2-10.


**Checkerberry/Wintergreen** (*Gaultheria procumbens*) Also known as teaberry. Grows up to 6 inches high and spreads 4 to 6 inches annually. Favors well-drained, acidic soil with average moisture. Grows in partial to full shade but produces more fruit with adequate light. Leaves are evergreen and red berries remain on the plant all winter. Young leaves and berries have a wintergreen flavor. Zones 3-5.

**Woodbine/Virginia Creeper** (*Parthenocissus quinquefolia*) A climbing vine that can reach heights of up to 40 feet. Grows easily. Will tolerate a range of soil types and a variety of light conditions. Drought tolerant. Small white flowers in spring. Foliage turns bright red in the fall and small purple berries are produced. When not in a position to climb it is an excellent ground cover and will put down more roots. Zones 3-9.

Lowbush Blueberry Grows from 2 to 24 inches and spreads to form colonies. Prefers an acidic, well-drained soil that has previously been untilled. A popular ground cover. Blueberries are attractive to wildlife and humans. Grows well in partial shade to full sun. Zones 2-6.

**Lingonberry** (*Vaccinium vitis-idaea*) Also called Crowberry or Mountain Cranberry. Grows to 7 inches and spreads. Small, glossy-green, leathery foliage and small pink or white flowers, followed by small, red fruit, sour but edible. Found in bogs and wet or dry, rocky, mossy slopes. Sun to shade. Dry to moist, well-drained soil. Zones 2-6.

PERENNIALS

**Harebell** (*Campanula rotundifolia*) Grows from 1 to 2 feet high with a spread of 6 inches. Flowers are deep blue and bell shaped. Blooms from June to September often until the first hard frost. Full to partial sun. Prefers dry to medium sand or gravel soils. Zones 3-8.
Black-eyed Susan (Rudbeckia hirta) Grows from 2 to 3 feet high with a spread of 1 to 2 feet. Leaves are rough, hairy, and lance shaped. Flowers are yellow to orange-yellow with a dark brown center. Full sun to part shade. Prefers dry to medium wet, well-drained soil but is tolerant of heat, drought and a wide range of soils. Low maintenance. Zones 3-9.

Tall Meadow Rue (Thalictrum polygamum) Grows from 3 to 8 feet high. Typically found in swampy areas and near water bodies. Small white inflorescences bloom in mid summer. Often recommended for the back border of gardens due to its large size. Prefers average to moist soil with light shade to full sun. Zones 3-8.

Appalachian Barren Strawberry (Waldsteinia fragarioides) Grows from 3 to 8 inches high with a ½ to 1 foot spread. A low, mat-forming, strawberry-like plant with evergreen, basal leaves and several yellow flowers on a leafless stalk. Fruit is not fleshy or edible. Sun to shade. Prefers medium wet, well-drained, organic, slightly acidic soil, but tolerates a wide range. Flowers from April to June. Zones 3-9.

USEFUL LINKS:
The following publications can be found at: http://extensionpubs.umext.maine.edu/

University of Maine Cooperative Extension Bulletin #2502 “Native Plants: A 2002 Maine Source List.”

University of Maine Cooperative Extension Bulletin #2500 “Gardening to Conserve Maine’s Landscape: Plants to Use and Plants to Avoid.”

University of Maine Cooperative Extension Bulletin #2701 “Designing Your Landscape for Maine.”

Part of the Conservation Practices for Homeowners Factsheet Series, available at:
Maine DEP (800.452.1942); http://www.maine.gov/dep/blwq/docwatershed/materials.htm
Portland Water District (207.774.5961); http://www.pwd.org/news/publications.php
King standing at top of box culvert location
Front view of porch
Erosion from porch roof
Erosion from porch roof
Erosion along old boat launch
Erosion along boat launch below tree
Relocate fire pit away from lake and buffer