TECHNICAL ASSISTANCE BULLETINS

Buffers
For Water Quality Protection

A technical assistance series prepared by:

Maine State Planning Office

Maine Department of Environmental Protection

Oxford County Soil and Water Conservation District

Androscoggin Valley Council of Governments

with input from a number of professional and citizen planners.

Inside

TA Bulletin #2

This TA Bulletin is one in a series of documents intended to provide guidance to volunteer board and committee members on specific planning topics. Emphasis is placed on the development review process.

Financial assistance for the development of this document provided by the National Oceanic and Atmospheric Administration.

May 2000

Streams, lakes, and other water bodies are receiving more polluted runoff each year from human activity in their watersheds. This runoff can cause a range of problems from algal blooms to the destruction of fish habitat. Additionally, heavy use of shoreline areas tramples vegetation and compacts the earth until it is as hard and impenetrable as asphalt.

Water resources are the building block of our natural environment. Additionally, they are important to the economic well being of our State. When water quality deteriorates, the value of waterfront property decreases. Town residents also need to be concerned about water quality as streams, rivers, lakes, estuaries, and bays all serve as important recreational areas. Recreational uses provide revenue in the form of tourism and summer resident tax base. Lakes may serve as public drinking water supplies, and some streams and rivers are an important source of raw and process water for industry.

Buffers are undisturbed areas of vegetation adjacent to water bodies or developed sites. They are vital to the protection of our water resources. Once established, stream buffers are complex ecosystems which provide numerous benefits to the area:

- The rate of runoff is reduced, pollutants are removed, and excess nutrients are absorbed.
- Detritus, a source of energy for aquatic life, is provided.
- Aesthetic value to the area is increased.
- Shoreline erosion is reduced.
- Wildlife habitat, particularly for “edge” species of songbirds and mammals, is provided.
- Tree canopy creates shade which helps to keep water temperatures lower. This is particularly important in streams where temperatures are critical for the survival of the stream cold water fish.

Background Information

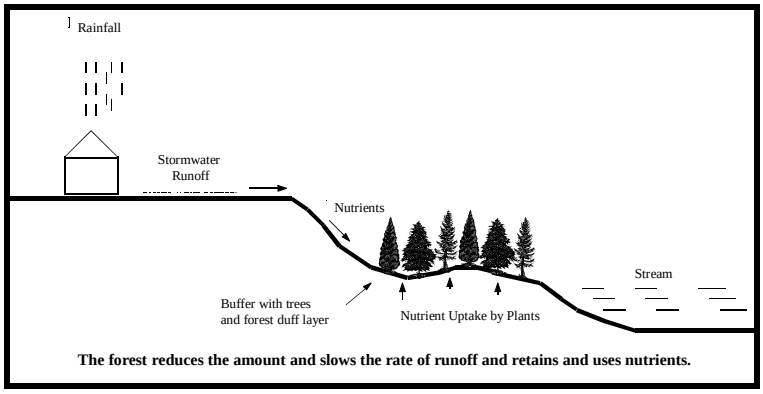
Principles of Buffers

Buffers protect water quality by preventing sediment and nutrient-laden runoff from getting into water bodies. This is accomplished on several different levels within the buffer:

- The buffer canopy deflects raindrops and reduces their erosive impact on soils.
- Plant roots serve as webbing that holds the soil in place, reducing erosion.
- Plants take up excess nutrients.
- Irregularities in the land reduce the rate of runoff.
- These land irregularities in the form of small pockets provide storage and allow for infiltration. They also serve a valuable role in providing habitat such as vernal pools.
- The dead vegetation (forest duff) from years past serves as a sponge to further absorb precipitation and runoff.
- The roots absorb some of the excess water.

Some general specifications for streamside buffers include the following:

- Streamside forest must be wide enough to filter sediment from surface runoff. The appropriate width of the buffer will depend upon the length and slope of the area, the soil permeability, the size of the drainage area, the type and density of vegetation, and the land use adjacent to the buffer.
- The buffer should consist of several vegetation layers with a variety of plant species including different species of trees, shrubs, and other groundcover.
- When creating a new buffer, the topography of the area must be such that water flows evenly through the buffer. If water is allowed to concentrate because of poor grading or uneven runoff distribution, the buffer will be short circuited and have only minimal benefit. However, natural, well-established buffers include vernal pools and natural depressions which are vital as habitat. These areas should not be disturbed.
- A portion of the buffer immediately adjacent to the stream should be managed to provide detritus and large woody debris to the stream.
- Canopy cover should be managed to maintain stream temperatures suitable for aquatic habitat.
- Managed harvest of some large trees may be necessary.



