

Lake Shoreland Protection and Restoration Management Options

In fulfillment of the Requirements of Act 138

January 11, 2013



**Vermont Agency of Natural Resources
Department of Environmental Conservation
Lakes and Ponds Section**

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January 11, 2013

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Cover photo, Lake Eden, Eden, Vermont.

Photo shows several decades of natural re-growth of native species on a shore that had previously been cleared of all its woodlands; it now serves as a family picnic grove for the shoreland owners.

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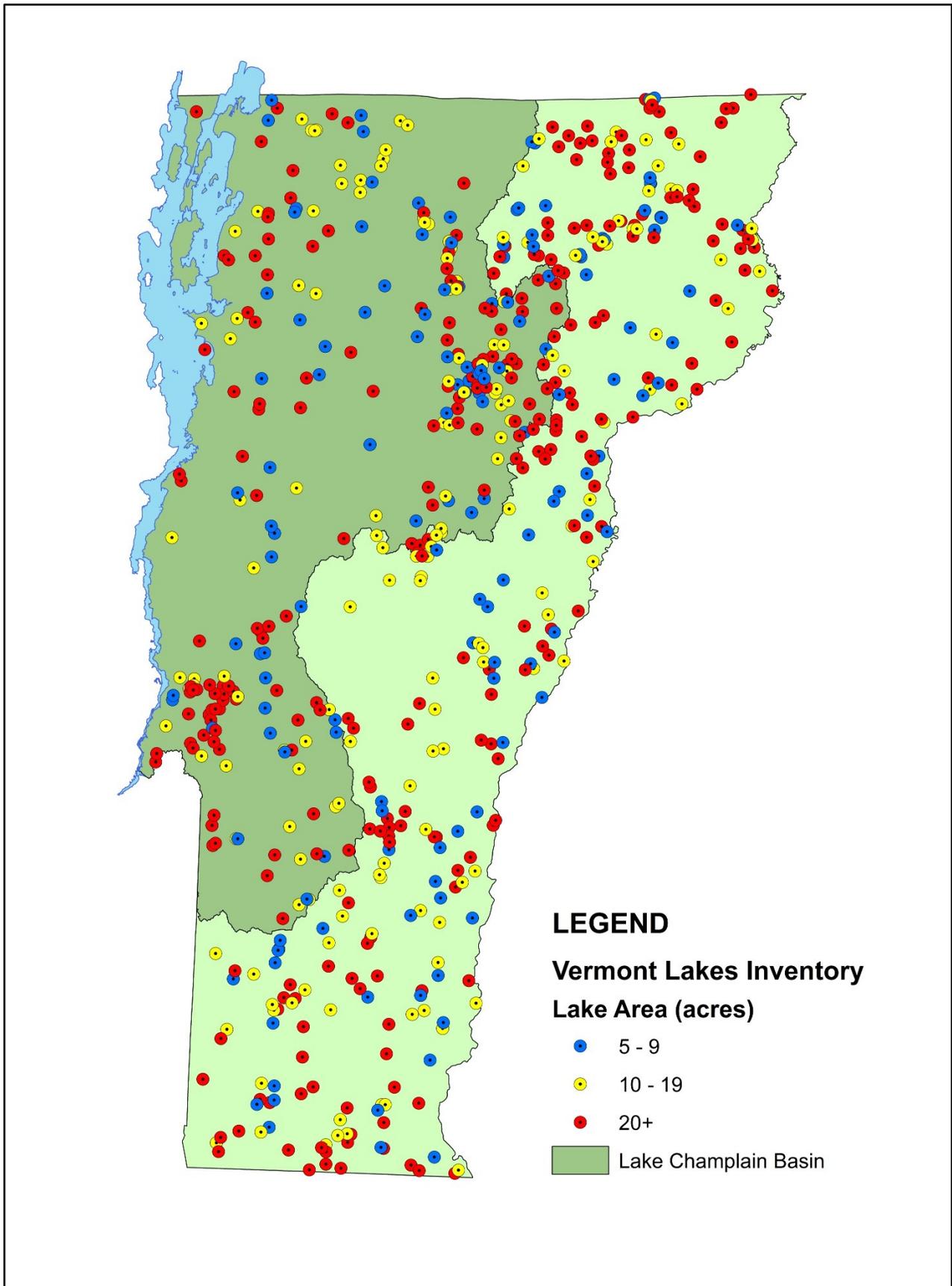


Figure 1. Distribution of Lakes in Vermont. Lake Champlain is Vermont’s largest lake with a complex ecosystem and watershed covering half the state. Vermont also has over 800 other lakes, 292 of them 20 acres or larger in size, which provide a variety of outstanding recreational opportunities and natural values.

Executive Summary

According to a U.S. Environmental Protection Agency (USEPA) study of lakes across the country, the health of Vermont's lakes is less than both the northeast region and the national average in terms of percent of shoreland that is either in fair or poor condition, as measured by the extent of clearing, lawns and development near the shoreline. When a lake's natural vegetation (woodland) is removed and replaced by lawns and impervious surfaces, fish and wildlife habitat degrades, shores erode, and the lake is more vulnerable to water quality problems such as algae blooms. Cleared shores are also more susceptible to erosion during flood events.

Naturally vegetated lakeshores reduce pollution, protect property and fisheries, improve recreation, and greatly contribute to the economy. Some of the many benefits and values naturally vegetated lakeshores offer include:

Revenue and property values. Healthy lakes generate millions of dollars annually for the Vermont economy and private property maintains highest value when water quality is good.

Flood resilience. Well-vegetated shorelands provide flood resilience and play an essential part in buttressing Vermont's water resources against the effect of climate change.

Recreation and tourism. Treed shorelands are scenic, enhancing the recreational experience and contributing to Vermont's tourism economy.

In addition, a wooded shore provides ecosystem services that are essential for protecting lake ecological health:

Pollution filtration. Shoreland vegetation naturally filters phosphorus and sediment from uphill runoff.

Shoreline stability. Wooded shores provide shoreline stability with a diversity of dense root structures.



Figure 2. Common lakeshore development consists of clearing native vegetation and planting a lawn. Suburbanized shorelands diminish lake health.

Habitat for fish and aquatic species. Fallen trees and branches provide critical physical habitat for fish, amphibians, turtles and insects such as dragonflies .

Prevention of problem plant growth. Overhanging branches keep the water shaded and cool, thus helping to prevent algae and problem plant growth that thrive in warm and sunny waters.

Habitat for wildlife species. A natural shoreline enables use of the lake environment for species such as loons, kingfishers and otters.

At present, most shoreland development in Vermont involves clearing native vegetation along shorelines to establish lawns down to the water's edge, and as a result, 82 percent of Vermont's shorelands are currently in poor or fair condition. Accordingly, Vermont lakes are more threatened by phosphorus and sediment runoff from shoreland areas, habitat degradation, and flood damage than lakes in other New England states and the nation.

The Vermont Legislature passed Act 138 during the 2012 legislative session, which requires the Vermont Agency of Natural Resources (VTANR) to submit a report with options for restoring and protecting lakeshores. In particular, Act 138 calls on VTANR to address whether the state should enact statewide shoreland regulations.

Vermont's Shoreland Management Programs

Vermont's current shoreland management programs focus on education, outreach and technical assistance. At present, there is no statewide standard for shoreland management and the responsibility for developing standards falls to municipalities. Less than 20 percent of towns have implemented ordinances to protect lakeshores. Municipal adoption of effective local shoreland zoning has progressed very slowly over the last 40 years and efforts have varied in effectiveness.



Figure 3. Lake-friendly shoreland development includes: setting a lawn back from the lake; allowing native trees to stabilize the bank, while pruning lower branches for a view; leaving woodlands (duff layer, shrubs, and mature trees) in place to filter runoff and provide healthy habitat for fish and other wildlife.

Act 250 and the Stormwater Management Rules have limited applicability to lakeshore management. Most shoreland development occurs one lot at a time and is thus sub-jurisdictional with respect to Act 250. The vast majority of shoreland development is also sub-jurisdictional to the Stormwater Management Rules as the developed area is usually less than one acre. Finally, 80 percent of towns lack shoreland development standards. The majority of shoreland development occurs without any guidance or requirements addressing lake protection.

The VTANR concludes that the current shoreland management approach in Vermont – education, outreach, technical assistance and voluntary municipal participation – is not providing adequate protection of Vermont’s lakes. Comparing Vermont’s current shoreland management practices to other northeastern states’ programs reveals a major gap in Vermont’s management program: Vermont is the only northeastern state without state standards for shoreland development. New approaches are needed to ensure the long term health of Vermont lakes and shorelands.