The forest reduces the amount and slows the rate of runoff and retains and uses nutrients.

Androscoggin Valley Council of Governments

Need for Protection and Enhancement of Buffers

Buffers are a long-term, low maintenance form of treatment for the non-point source pollution that we create everyday. The desire for a "view" to the water from housing and business developments, along with the pressure from logging and agriculture, have significantly reduced the extent and number of buffer areas surrounding our water bodies. The result has been an adverse effect on the quality of water and aquatic and terrestrial habitats. To reverse this trend, it is important to preserve and re-establish buffers in the many areas where they may be extremely beneficial but are minimal or non-existent.

Planning Considerations

Comprehensive Planning

Buffers should be required adjacent to water bodies in order to improve stormwater and nutrient management, provide green space, and protect wildlife habitat and travel corridors. Providing protection requires three activities: planning, regulation, and education. Planning is necessary to determine which water bodies need protection through the use of buffers and to create the legal basis for requiring buffers in land use ordinances. Education is needed to gain public support for the regulations, to encourage land owners to provide buffers on already developed property and in areas where they are not required by regulation, and to provide ongoing maintenance of buffer areas.

Buffers are usually required by shoreland zoning ordinances and phosphorus and stormwater management standards. The use of buffers for these reasons should be supported in the comprehensive plan, but the plan should also support the use of buffers along water bodies which are not in the shoreland zone and for development which may not need buffers to meet phosphorus or stormwater regulations.

The comprehensive planning process should be used to:

- encourage the use of buffers as the primary control for stormwater management and phosphorus control, and
- identify water bodies the town wants to protect with buffers.

The following three steps can be taken to identify vulnerable resources and provide policies and strategies that support the use of buffers.

1. Determine:
   - the benefits of buffers for:
     - ⇒ control of shoreline erosion,
     - ⇒ mitigation of stormwater and phosphorus impacts, and
     - ⇒ provision for fisheries and wildlife habitat and wildlife travel corridors.
   - the extent of water bodies and other resources that the town wishes to protect.

In determining water bodies, other than those having shoreland zoning, to protect with buffers, the town must remember that small bodies of water are usually more susceptible to non-point pollution from stormwater runoff than larger bodies of water. Additionally, the smaller bodies often provide important wildlife habitat. Streams flowing to lakes are particularly important since good buffers can help reduce the pollutant load to the lake.

2. Inventory and, where possible, map:
   - streams not subject to shoreland zoning,
   - ponds of less than ten (10) acres,
   - open water wetlands not subject to shoreland zoning,
   - coastal wetlands,
   - other wetlands important to fisheries and wildlife habitat, and
   - vernal pools.

While some of these resources will be difficult to map, USGS and National Wetland Inventory maps can be used in conjunction with the community's existing shoreland zoning map to identify the streams and wetlands which may need buffers. Vernal pools are difficult to identify and regulate, but are emerging as a unique and critical wildlife habitat. Care and careful discussion should occur regarding their protection. For information on defining and documenting vernal pools, consult the Maine Citizen's Guide to Locating and Documenting Vernal Pools by the Maine Audubon Society, August 1999.

3. Policies and strategies to encourage buffers for the resources which the town feels worthy of protection should be developed. If buffer standards are to be included in town ordinances, the policy and strategies in the comprehensive plan must lay a clear foundation for the standards. Where possible, the resources should be noted on the future land use map. For those that cannot be mapped, the policy should specifically identify the type of resource for which buffers should be required. Following are some sample policies and strategies which towns may find helpful in developing local policy and in meeting the State goals.

Model Policies:

⇒ Preserve wildlife habitat including deer wintering areas and travel corridors adjacent to rivers, streams, wetlands, ponds, lakes, coastal shorelines, and coastal wetlands.

⇒ Protect the riparian habitat of small streams identified on the USGS quadrangle maps and ensure that streams are not subject to thermal warming which may degrade cold water fisheries.

⇒ Maintain diverse wildlife resources and habitats and fisheries, including wildlife travel corridors, along streams, ponds (including ponds of less than ten [10] acres), wetlands, and winter deer yards through habitat preservation and enhancement.

⇒ Protect coastal wetlands and the diverse wildlife habitat, including migratory bird habitat, they support.