Regulatory Options

As required in Act 138, VTANR provides the following regulatory options for consideration to supplement Vermont’s current shoreland management program:

State administered option: The Agency would adopt standards via rule making and administer a state-wide permit program.

Enhanced local option: Set minimum standards that the municipalities can choose to administer themselves. This option may be attractive to the 20 percent of towns that already have protective shoreland zoning, or towns that want to add to the state minimum standards to reflect local priorities. The Agency would administer the standards through a permit program in municipalities that choose not to do so themselves.

Municipality administered option: The state sets minimum standards that municipalities must incorporate into their zoning ordinances. The state would provide technical assistance to towns. The state would administer the minimum standards in the 94 towns which have no zoning.

Non-Regulatory Options

Although VTANR concludes that Vermont’s shoreland management program relying solely on education, outreach and technical assistance is not adequately protecting Vermont’s lakes, such non-regulatory programs

are a necessary component of any protection and restoration program. The following elements are therefore recommended for continuation, expansion or establishment:

- ◆ Encourage and enable shoreland conservation projects that preserve undeveloped lakeshores.
- ◆ Evaluate a use value appraisal-type tax credit for establishing or protecting a wooded lakeshore and to reward landowners for maintaining a naturally vegetated shore.
- ◆ Support education and outreach efforts, such as the Agency’s Lake Wise Program and literature and website materials. Continue Agency individual site visits, as requested, to provide recommendations regarding shoreland management or restoration.
- ◆ Continue to support the Vermont League of City and Towns lake protection technical assistance to towns.
- ◆ Establish a “green” certification program for contractors to provide training on water resource protection measures such as vegetated shorelands and erosion control during construction.
- ◆ Continue to fund lake events and technical assistance projects that promote and demonstrate shoreland restoration and protection. Partner with external organizations, such as the Vermont Federation of Lakes and Ponds, the Natural Resources Conservation Districts, and the Regional Planning Commissions.

There has never been a better time, or a greater need, to rethink how Vermont manages its lake shorelands. Recent flooding events caused by extreme weather, such as the 2011 spring flooding and Tropical Storm Irene, demonstrated that wooded shorelands are substantially more resilient to high water and wave action than cleared shores or those with retaining walls. Increasing public scrutiny on the effort to stem phosphorus pollution in Lake Champlain provides a reminder to all lakefront landowners that collective action is needed to prevent degradation of water quality for all Vermont lakes.

This is an opportunity for the Vermont Legislature to implement a fair and effective program for lakeshore management and protection to ensure that the state’s economic, social, and ecological values are protected for current and future generations.



Introduction

This report presents options and recommendations for strengthening Vermont shoreland management. Scientific studies in Vermont and the nation link degraded lake conditions to poorly planned and increasing lakeshore development. Most Vermont lakeshore owners manage their property with little or no knowledge or standards for lake protection. This report evaluates options for lakeshore management by reviewing Vermont's current programs as well as those of other states.

This report examines the values of a well-managed shoreland, and the current status of Vermont's lakeshores. The report then evaluates Vermont's non-regulatory shoreland management programs, and the regulatory program of three other states. Finally, regulatory options for Vermont are presented, as well as enhancements of the existing non-regulatory approaches.

A lake's first line of defense against pollution and habitat degradation is its shoreland—the surrounding land that drains directly into the lake. Naturally vegetated shorelands protect lake health and recreational values, provide flood resilience and fortify Vermont's economy.

Part One - The Consequences of Cleared Shorelands

The Status of Vermont Lakes

Vermont's 800+ lakes and ponds are natural jewels left by glacial activity more than 10,000 years ago. Over time, they have provided waterways for human settlement, exploration, battles, and trade and commerce. Today, people use Vermont lakes primarily for recreation. Vermont residents and visitors may spend a day fishing or boating, go camping, or rent a lake house, and many own homes or camps on the lakeshore.

For lakes to be resilient to human activity on the land and to climate change, their first line of defense is a well vegetated shore. However, data show that in Vermont, developed sites have 96 percent fewer trees along the shores than undeveloped sites and that cleared shores pose the greatest threat to Vermont lakes.^{1,2} **Naturally vegetated shores protect lake water quality, ecology, and bank stability. Healthy lakes benefit people, property values, and the tourism economy.**^{3,4,5}



Figure 5. Shallow water habitat structure. Fallen trees, branches and leaves, rocks, aquatic plants and the adjacent woodlands provide shelter, feeding, and breeding sites for a large variety of aquatic and terrestrial life.

• Lake Habitat For Fish and Wildlife

Recent studies in Vermont indicate that clearing shorelands of natural vegetation results in degradation of aquatic habitat.⁶ VTANR's participation in the 2007 EPA National Lake Assessment shows that in Vermont 82% of lake shorelands are in poor or fair condition because of excessive disturbance (clearing or impervious surfaces).⁷ In addition, VANR's Littoral Habitat Study shows a strong correlation between cleared shoreland and loss of shallow water habitat for fish and other organisms.⁷

Vermont lakes rank worse than the northeast region and the national average in terms of shoreland disturbance. Only 17% of Vermont lakeshores are in good condition as measured by the extent of disturbance and lawns along the shore, compared to 42% regionally and 35% nationally (Figure 4).⁶

Vermont lakes with good shoreland condition (e.g. the natural woodlands have been maintained)

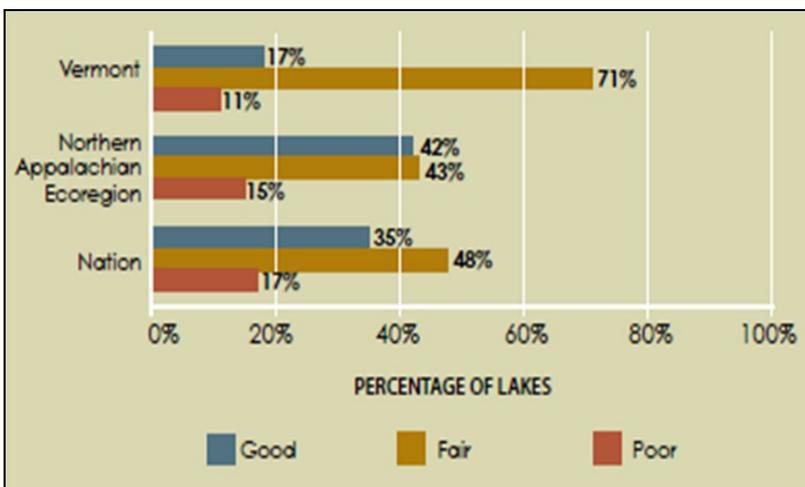


Figure 4. Extent of Lakeshore Disturbance. 83% of Vermont's shorelands are in either fair or poor condition, compared to 58% in the northeast region, and 65% nationally.

have corresponding healthy shallow water habitat including a variety of sediment, woody snags, diverse aquatic plants, and boulders and cobble. These complex environments provide habitat for a wide diversity of terrestrial and aquatic organisms—from fish, to aquatic insects, to birds and mammals.

• **Bank Stability**

Clearing lakeshores of vegetation causes bank instability and erosion.⁸ As witnessed on Lake Champlain during spring 2011 flooding, well vegetated banks resisted the winds, waves, high waters, and storm water runoff better than cleared or walled shores. In addition, walled shores do not provide good habitat. Property owners who have cleared shores, often later pay for a wall to stabilize the bank. The clearing of shores is costly for owners and the lake.



Figure 6. Eroding and Non-Eroding Shorelines. The shore above is experiencing erosion because a lawn provides little soil stability. In contrast, the mix of trees, shrubs and groundcover at left offers excellent stability due to the variety and density of root structures and mass.



Figure 7. Lake-friendly shoreland development:

- ◆ Provides bank stability with trees and shrubs
- ◆ Provides shade and overhanging vegetation for aquatic habitat
- ◆ Allows woodlands to naturally filter runoff
- ◆ Establishes lawns back from lake
- ◆ Preserves the natural lakeshore beauty

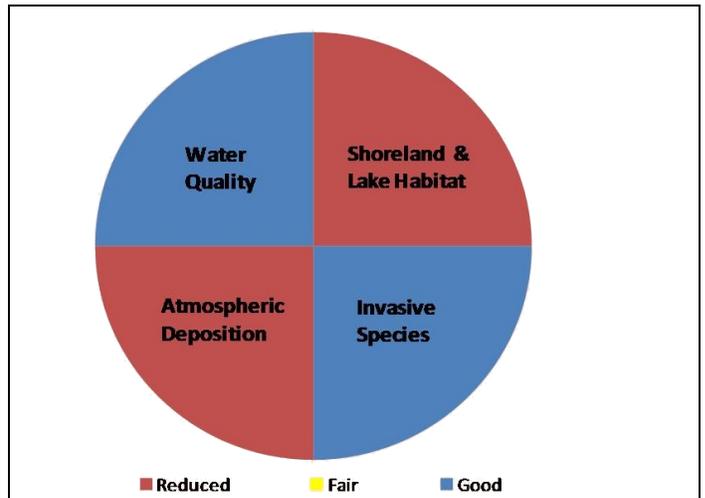


Figure 8: Score Card for Salem Lake , Derby, VT. The Vermont Lake Score Card is accessible on the Lakes and Ponds Section website and shows how each lake or Lake Champlain station is doing with respect to water quality, shoreland condition, invasive species, and atmospheric deposition (acidification and mercury contamination).

In general, water quality trends are good across the state, but the shoreland and lake habitat conditions are not. The score card for Lake Salem in Derby represents a typical lake report card with a “good” rating for water quality, but with reduced conditions for shoreland and lake habitat. Lake Salem’s lakeshore condition threatens its good water quality because more than 50% of the natural woodland shore has been converted to lawn down to the lake. (Salem Lake, like the majority of Vermont lakes, is rated “reduced” for atmospheric deposition because of a fish consumption advisory for mercury.)

• **Water Quality**

Cleared shoreland results in increased phosphorus and sediment pollution of lakes which decreases water clarity and increases algae growth. Eventually phosphorus pollution can lead to blue-green algae blooms, which can pose a serious health concern.⁹ Cleared shores contribute 18 times the sediment, five times the runoff and seven times the phosphorus to the lake than those where the shoreland is wooded.¹⁰ Shores with lawns and impervious surfaces, with little or no natural vegetation and underlying duff layer, turn the lake into a stormwater catch basin with no natural way to filter and clean run-off.



Development on Vermont Shorelands



- **Increasing Loss of Natural Shorelands**

The pattern of clearing all trees and shrubs in preparation for shoreland development is a concern for Vermonters. In 2002, The University of Vermont Center for Rural Studies conducted a survey asking Vermonters to identify recreation-related issues. Of the 510 survey respondents, 84% identified lakeshore development as a problem.¹¹ And yet, despite the fact that shoreland clearing leads to loss of wildlife habitat, excessive loading of sediment and nutrients, and a decline in water quality, the dominant development trend on Vermont lakes continues to be lawn to the lake's edge.^{12,13,14}

- **Redevelopment**

The enlargement and/or winterization of lakeshore homes is often associated with house additions, and the enlargement of lawns and driveways, all of which can degrade water quality.¹⁵ Many Vermont seasonal camps are being replaced by large year-round homes. It is not the redevelopment itself that causes concern, but rather the resulting increased loss of shoreland vegetation. However, there are few standards that have guided either development or redevelopment of lakeshores in Vermont and so there has been a significant loss of natural shoreland.

- **Gaps in Standards**

The cumulative impact from individual property development is the greatest stressor to Vermont lakes and those in other states.^{16,17} Construction erosion control and post-construction site design under the Stormwater Management Rules apply only to one acre or greater of disturbed or impervious area.¹⁸ Given the typically small lot size, almost no lakeshore owners are covered under the Stormwater Rules. Likewise, both agricultural and forestry uses have some restrictions within the shoreland area. In addition, only 20 percent of Vermont towns have

shoreland regulations that provide a minimum of protection and 80 percent of towns do not have effective shoreland regulations or zoning at all.

Economic Value of Shorelands

Vermont lakes are critical to local and state economies. They provide valuable services, such as drinking water for thousands of Vermonters; provide critical wildlife habitat; and scenic and recreational amenities that attract tourists, hunters and anglers, and recreation enthusiasts. Visitors and lake users are drawn to lakes with good water quality, scenic shores and quality fishing and wildlife observation opportunities, all supported by naturally vegetated shores.

Lakes and ponds provide services for which people are willing to pay a premium. The loss of these services due to pollution or habitat degradation can result in considerable expense to taxpayers.^{19,20}

Whether it is their impact on property values, or the revenue they generate through increased tourism and recreation or through the sales of fishing licenses, Vermont lakes help to generate hundreds of millions of dollars annually and play an integral role in Vermont's economy (Table 1, page 6). When, however, conditions in a lake degrade, these economic benefits are threatened and local, state and federal agencies may be obligated to pay substantial sums for restoration.



- **Recreation and Tourism**

A study completed by Gilbert and Manning in 2002 details the amount of money Vermont State Park visitors spend and what they are spending it on including food, souvenirs, park fees, and gas/transportation. When comparing the average annual total visitor expenditures for a state park located on a lake or pond to the average for those not so located, the difference is stark. *The average annual total visitor expenditures for lake-based state parks (\$976,870) is nearly three times the amount of that of non-lake based state parks (\$367,122).*²¹

- **Fish and Wildlife**

In 2009, 83,017 Vermont residents bought fishing licenses. Nearly 57% of the residents surveyed fished for trout or salmon in ponds or lakes (excluding Lake Champlain) between 2007 and 2009, and approximately half fished Lake Champlain during the same time period.²²

Total fishing license sales amount to approximately \$3,000,000 annually.²³

According to the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation – State Overview Preliminary Report, 207,000 Vermont residents and non-residents spent a total of \$131,223,000 on trip- and equipment-related purchases for 2,215,000 fishing days.²⁴ In the same 2011 report, wildlife-watching by 370,000 people brought in an estimated \$288,507,000 through trip, equipment, and other expenditures. At 53%, Vermont has the highest participation rate of wildlife watching of any state.

Activity	Annual Visitor Expenditures/ Revenue Generated in VT
Visiting Lake-Based State Parks	\$976,870 average per park ²¹
Fishing	\$131,223,000 ^{23,24}
Wildlife Watching	\$288,507,000 ²⁶
Lakeshore Property Values	Up to \$200 per foot frontage for each 1-meter increase in water clarity ³⁰

Table 1. Economic inputs provided by a few ecosystem services of Vermont lakes and ponds.

• **Property Values**

A study on the impact of water quality on lakefront property values in Maine, New Hampshire, and Vermont show a significant loss in property value as water quality degrades.²⁷ Cleared shores increase nutrient loading to the lake, degrading water quality. The study found that a decline in water clarity lowered lakefront property values – a potential loss of millions of dollars for a single lake.²⁷ Property value decline is not only a loss for the owner, but for a town’s tax revenue.

In Vermont, realtors have reported that degraded water quality hurts lakeshore property values.

*When we list a lakefront property, that's one of the main questions [water quality] because it does have a significant impact on the value. When people are looking, buyers want water they can swim in and use. You don't want to pay for something you can't use, because it's not cheap.*²⁹ **Evan Potvin, VT Real Estate Agent, quoted on VPR on August 18, 2009.**

• **Intrinsic Ecological Value**

The lakeshore is the interface between water and land, and critical to the health and future of the lake. Eighty to ninety percent of all lake life is born, raised and fed

in the area where land and water meet.³³ Natural vegetation on the shore means the lake can function as an ecological whole and provide the full suite of natural values. It is much less costly to protect a lake’s water quality in the first instance, through shoreland protection, than to have to pay to restore it after it is already degraded.

• **Flood Resiliency**

Vermont lakes are under increasing pressure from stressors – from climate change and the forecasted large rain events and subsequent flooding to the introduction of new aquatic invasive species. The resilience to ecosystem stressors that woodland shores provide is an economically valuable ecosystem service.

*The number one way to build resilience to climate change for lakes is to expand and improve riparian vegetation. It is a win-win management strategy.*³⁴

Dr. Steve Carpenter, Director of the Center for Limnology, University of Wisconsin

2011 Laureate of the Stockholm Water Prize

• **The Cost of Nutrient Loading and Habitat Degradation**

While the monetary value of some ecosystem services provided by Vermont lakes is described above, it is more difficult to quantify the true cost of their loss.³¹ The following reiterates how nutrient loading and habitat degradation affects people and the lakes.³²

Lower Property Values: There is a documented decrease in property values as water clarity decreases, as a result of sedimentation and nutrient loading.

Poor Fishing: Excess sediment and nutrients degrade fish habitat by decreasing water clarity and oxygen availability, and covering spawning grounds. Cleared shores reduce physical habitat diversity that fish rely on for cover and feeding.