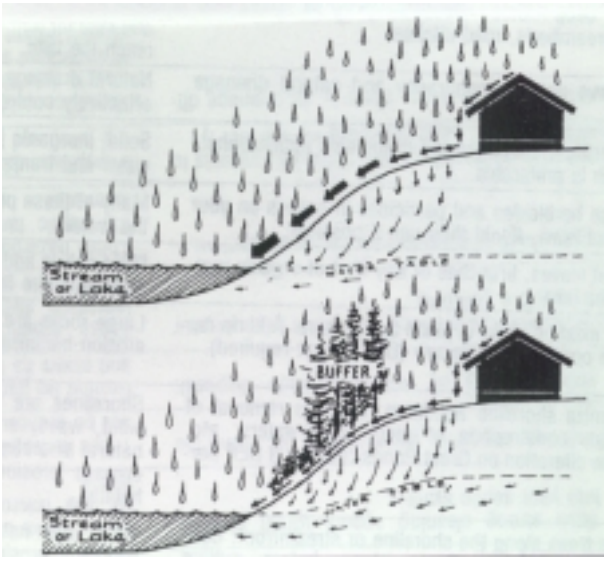
Model Strategies:

⇒ Subdivision and Zoning Ordinances should require natural vegetated buffers or the creation of vegetated buffers along:

- year-round and intermittent streams shown on the most recent USGS quadrangle maps of the town,
- wetlands having open water,
- ponds of less than ten (10) acres, and
- vernal pools.

⇒ The Conservation Commission should develop and implement an educational program to inform residents of the value of our small streams, small ponds, wetlands, and vernal pools and the importance of maintaining vegetated buffers along their shores.

⇒ Preserve water quality by minimizing nutrient export to streams, lakes and rivers.



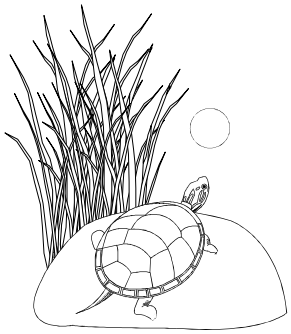
From: For Your Lake's Sake

Review Process

The left column provides a listing of documents which towns should require in order to adequately review proposals. Submittal requirements should be included in local ordinances. The town may also develop a submittal checklist so that the planning board can easily determine if an application is complete. The right column provides a discussion of the submittal requirements - why they are needed and how they are used. The section is followed by some examples of Buffer Restrictions which may be helpful in the approval process.

Submittals	Discussion
A. Site plan showing the layout of the buffer and the topography of the site. The extent of existing and proposed vegetation and the pre- and post-development topography will be shown on the plan. When a high intensity soils map is submitted, the buffer shall be shown on the soils map which shall be at the same scale as the site plan. 	**A.** The extent of existing vegetation is needed to determine if planting additional vegetation will be necessary to provide the proper width and extent of buffer. The extent of proposed vegetation, if additional vegetation is needed, is required to ensure that the extent of the buffer is appropriate. Since the width of the buffer depends on the slope, having the buffer layout on a site plan with topography facilitates the analysis. If a high intensity soil map is required for submittals for other standards, it is good practice to show buffers on the high intensity soils map. The type of soil and the approximate slope are shown on the soil map. These two factors play a key role in the amount of infiltration and runoff in the buffer area. In cases where compromises must be made in buffer width or in cases where additional buffer width may be desirable to increase protection of a sensitive resource, the type of soil and its infiltrative capacity can provide direction to the reviewers.
B. Description of existing vegetation in the proposed buffer area.	**B.** A written description of the buffer area including the vegetation helps in analyzing the need for supplemental vegetation and enhancement. It also provides a common basis for documentation of existing conditions once the reviewing authority has inspected the site. A description is important if the buffer is damaged during construction or by a landowner in the future. The description should be incorporated into the plan approval by reference or in the Findings of Fact.
C. If a new buffer is proposed, describe how the buffer area will be developed.	**C.** A description of how the buffer will be developed is necessary in order to ensure that the grading and vegetation will be effective. Buffers should have features of natural land such as irregular and rough surfaces. The vegetation should be adequate to create a canopy over the land and should be of a type that will create a duff layer over a period of years. Evergreen buffers may be allowed where natural vegetation in the area is primarily that type.
D. Description of provisions for maintenance of the buffer area including restrictions on earth moving and vegetative clearing.	D. The provisions for maintenance must comply with the ordinance standards and should be incorporated into the plan approval process. Maintenance provisions are important; it is generally most desirable to leave buffers in their natural state and avoid maintenance. However, owners may wish to be able to remove dead and decaying trees. Minimal thinning of thickly vegetated areas or removal of some mature trees may be desirable. Inclusion of maintenance provisions in the plan approval