Poor Aquatic and Shore Habitat: Naturally vegetated shores and the adjacent shallows are necessary for many native bird, reptile, amphibian and insect life cycles.

Nuisance Growth of Aquatic Plants and Algae: Nutrient laden sediments feed nuisance plant and algae growth.

Loss of Tourism: Highly eutrophic lakes are unattractive aesthetically and recreationally to residents and visitors.

Local Tax Impacts: Declines in property value decrease tax revenues, as costs increase to clean up sediment and restore degraded ecosystems.

Loss of Resilience: Intact, well vegetated shorelands are more resilient to flooding impacts and climate change. The value of resilience is difficult to quantify, but record flooding in 2011 caused millions of dollars in damage in Lake Champlain alone.

Part Two - Shoreland Management Options

Current Shoreland Management Options

Many water resources management programs in the country use a balance of education and regulation.³⁵ In Vermont, preserving lakeshores depends entirely on voluntary landowner participation in lake-friendly development, with the exception of the small number of towns that have shoreland zoning. Education and outreach are key to gaining voluntary participation in lake-friendly development, Table 2 shows a range of education and outreach efforts used in Vermont to promote effective shoreland stewardship practices.

Current Non-Regulatory Programs – Education and Outreach

Below are three examples of current non-regulatory, education and outreach lake protection efforts.

- **FOVLAP - Buffers for Blue Lakes**

Formed in 1972, the Federation of Vermont Lakes and Ponds is a non-profit group of more than 80 lake associations. FOVLAP communicates with about 350 lake residents through their semi-annual newsletter, email notices, meetings, and annual events.

FOVLAP has made shoreland protection a priority. Their social marketing campaign encouraging lakeshore owners to protect their shores with native species plantings has received Watershed License Plate, Green Mountain Coffee Roasters, and Vermont Community Foundation grants, totaling about \$10,000. They conducted a state-wide survey of their members to learn how to best launch a campaign to protect lakeshores. In 2012, FOVLAP’s “Buffers for Blue Lakes” campaign partnered with local lake and watershed associations, the Orleans County Natural Resources Conservation District, and the Northwoods Stewardship Center to offer the Northeast Kingdom Healthy Waters Workshops, including a workshop on lakeshore best management practices. A similar southern workshop was held at Lake St. Catherine in Poultney. At most of the FOVLAP Annual Lake Meetings (60-85 attendees with 25-40 lakes represented state-wide), FOVLAP addresses the importance of mixed woody shoreland vegetation. For example in 2012, horticulturalist Charlie Nardozi provided suggestions of native, edible species suitable for lakeshores.

Pros: FOVLAP members are well connected, informed and involved in lake issues and have helped spread the word about the value of protecting shorelands. They collaborate closely and productively with ANR’s Lakes and Ponds Section and provide input and insight into state-wide lake issues.

Cons: FOVLAP’s outreach for lakeshore protection depends on busy volunteers; membership in lake associations is down; seasonal lake residents are changing from once being on the lake all summer to spending less time and being less involved in lake initiatives. Lake residents living year round on their lake do not participate as much as seasonal residents do in FOVLAP initiatives.³⁶ Education and outreach is a piece-meal incremental approach when relied on solely for shoreland protection.

Education Outreach	Audience	Results
Financial Incentives (to date primarily grants) to provide replanting or restoration of shorelands	Lakeshore property owners Towns Regional planning commissions.	Piecemeal approach, ineffective way to protect longer or priority stretches of shoreland No guarantee for long term maintenance of any project
Conservation Initiatives (VT Land Trust or “Current Use” Program)	Landowners Lake Associations	An underused approach, perhaps hindered by the high value of developed shoreland property.
Partnership Approach	Volunteer lake monitors Lake associations Fed. of VT Lakes & Ponds Lake Champ Basin Program Lake Champlain Committee Regional planning commissions Natural Resource Conservation Districts Towns	All shoreland re-vegetation or runoff control projects are done and maintained on a voluntary basis. If lakeshore property changes hands, there is no guarantee how the property will continue to be managed. Lake Associations have asked for stronger state grant support.
Educational Curriculum	K-12 Grade Audience	Project WET, Water Education for Teachers, has trained 100s of teachers in lake science and issues.
Awards - Lake Wise Certification	Shoreland property owners	In 2013, Lake Wise Awards will recognize excellent lake stewards on properties using lake-friendly practices. Model lakeshore properties will be showcased with beautiful stewardship signs as a way to inspire other landowners to adopt better practices.
Other Efforts - Lake Seminar Tech. Assistance Newsletter	Lakeshore property owners Towns	Good communications state-wide with a strong network of lake users.

Table 2. Several Vermont lakeshore protection education and outreach initiatives.

- **Northeast Kingdom Lake Buffering Program- Orleans County Natural Resources Conservation District** With about \$9,500 in Ecosystem Restoration Grant funds provided annually for four years, the Orleans NRCD has offered landowners native trees and shrubs for stabilizing and re-vegetating lakeshores. Dayna Cole, Program Director, says it has not been an easy sell, and over the last four years has planted trees on only eight sites.³⁷

Pros: Landowners pay twenty percent of tree planting costs, which helps ensure that the trees will not get cut down right away; local technical assistance available to landowners; program has gained local recognition; and by enabling planting by a few shoreland owners, they can then influence their neighbors.

Cons: Slow going; spotty lakeshore protection approach; difficult to measure success.

- **Vermont League of Cities and Towns - Water Resources Coordinator**

The Ecosystem Restoration Program has provided \$50,000 in annual funding to the Vermont League of Cities and Towns (VLCT) to support a part-time Water Resources Coordinator. The Coordinator works with planning and conservation commissions and municipal staff to enhance their water quality protection zoning regulations. In 2011, the Coordinator developed a Model Lake Shoreland District Protection Bylaw. A technical paper accompanies the ordinance, explaining how towns can adopt the bylaw. The Coordinator's shoreland protection outreach efforts also have included offering a Municipal Shoreland Zoning Workshop at the 2011 Annual Vermont Lake Seminar.

Pros: The Water Resources Coordinator is an important voice for shoreland protection at the VLCT. The Model Lakeshore Ordinance has been written and promoted to towns interested in lakeshore protection.

Cons: The new model shoreland has been available since spring of 2011, but no towns have made use of it to date to complete adoption of a lakeshore ordinance. Currently only 14 percent of municipalities have adopted shoreland zoning that meets minimum standards for lake protection (see Figure 8 and Appendix 2). Twenty-five percent of towns in Vermont have no zoning at all. The coordinator's time for working on shoreland issues is limited as the coordinator also addresses river corridor and low impact development town ordinances.

Municipal Regulatory Programs

Current Status

Vermont law enables municipalities to conduct a wide range of regulatory and non-regulatory activities related to local land use planning.³⁸ Regulating at the municipal level grants towns flexibility to determine what, if any, ordinances best meet their land use needs.

As of 2009, according to the Vermont League of Cities and Towns, only 29 of the 136 towns within the Lake Champlain basin had adopted ordinances that protect water quality, but not all these ordinances cover lakeshore protection.³⁹ Statewide, about 15 percent of towns have a shoreland ordinance that includes an at least 50 foot naturally vegetated zone along the shore. Thirty-seven percent of towns have no zoning at all. Below are three case studies that show the diversity of shoreland zoning in Vermont.

Status of Vt Municipal Shoreland Zoning

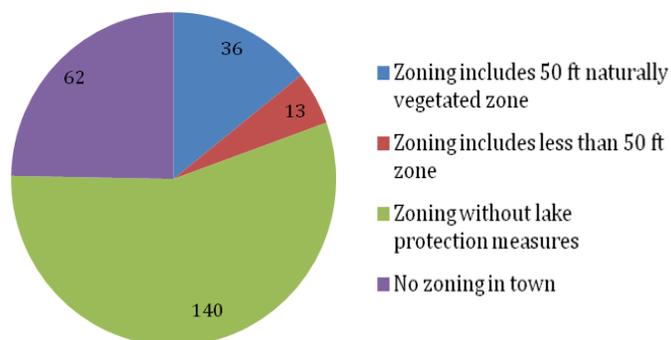


Figure 9. Number of Vermont Towns with Selected Municipal Shoreland Zoning Coverage. Less than 20 percent of towns in Vermont include requirements for natural vegetation along the shore. See Appendix 2 for further details.

Case Studies of Three Towns in the Lamoille Watershed

- **Greensboro - Strong Zoning to Protect Water Quality**

The Town of Greensboro has established a Lakeshore District for Caspian and Elligo Lakes, with specifications for minimum lot size (1 acre), minimum lot width (100 feet), and minimum building setback (150 feet). In addition, there is also a vegetated buffer requirement of 75 feet (Table 4). The bylaws also specify a maximum house size of 2,500 square feet for newly constructed homes, rebuilt homes, or homes for which an addition is being built. In addition, there are setback and buffer requirements for Long Pond (300 foot setback, 100 foot buffer) and for Mud and Horse Ponds (50 foot setback, 50 foot buffer).

Within the buffer area (with the exception of Long Pond), existing healthy trees, shrubs, and ground cover need to be maintained and enhanced by selective cutting and pruning. No trees may be cut or brush cleared within 100 feet of Long Pond without the permission of the Planning Commission. For existing development within the vegetative buffer (e.g. a field, lawn, powerline, or access), such use may be maintained but not expanded, including lawns. The footprint of a non-conforming structure within the buffer may not be expanded.

The Zoning Board of Adjustment has the capacity to grant variances and as recently as July 2012, a variance was granted for the construction of a 26 by 28 foot garage within the established buffer area of Elligo Lake.⁴⁰ In addition, Greensboro residents have described violations to the buffer requirement that the town simply did not have the resources to enforce.⁴¹

● **Elmore - Moderate zoning to protect water quality**

Elmore designates a shoreland district that includes all lands located within 500 feet of the shorelines of Lake Elmore, Little Elmore Pond, and Hardwood Pond. The shoreland district allows for compatible forms of development within the shoreland areas, “which will protect water quality and shoreland vegetation, minimize adverse impacts to the lakeshore environment, limit en-

croachments into public waters, and preserve both visual and physical access to and from the lake.”

The Town of Elmore requires a one acre minimum lot size for Lake Elmore (five acres for Little Elmore and Hardwood Ponds), 150 feet minimum lot depth, a building setback of 40 feet (100 feet for Little Elmore and Hardwood Ponds), a maximum developed lot coverage of 10%, a minimum lake frontage of 125 feet (400 feet for Little Elmore and Hardwood Ponds), and a 40 foot vegetated buffer for Lake Elmore (100 feet for Little Elmore and Hardwood Ponds). Within the vegetated buffer, a minimum amount of clearing to accommodate permitted accessory structures is allowed, as is the removal of existing vegetation with approval from the Development Review Board. Clearing to create or enhance views, or to improve lake or pond access, may be permitted in accordance with a landscaping plan if the plan is designed to maintain water quality, prevent erosion, and enhance the visual character of the shoreline as viewed from the lake or pond. None of the provisions outlined specifically address non-conforming uses.

● **Eden - No Zoning**

The Town of Eden includes shorelands on four lakes and ponds over 20 acres – Long Pond, Lake Eden, South Pond, and the northern-most tip of the Green River Reservoir. No zoning bylaws currently exist.

Town	Min. Lot Size	Min. Lot Width/ Frontage	Min. Bldg. Setback	Max. Lot Coverage	Min. Lake Frontage	Vegetated Buffer
Greensboro Lake-shore District (Lakes Caspian & Elligo only)	1 acre	100 feet	150 feet (Caspian & Elligo) 300 feet (Long Pond) 50 feet (Mud & Horse Ponds)	N/A	N/A	75 feet (Caspian & Elligo) 100 feet (Long Pond) 50 feet (Horse & Mud Ponds)
Elmore Shoreland District (Elmore Lake, Little Elmore & Hardwood Ponds)	1 acre (Elmore) 5 acres (Little Elmore & Hardwood Ponds)	150 feet	40 feet (Elmore) 100 feet (Little Elmore & Hardwood Ponds)	10%	125 feet (Elmore) 400 feet (Little Elmore & Hardwood Ponds)	40 feet (Elmore) 100 feet (Little Elmore & Hardwood Ponds); exceptions given per DRB approval
Eden	N/A	N/A	N/A	N/A	N/A	N/A

Conclusions

As demonstrated by the three case studies above, municipal level zoning can vary widely from town to town, and may or may not include provisions that protect lakes. Additionally, variances not in accordance with zoning bylaws may be allowed with the approval of the zoning board of adjustment. Local regulation poses the following challenges to achieving the goal of protecting the health of our lakes, which are public resources of statewide significance:

- **There are a diversity of zoning ordinances.** Although a town may designate a shoreland district, it might not include measures that protect lakes, such as maintenance of shoreland vegetation.

Table 3. Comparison of shoreland ordinances in three Vermont towns. Municipal shoreland ordinances vary greatly from town to town; some towns have no protective ordinances, and some provide

- ***A single lake may fall under the jurisdiction of multiple towns.*** There can be more than one municipality on a particular lake and those municipalities may have different shoreland zoning restrictions – or in some cases, no zoning at all.
- ***Zoning ordinances are likely to be ineffective for lakes with highly developed shorelands.*** Addressing changes in existing uses is complex and ensuring the



degree of non-conformance does not increase can become a contentious local issue.

- ***Zoning enforcement varies widely from town to town, and may change as the composition of the zoning board of adjustment changes.*** Even if a town has good standards to protect water quality in their zoning, waivers or variances can be granted, as illustrated by Greensboro.
- ***Towns may lack the resources required to properly enforce zoning bylaws.*** In some cases, towns may not have the funds or expertise available to enforce zoning regulations.
- ***Standards need not be applied, only considered during a review process.*** Even if a town has good standards for review of site plans or through a conditional use review process, the reviewing body could apply, somewhat apply, or not apply the standards as long as they were considered during the review process.
- ***Zoning is not static.*** Shoreland protection in town ordinances can be weakened at any time.

Part Three - Vermont Shoreland Regulatory Framework

Federal, State, and Local Responsibility

● Federal Clean Water Act

Growing public awareness and concern for controlling water pollution led to the enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. The law prohibits the discharge of any pollutant from a point source into navigable waters, unless a permit is obtained. The Clean Water Act requires that state water quality standards be set for all contaminants in surface waters, and many of Vermont's water quality permit and enforcement programs address discharges. The Act also recognizes the need for planning to address the problems posed by nonpoint source pollution, including lakeshore erosion and property runoff to lakes.⁴²

● Vermont Water Quality Standards

All surface waters in the state are public resources and are protected by the Vermont Agency of Natural Resources (VTANR). Vermont has established water quality standards for all surface waters—rivers, streams, lakes and ponds—to ensure that the waters continue to support uses like swimming, fishing, and aquatic habitat.

Classes of Vermont surface waters

All surface waters in Vermont are classified as either Class A or Class B. Class A waters (3% of state waters) are managed to maintain the highest quality standards of drinking water or ecologically significant wildlife and aquatic habitat. Most lakes are Class B waters, and water quality is managed to support swimming, fishing, boating, aquatic habitat and biota.

Numeric water quality standards

A numeric water quality standard is a maximum allowed concentration of a pollutant in water. Numeric standards are associated with each water classification. Specific standards for parameters such as pH, phosphorus, temperature, and turbidity can be found in the Vermont Water Quality Standards.⁴³ Lakes Champlain and Memphremagog are considered impaired due to phosphorus levels that exceed the standard.

Narrative water quality standards

A narrative water quality standard describes the acceptable conditions in or on the water, such as for swimming or aquatic habitat. These standards protect surface water uses such as swimming and aquatic biota from accelerated eutrophication, more than minor changes in condition, impairment of the biological community, and toxicity levels in fish for human consumption.

● Municipal Shoreland Management

In Vermont, municipalities may adopt shoreland regulations that set standards for lakeshore development. Currently, less than 20 percent of towns have shoreland zoning that provides some lake protection. The Vermont League of City and Towns (VLCT) has created a "Model Lake Shoreland Protection District Bylaw" for towns to use in establishing shoreland zoning.⁴⁴ The VT Department of Environmental Conservation, Regional Planning Commissions, and the VLCT provide technical assistance to towns interested in enacting such an ordinance.

● Agency of Natural Resources

The Agency is required to monitor, study, and assess lake conditions and to provide information and technical assistance to Vermonters. Within the Agency, the Shoreland Management Program supports policy decisions with science-based recommendations.⁴⁵ The *Vermont Lakes Shoreland Handbook* is in development and a new lakeshore stewardship awards program, Lake Wise, will start in 2013.⁴⁶ The Departments of Fish and Wildlife, and Forests, Parks and Recreation both promote vegetated shorelands for their value in supporting habitat and recreation.