Submittals



E. List of deed restrictions and covenants to be included in deeds to all affected properties or lots.

F. Plat with buffer location, maintenance provisions, and list of deed restrictions and/or covenants.

Discussion

ensures that the town can take enforcement action if an owner makes changes in the buffer that degrade the quality of the buffer and do not comply with the standards.

E. The deed restrictions or deed covenants are important documents since they are the primary method of informing future owners that required buffers exist on their property and that the buffers have to be maintained. Ultimately, a list of deed restrictions and/or covenants and a statement that the restrictions and covenants will be included in deeds to all affected properties should be placed on the plat or made part of the Findings of Fact.

F. The plat plan of a subdivision and the final plan for a site plan review - the plans which are approved by the reviewing authority - are important legal documents. They provide the authority for the municipality to enforce the ordinance standards and provisions which the developer agreed to during the approval process. As an alternative to placing the maintenance provisions and deed restrictions on the plat, a board may allow the plat to refer to the Findings of Fact which the board will develop. When the plat refers to the Findings of Fact, the Findings must include <u>all</u> provisions in the Findings.

Sample Buffer Restrictions and Conditions for Plan Approval

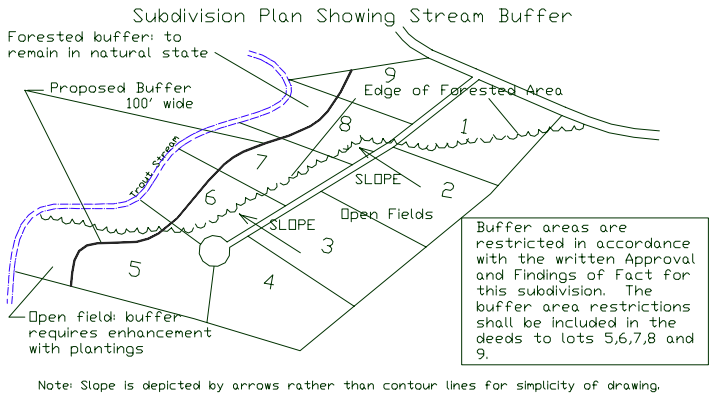
The following are some examples of restrictions to establish and maintain buffer areas. Examples are provided for both existing forested buffers and for buffers to be established in open, non-forested areas. These restrictions should be contained in the submittal and placed on the plan. If not included on the plan, they may be included in the conditions of approval developed by the planning board.

Forested Buffers

- Will remain in their natural state.
- Duff layer, leaf litter, shall be left in place. No grading or excavation of the buffer area is permitted.
- Dead and diseased trees may be removed.
- The canopy shall be maintained; where openings larger than two hundred fifty (250) feet occur, the area shall be replanted with tree species native to the area.
- A walking path no greater than six (6) feet leading to the water body may be cleared; the path shall be curved and shall not create a straight flow path to the stream.
- Pruning of trees to a height of twelve (12) feet is permitted provided that the top two-thirds (2/3) of the tree canopy is maintained.
- No concentrated flows shall be allowed to enter the buffer except those which are naturally occurring and currently exist. Flows concentrated from development shall be spread out by use of a level spreader or other means.

Buffer on Non-forested Areas

- The area will be planted with four-foot (4) high trees no more than ten (10) feet apart. Trees shall be native to the area and approved by the Code Enforcement Officer.
- Note: Buffer maintenance restrictions similar to those required for forested buffers should be added.



Androscoggin Valley Council of Governments

Review Standards

This section presents review standards for zoning, site plan review, and subdivision ordinances. The standards should be applicable to new development, expansions, and changes in use. However, in applying the standards to expansions and changes in use, the town will need to be flexible since it may be difficult to meet width requirements on previously developed sites.

The left column presents the Standard, and the right column provides guidance on how the standard should be applied.

Applicability: A standard having several components is presented. It can be used for subdivision and site plan review whether the site plan procedure is part of a zoning ordinance or a stand alone site plan review ordinance.