Vermont Regulations with Limited Shoreland Jurisdiction

Several Vermont regulations provide minor coverage over shoreland development, but none offer adequate or comprehensive shoreland protection.

The Vermont Shoreland Encroachment Program has jurisdiction on projects (docks, walls, fill, and dredging) that fall below a lake's mean summer water level. The adjacent shoreland is covered only to the extent that it ties directly into the proposed project.

Act 250 rarely applies to shoreland projects as most shoreland development occurs one lot at a time and is thus sub-jurisdictional with respect to Act 250.

Stormwater Management Rules apply to construction projects that disturb more than one acre of soil, create more than an acre of impervious surface, or involve industrial facilities. These rules are designed to prevent and control erosion and reduce polluted water run-off from impervious surfaces. These rules rarely apply to smaller size lakeshore development or redevelopment projects and are not written for lakeshore management as they do not require set backs from surface waters or protect shoreland vegetation.

State Regulatory Programs - Three State Models of Lakeshore Regulations

Currently, Vermont has no statewide lakeshore protection rule (such a law was passed in 1969, but it was repealed in 1973).⁴⁷ In the following section, three states with lakeshore protection laws are described. These state models include varied approaches to administration, but all offer good examples for Vermont to consider. (For a listing of selected state shoreland protection standards, see Appendix 1.)

◆ New Hampshire—Administered by State Agency

New Hampshire Department of Environmental Services (NHDES)

History of Shoreland Water Quality Protection Act

The SWQPA, originally named the Comprehensive Shoreland Protection Act, was enacted into law in 1991. The Act established minimum standards for the subdivision, use, and development of the shorelands along the state's lakes ten acres or greater. In 2008, the Act was amended to include limitations on impervious surfaces, new vegetation maintenance requirements, and the establishment of a permit requirement for many construction, excavation, and filling activities within the Protected Shoreland. In 2011 changes were made to the vegetation requirements within the natural woodland and waterfront buffers, the impervious surface limitations, and a new shoreland permit by notification process was adopted.⁴⁸ The Act is designed to meet many goals, including maintaining safe and healthy lake conditions; protecting fish spawning grounds, aquatic life, bird, and wildlife habitats; anticipating and responding to the impacts of development in shoreland areas; providing for economic development in proximity to waters; and preventing and controlling water pollution.⁴⁹

New Hampshire Shoreland Regulations	
Number of Lakes	959 (>10 acres)
Regulation	Shoreland Water Quality Protection Act (SWQPA)
Setbacks and Vegetated Requirements	On all lakes > 10 acres, primary structures must be set back 50 feet from the lake and natural vegetation must be left growing within 250 feet of the lake. All shoreland protection rules apply within 250 feet of the shore.
Year Enacted	1991 (amended in 2008 & 2011, adding impervious surface rules)
Administered	Statewide by the NHDES
Other Restrictions	All fertilizers, except for limestone, are banned within 25 feet of shore

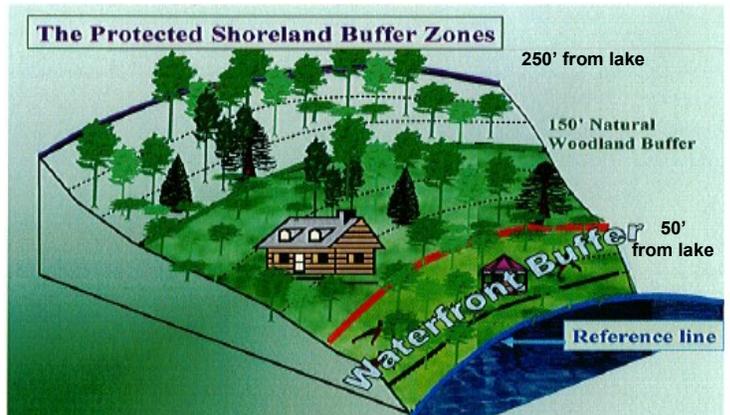


Figure 10. New Hampshire's Protected Shoreland Buffer Zone

How New Hampshire's Shoreland Act Works

New Hampshire has jurisdiction over land uses within 250 feet of the lake's edge and calls this area the Protected Shoreland Zone. Within this 250 feet of shoreland, there are two subzones, the Waterfront Buffer Zone, which extends 50 feet from the lake and the Natural Woodland Buffer Zone, which covers 50-150 feet from the lake; the remaining 50 feet and the two subzones make up the Protected Shoreland Buffer Zone.⁴⁹

Waterfront Buffer Subzone Restrictions:

A grid system of 50'x50' is used to determine the appropriate density and type of vegetation within the Waterfront Buffer Zone. There must be a minimum of fifty points within a 50'x50' parcel. Points are determined by a tree's or a sapling's diameter at breast height (4 ½ feet) and the mix of groundcover and thickness of shrubs (ground cover and shrubs can not exceed 25% of the points). The number of required points is proportional to the grid size if less than 50'x50', and tree branches can be trimmed for views. A permanent pathway up to six feet wide leading to the lake is allowed as long as it does not contribute stormwater runoff, so paths that meander are more permissible than straight paths.

Natural Woodland Buffer Subzone :

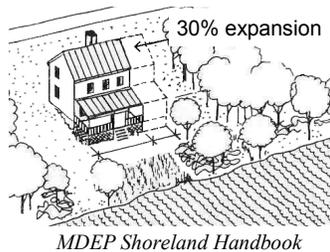
This area 50 to 150 feet from the water edge must be maintained with at least twenty five percent vegetation in an "unaltered state," meaning no trimming, pruning, limbing or mowing. Vegetation clearing for building construction is limited to 25 feet outward from the building, septic, and driveway.

The Protected Shoreland Zone:

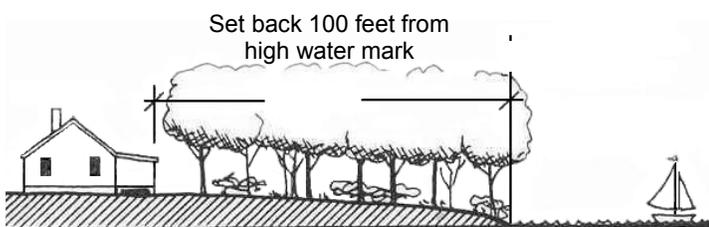
Property owners who exceed 30 percent impervious surface coverage must have a Stormwater Management System designed by a certified engineer. Property owners who exceed twenty percent of impervious surface coverage (20 to 30 percent impervious) are required to

Maine Shoreland Regulations	
Number of Lakes	2,600 (>10 acres in size)
Regulation	Mandatory Shoreland Zoning Act
Setbacks and Vegetated Requirements	This Act establishes a statewide shoreland protection zone within 250 feet of Maine's rivers, wetlands, lakes and ocean. All structures must be set back 100 feet from the lake and cannot exceed 35 feet in height. There is a vegetative requirement and only 20 percent of the lot can be impervious. Minimum lot sizes for lakeshore are 200 feet by
Year Enacted	1971
Administered	Municipalities have Local Code Enforcement officers who administer and enforce the Shoreland Zoning Act. MDEP assists municipalities with shoreland zoning by providing technical assistance and training on shoreland zoning rules. The MDEP Shoreland Zoning Program offers an "on-call" toll free system to provide shoreland zoning assis-
Other Restrictions	All site workers and construction contractors must be state certified to work within 250 feet of any surface water shore.

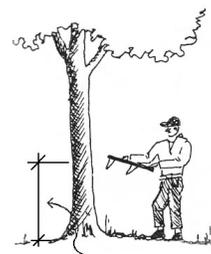
have a Stormwater Management Plan, which they must submit to NHDES, but do not necessarily have to have a certified engineer approve this plan. Within all zones, a permit from the NHDES is required for any construction, excavation or filling activities (with a few exceptions). The construction permits fees help pay for the enforcement by NHDES inspectors.



Pros: A lakeshore culture has developed around this law; people associate healthy lakes with wooded shores and a protected shoreland. The public supports the law to protect recreational opportunities and property values.⁵⁰ Recent amendments to the law strengthened lake protection by increasing the vegetative requirement and adding new impervious surface rules. The law is adminis-



tered by the NHDES, ensuring its uniformity across the state. Good "Fact Sheets" are available.



Cons: Although the 2011 amendments clarify the 250 shoreland zone and what projects are and are not permitted, the law does not apply to existing landscaping. Owners of lots legally developed or landscaped before the amendments are not required to increase the area of natural vegetation. Some towns have adopted their own, slightly more lenient version of shoreland zoning with approval by NHDES.⁴⁷

Diameter	Points
Under 2"	0
2" to < 4"	1
4" to < 8"	2
8" to < 12"	4
12" or >	8

Measure tree diameter at 4.5 feet from ground

◆ **Maine—Administered by Municipalities**

Maine Department of Environmental Protection (MDEP)

History of the Mandatory Shoreland Zoning Act

Originally passed in 1972, during the last 40 years changes to Maine's Shoreland Act have increased the set back building distance from 75 to 100 feet, and fortified the vegetative requirements. Their Act is designed to prevent and control water pollution, protect fisheries, and conserve natural beauty and shore cover.⁵¹

How Maine's Shoreland Zoning Act Works

Shoreland zoning regulations are based on standards developed by MDEP and administered and enforced by each municipality through locally adopted ordinances. The local "Code Enforcement Officer" is the contact for shoreland zoning questions. Three Shoreland Zoning Staff at MDEP assist municipalities with shoreland zoning questions and issues, and provide technical assistance and training to the Code Enforcement Officers. MDEP staff are available to the public through a toll free number and they list all the Municipal Shoreland Ordinances on their web site.

The *Maine Shoreland Zoning Handbook for Shoreland Owners*⁵¹ explains the Shoreland Act with graphics illustrating for landowners and local Code Enforcement Officers the development allowed within the 250 foot shoreland zone. As shown above, shoreland owners can expand their home, but not more than 30 percent; the addition must not encroach towards the lake, but be built on the side or back of the existing structure.

The vegetation requirement follows a "Diameter at Breast Height" point system for determining the amount

of vegetation within a 25 foot by 50 foot section. Within this plot there has to be a minimum five saplings and vegetation under three feet can not be cut. Also, openings in the tree canopy can not be greater than 250 square feet and meandering paths can not be wider than six feet. According to Rich Baker of MDEP, this grid system is very easy for a landowner to understand which allows landowners to manage their own property.⁵³ New Hampshire based their grid system after Maine's in 2011.

Pros: Maine's law is easy to follow and reflects the state's 40 year history of fine-tuning, making it simple and more effective at protecting water quality and shoreland habitat.

Cons: MDEP staff have had some issues with the local administration and enforcement, and staff have commented that if it were state administered it might be more efficiently run.

Wisconsin Shoreland Regulations	
Number of Lakes	15,000 (>10 acres ?)
Regulation	The Shoreland Zoning Ordinance
Setbacks and Vegetated Requirements	The Shoreland Zoning Ordinance (NR 115) establishes statewide shoreland zoning standards on lands 1,000 feet from the ordinary high water mark, which mandate a 75 foot set-back for all structures and prohibit clear-cutting of trees and shrubs 35 feet from the lake (with the exception for a 30 foot wide path, for every 100 feet of shoreline, down to the water.) Every county in the state must adopt at least these minimal statewide shoreland regulations.
Year Enacted	1968
Administered	By counties
Other Restrictions	A 2009 ban on phosphorus in lawn fertilizer.

◆ **Wisconsin - Administered by Counties**

Wisconsin Department of Natural Resources (WDNR)

History of the Wisconsin Shoreland Zoning Ordinance

Since 1968, Wisconsin has required counties to adopt ordinances on shoreland zoning that include setbacks of structures from the water's edge, minimum lot sizes on new subdivisions, and restrictions on clear-cutting of trees in the nearshore area. Additional zoning guidelines have been added on a county-by-county basis to address

the kinds of developments, improvements and modifications those communities were experiencing.

How Wisconsin's Shoreland Ordinance Works

All counties in the state must adopt shoreland zoning ordinances to protect the navigable waters of the state. The "shoreland zone" is defined as the area within 1,000 feet of a navigable lake or pond. These ordinances require owners to maintain safe and healthful conditions; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control placement of structures and land uses; and reserve shore cover and natural beauty.⁵⁴ County ordinances may be more restrictive than the state standards, but not less.

Lot size standards depend on the sewage system. Lots served by a public sewer system must have a minimum average width of 65 feet and a minimum area of 10,000 square feet. Unsewered lots (lots using on-site systems) must have a minimum average width of 100 feet and a minimum area of 20,000 square feet. Buffer strip rules vary according to the zone. The clear-cutting of trees and shrubs is not allowed in the strip of land from the ordinary high water mark to 35 feet inland. One exception exists for a 30 foot wide path down to the water, allowed for every 100 feet of shoreline.

All buildings and structures must be set back at least 75 feet from the high water mark. Structures can not be more than 35 feet in height. There is a provision for the grandfathering of homes (legal non-conformities), which allows for the continued use of those homes that were built before the Ordinance took effect. This only allows for the grandfathering of homes in violation of the setback requirements, not the buffer strip rules. Each county must address nonconformities through limiting or prohibiting additions, structural alterations, and/or repairs. The intent is that all nonconformities shall eventually be brought into conformity with the ordinance.⁵⁵

Pros: Wisconsin is a large state with many lakes, and county-administration of state shoreland standards is most effective. The vegetative requirements apply to all shoreland homes, regardless of the year built.

Cons: Although updates to the shoreland law have been written, they have been put on hold for the last few years. Amendments to better protect lakes from large rain events, increased impervious surfaces, and habitat degradation are being considered. The exception for a 30 foot wide cleared path to the water's edge for every 100 feet of shore lessens the vegetative protection of the lake.

Conclusions from the review of other state regulations

Municipal or county administration of a shoreland regulation keeps the cost to the state down, but transfers that cost to the local entity and may result in inconsistencies in effectiveness and enforcement.

States with shoreland protection standards have nurtured a lake culture where lake users accept and support vegetated lakeshores because they associate them with healthy lakes. Washington, Minnesota, Wisconsin, Michigan, New York, Quebec Province, and all the New England states besides Vermont have shoreland regulations.

Good education and outreach is a critical to maximizing compliance. Maine and New Hampshire offer internet resources and fact sheets that explain how their shoreland law works. The Maine Shoreland Owner Handbook makes it easy for a shoreland owner to understand how to manage their property.⁵⁶

Best Management Practice	Comments
<i>Vegetated protective zone</i> – an area of mixed native vegetation along the shore, made up of trees, shrubs, groundcover, and duff (decomposing material)	<i>The single most important shoreland management tool.</i> The multiple layers of vegetation, the absorbent duff layer and the natural uneven ground all contribute to filtering and infiltrating sediments and phosphorus from runoff and ensuring that only clean water reaches the lake. The variety of root structure, depth and mass hold the soil together and prevent erosion. Fallen trees, branches and leaves all provide essential habitat structure in the shallow water.
Erosion control standards during construction	The construction period can be a time of significant sediment runoff into the lake unless simple erosion control measures are followed.
Placement of buildings 25 ft uphill of the vegetated protective zone	Ensures that construction equipment does not encroach on the protective zone.
Standards that address existing, non-conforming uses	Typically, a regulation does not require any action to reduce the degree of non-conformance unless a change in use is proposed for the property. When a change or increase in use is proposed, it is usual to require the degree of non-conformance not be increased. In addition, mitigation measures can reduce the impact of a change (for instance a home can be enlarged in exchange for planting along the shore).
Minimum lot sizes and lake frontage when new lots are being cre-	To ensure adequate space for a vegetated protective zone and setbacks and well-functioning on-site septic systems.
Low-impact development standards for the developed portion of the property	To reduce runoff into the protective zone, increasing its effectiveness. Measures could include a limit on impervious area, driveway standards, infiltration requirements.

Table 4. Best management practices for shorelands. Regulations in other states, the Vermont League of Cities and Towns model shoreland ordinance,^{57,58} and VTANR management recommendations contain these recommendations for shoreland to protect water quality and habitat, provide bank stability and scenic values.

Part Four - Shoreland Protection and Restoration Recommendations

This report highlights the role naturally vegetated and well-managed lakeshores play in the long-term prosperity of lakes and ponds. Vermont's lakes are a valued resource for recreation, the economy, and the natural landscape. However, Vermont's shorelands are in substantially poorer condition than lakes in the northeast eco-region and in the nation. Comparing Vermont's current shoreland management practices to other northeastern states' programs reveals a major gap in Vermont's management program, that of uniform and required standards for shoreland development. The VANR concludes that the current shoreland management approach in Vermont, education, outreach, technical assistance and voluntary municipal participation, is not providing adequate management and protection of our lakes. Ensuring the long term health of Vermont lakes and continued enjoyment of them requires new approaches and standards to protect and restore wood-land shores.