These standards may be used for water bodies which are not subject to shoreland zoning but which are *identified in the comprehensive plan* as needing protection through the use of buffers. It is important that the *policy in the comprehensive plan* clearly identifies the types of water bodies which the town wants to protect by using buffers. These standards should not be applied to shoreland zoned areas since the typical shoreland zoning standard is different than these standards.

The types of water bodies to which a town may wish to apply the standard include:

- streams not subject to shoreland zoning,
- ponds of less than ten (10) acres,
- open water wetlands not subject to shoreland zoning,
- coastal wetlands not subject to shoreland zoning,
- other wetlands containing important fisheries and wildlife habitat, and
- vernal pools.

Relationship to Other Buffering Requirements: Buffer strips may be required or be proposed to comply with other ordinances. Shoreland zoning requires setbacks and buffers. Stormwater treatment and/or phosphorus controls may use buffers located down gradient of developed areas such as buildings, parking areas, roads and lawns. In such cases, the buffer strips should be designed to meet the requirements for the shoreland zone or the stormwater and phosphorus standards. Buffers required by these other ordinance provisions should be clearly identified on the plan. Additionally, plan approval should require maintenance of the buffer and deed covenants describing the location and the maintenance. The buffers required by other ordinance provisions may have their own requirements for width and vegetation. Where vegetation is not specified, the requirements contained herein may be used.

Taking/Variance Issues: Buffers in subdivisions usually do not raise concerns about takings because the lots can be configured such that the property will provide a reasonable return on investment. Extensive buffers on single, small lots which are subject to site plan review may be more problematic. The size of the buffer could leave an area which is very difficult or impossible to use. However, this concern can be addressed by allowing a variance. Wording can be added to the appeals section of the ordinance which would allow the granting of a variance for the width of the buffer or the use of other practices to control runoff and meet the intent of the buffer requirements to the greatest extent practicable. Variances should only be granted in accordance with the variance provisions of State Law (30-A MRSA 4353) or those contained in the local ordinance.

Standard	Discussion
A. Vegetative buffers shall be located between all disturbed areas of a development and all water bodies on or adjacent to the development including vernal pools, wetlands containing open water, streams, rivers, and ponds and which water bodies are not subject to shoreland zoning.	**A.** Only include water bodies in the list when there is clear policy in the comprehensive plan stating that each type listed should be protected by the use of shoreline buffers. As discussed in earlier sections, shoreland zoning contains a separate buffer standard. Note: The buffer location and maintenance requirements should appear on the final plan and should be included in the deed(s) for lot(s) containing buffer areas.
B. Vegetative buffers shall retain existing vegetation or be planted with trees native to the locale, having a height of at least four (4) feet and be capable of growing to at least twenty (20) feet in height. For natural buffers, or for	**B.** This requirement may be used for all buffers including those which are proposed for phosphorus and/or stormwater control. Natural vegetation usually provides the best buffer since it creates a ground cover and canopy

planted buffers at twenty (20) years after planting, the canopy of the growth shall have no openings greater than two hundred fifty (250) square feet. Trees shall be added where natural growth does not provide for sufficient canopy.

to the maximum extent that the ground can support the growth. If a natural buffer needs to be enhanced to improve its characteristics, it is best to plant trees and/ or shrubs native to the area. For buffers with no shrub or tree growth, it may be beneficial to plant both trees and shrubs. The shrubs will provide a cover while the tree canopy is being established.

C. The buffer width will be related to the slope of the land as presented in the following table.

Average Slope of Land Between Disturbed Area and Normal Water Mark (Percent)	Width* of Strip Between Disturbed Area and Normal High Water Mark
0	50
10	90
20	130
30	170
40	210
50	250
60	290
70	330
*Measured along surface of the ground.	

From Site Location of Development Rules

C. Buffers required by shoreland zoning or required to control phosphorus or stormwater runoff will have their own criteria on width.

D. For both natural and planted buffer strips, the ground shall be left in its natural state to the greatest extent practical. The organic and duff layers shall not be removed.

D. It is desirable to leave the natural features of the land intact in order to allow for ponding and infiltration of stormwater to the greatest extent possible in the buffer. Clearing and grading of the land is undesirable since it eliminates natural features which help to slow runoff and encourage infiltration. The duff layer also acts as a sponge to absorb water and nutrients and slow down the rate of runoff. This standard should be applied to all buffer areas required for water quality protection.

E. Buffer strips shall be maintained in a reasonably natural state.

1. Clearing of dead and diseased trees may occur. Additional trees, native to the locale, having a height of at least four (4) feet and capable of growing to at least twenty (20) feet in height will be added where clearing creates canopy openings larger than two hundred fifty (250) square feet.

2. The underlaying vegetation, and the organic and duff layers shall not be removed.

E. This maintenance standard should also be applied to all buffer areas required for water quality protection by other ordinance provisions. Maintaining the original groundcover, duff layer and topography creates the least disturbance to habitat and reduces stormwater runoff because of the irregularities in the surface of the land and the ability of the duff layer to absorb and “treat” runoff.

Definitions

It is not necessary to use all of these definitions in a local ordinance. Many are provided for information only.

Canopy - the high, overarching tree tops.

Coastal Wetland - all tidal and subtidal lands; all lands below any identifiable debris line left by tidal action; all lands with vegetation present that is tolerant of salt water and occurs primarily in a salt water or estuarine habitat; any swamp, marsh, bog, beach, flat or other contiguous low land which is subject to tidal action during the maximum spring tide level as identified in tide tables published by the National Ocean Service. Coastal wetlands may include portions of coastal sand dunes.

Duff - decaying organic matter consisting of the dead leaves, evergreen needles, tree parts and other organic matter typically found on the forest floor.

Detritus - disintegrated organic matter.

Erosion - the wearing away of the land surface by water or other geologic agents.

Open Water Wetland - a wetland in which surface water is present throughout the year except in years of extreme drought. (Note: these are the wettest wetlands and contain open shallow water zones.)

Riparian - riparian areas are plant communities contiguous to and affected by surface and subsurface hydrological features of water bodies and wetlands. Riparian areas have one or both of the following characteristics:

1) distinctly different vegetative species than adjacent areas.
2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. (Note: Riparian areas are usually transitional between wetland and upland.)

Stream - a stream is any body of water which flows more than three (3) months each year and has a mineral channel. An alternative definition is: a body of water which is shown as a year-round or seasonal stream on the most recent 7 1/2 or 15 minute USGS topographic map. (If this definition is used, then streams that require buffers, other than those which are subject to shoreland zoning, should be described in the comprehensive plan and shown on the plan's future land use map).

Soil Permeability - the quality of the soil that enables water to move downward through it. (Note: permeability is measured as the number of inches per hour that water moves downward through the saturated soil.)

Vernal Pools - naturally occurring, temporary to permanent bodies of water in shallow depressions that fill during the spring and fall and may be dry during the summer. Vernal pools have no predatory fish populations. Vernal pools often provide the primary breeding habitat for wood frogs, spotted salamanders, blue-spotted salamanders, and fairy shrimp and provide habitat for other wildlife including several endangered and threatened species.

Wetland - areas inundated or saturated by surface water or groundwater at a frequency and for a duration sufficient to support, and which under normal circumstances do support, a prevalence of wetland vegetation typically adapted for life in saturated soils. (Note: wetlands are identified by a combination of soils, hydrology, and vegetation. Wetland functions include fish and wildlife habitat, water storage, sediment trapping, flood damage reduction, water quality improvement and ground water recharge.)

BIBLIOGRAPHY

Androscoggin Valley Soil and Water Conservation District and Lake and Watershed Resource Management Associates, The Buffer Handbook, 1998.

Department of Environmental Protection and Lake and Watershed Resource Management Associates, Vegetative Buffers and How They Work.

Lake and Watershed Resource Management Associates, Vegetated Phosphorus Buffer Strips.

Southern Maine Regional Planning Commission and York County Soil and Water Conservation District, For Your Lake's Sake.

Thompson, Paula, Buffer Strip Plants for Water Quality Protection in Maine, 1997.

For further information, contact:

Maine State Planning Office
(207)287-3261
Web Address: http://janus.state.me.us/spo/

Maine Department of Environmental Protection
(207)287-2111
Web Address: http://janus.state.me.us/dep/home.htm

Maine Historic Preservation Commission
(207)287-2132
Web Address: http://janus.state.me.us/mhpc/

Copies of this report are available from the Maine State Planning Office, 38 State House Station, Augusta, ME, 04333-0038. Request the appropriate subject document from the Land Use Technical Assistance Series, or view and download this document from the SPO website (http://janus.state.me.us/spo/).

This document was developed and printed by the Maine Coastal Program/State Planning Office with financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Oceanic and Coastal Resource Management, National Oceanic and Atmospheric Administration, under award #NA77020187.