This report finds that:

1. 82% of Vermont's shorelands are in poor or fair condition due to clearing of native woodlands.
2. A shoreland cleared of natural vegetation results in:
 - Increased phosphorus and sediment runoff (the primary pollutants to Vermont lakes) both during and after development.
 - Degraded shallow water habitat.
 - Erosion caused by lawns down to the water's edge.
 - Bank instability during floods, as illustrated on Lake Champlain and other lakes in the spring of 2011.
 - Increased likeliness of algae growth, mucky bottoms, and nuisance plant growth.
3. Healthy lakes generate millions of dollars annually for the Vermont economy and private property maintains highest value when water quality is good.
4. Well-vegetated shorelands provide flood resilience and play an essential part in buttressing Vermont's water resources against the effect of climate change.
5. Education, outreach and technical assistance, while essential, cannot alone provide adequate protection of the shorelands and lakes.
6. Less than 20 percent of towns have ordinances to protect lakeshores, which vary in effectiveness. Adoption of good local shoreland zoning has progressed very slowly over the past 40 years.
7. Act 250 has jurisdiction over only a very small per-

centage of shoreland development; most shoreland development takes place one lot at a time. Likewise, the vast majority of shoreland development is sub-jurisdictional to the Stormwater Management Rules as the developed area is usually less than an acre.

8. Vermont lags behind other New England states and the nation in terms of shoreland condition. Accordingly our lakes are more threatened by phosphorus and sediment runoff from shoreland areas, habitat degradation, and flood damage.
9. It is far more effective both in cost and in functionality to prevent a problem rather than trying to restore water quality or habitat after damage is done.

The VTANR concludes that a new approach is necessary if Vermont is to adequately protect lake water quality, habitat, recreational use, the tourism economy, and property values. Vermont legislators have an opportunity to not only protect Vermont lakes from further degradation, but to strengthen the uses and values they hold for all Vermonters. VTANR provides these three options for protection and restoration of shorelands and lakes.

Three Regulatory Management Options:

State administered option: The Agency would adopt standards via rule making and administer a statewide permit program. Similar to Act 250, the extent of state jurisdiction in a town could vary depending on the existing ordinances in town.

Enhanced local option: Set minimum standards that the municipalities can choose to administer themselves. This option may be attractive to the twenty percent of towns that already have protective shoreland zoning, or that want to add to the state minimum standards to reflect local priorities. The Agency would administer the standards through a permit program for municipalities that choose not to do so themselves.

Municipality administered option: The state sets minimum standards that municipalities must incorporate into their zoning ordinances. The state could provide technical assistance to towns administering the ordinance. The state would administer the minimum standards in the 94 towns which have no zoning and are therefore not set up to administer an ordinance.

Paying for a statewide shoreland permit program

The VTANR estimates there would be annually 75 proposals for development on undeveloped shores, and 675 proposals for redevelopment of existing developed shores in Vermont. Under the permit administration options outlined above, the following program costs and revenues are identified.

State administered option: A permit fee as low as \$250 per application review would cover the state's costs.

Enhanced local option: Under this option the state would administer shoreland development applications in towns that choose not to adopt that state standards and provide technical assistance to those towns that are administering ordinances. Assuming that twenty percent of towns would manage an ordinance locally, fee revenue from the remaining towns would support administration of the program including technical assistance.

Municipality administered option: The state sets minimum standards that municipalities must incorporate into their zoning ordinances. The state would administer the minimum standards in towns which have no zoning. The state would administer the standards and collect fees only in towns without zoning.

Non-Regulatory Options

While VTANR concludes that a shoreland program relying solely on education, outreach and technical assistance is not adequately protecting Vermont lakes, such programs are a necessary component of any program, regulatory or not. The following elements are therefore recommended.

- Encourage and enable shoreland conservation projects that preserve undeveloped lakeshores.
- Evaluate a use value appraisal-type tax credit for establishing or protecting a wooded lakeshore and to reward landowners for maintaining a naturally vegetated shore.
- Support education and outreach efforts, such as the Agency's Lake Wise Program and the Lakes and Ponds Section literature and website materials.
- Continue to support the Vermont League of City and Towns lake protection technical assistance to towns.
- Establish a "green" certification program for contractors to provide training on water resource protection measures such as vegetated shorelands and erosion

control during construction.

- Continue Agency individual site visits, as requested, to provide recommendations regarding shoreland management or restoration.
- Continue to fund lake events and technical assistance projects that promote and demonstrate shoreland restoration and protection. Partner with external organizations, such as the Vermont Federation of Lakes and Ponds, the Natural Resources Conservation Districts, and the Regional Planning Commissions.



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Appendix 1. Comparisons of Selected State Shoreland Regulations

State (Width of State Shoreland Zone) # of lakes Date of Enactment	Protective Vegetation Requirement	Setback for Structures	Minimum Lot Size	Can Towns Adopt Less Strict Requirements?	Enforcement of Shoreland Zoning
Vermont 292 > 20 acres	0	0	0	-	There are no statewide shoreland regulations, but towns are authorized to adopt them if they choose. Towns with municipal shoreland zoning rules (~20%) often have a difficult time enforcing them
Maine (250 feet) 2,600 > 10 acres 1971	Yes	125' (100 foot setback for soil disturbance)	200'x200' for new construction	No	75-80% of towns adopt the state's model ordinance verbatim, other towns make minor changes that MDEP must approve. Local Code Enforcement Officers administer and enforce zoning. MDEP has five regional Shoreland Specialists to technically assist the public and Code Enforcement Officers.
New Hampshire (250 feet) 959 > 10 acres 1991 (revised in 2011)	Yes (vegetation requirements for all of shoreland zone -250 of shore)	50'		No	Statewide by the NHDES
Massachusetts (100 feet) 600 > 10 acres 1983	Determined by required review.	Determined by required review	Determined by required review	Yes. Local Conservation Commissions can approve all work projects within the 100' shoreland zone if they decide there will be no adverse affect to the lake bank.	The State Wetlands Protection Act designates a 100 foot buffer zone, providing a regulatory mechanism to require review of all projects within this zone. Less review is done for projects 50-100 feet from the protected water resource area if the slope within the buffer zone is not steeper than 15% and no more than 40% of the buffer zone is impervious surface. All review and enforcement is done by Municipal-volunteer Conservation Commissions. Mass DEP Circuit Riders assist Conservation Commissions.
Rhode Island n/a 1971	Yes, within 50' of lakeshore, must avoid and minimize alterations in canopy. Can clear 15' width without permit.	50'	Determined by required review	Must demonstrate in permit request to RIDEM that any changes minimize possible impacts.	Approval of RI Dept. of Environmental Mgt. is required for projects on ponds greater than three acres. Must get permit to build within 50' and must avoid and minimize alterations within 50'. RIDEP Freshwater Wetlands Program is responsible for enforcement.
Connecticut n/a 2,267 > 1 acre 1972	Determined by required review	Determined by required review	Determined by required review	No	The state requires all municipalities to establish a wetlands agency and all permits are done through that local agency. Municipal regulations must be in conformity with the Commissioner's Regulations, including the Wetlands and Watercourses Act.

Appendix 1. Comparisons of Selected State Shoreland Regulations, continued

<p>New York – Adirondack Park</p> <p>7,849 (state-wide)</p> <p>1973 (APA)</p>	<p>Not state-wide, but APA has vegetative requirement in park.</p>	<p>50 -100' within Adirondack Park Agency (No state-wide setback)</p>	<p>50-200' minimum lot width Adirondack Park, with options for “clustering” development.</p>	<p>Yes, but must appeal to local government or to APA for any changes.</p>	<p>Adirondack Park Agency (APA) (State Attorney General’s Office)</p>
<p>Wisconsin (1000 feet)</p> <p>15,000</p> <p>1968 (revised in 2010)</p>	<p>Yes 35’ vegetative requirement back from lake’s ordinary high water mark [OHWM].</p>	<p>75’</p>	<p>Yes Sewered lots minimum width size of 65’ and minimum area of 10,000 sq ft; unsewered lots minimum width 100’ and min area of 20,000 sq ft.</p>	<p>No</p>	<p>The statewide shoreland zoning standards under Chapter NR 115 are implemented by counties and generally apply only to unincorporated land that is within 1,000 feet of the ordinary high water mark of a lake, pond, or flowage. These minimum state standards establish setbacks and vegetative rules for each county.</p>
<p>Minnesota (1000 feet)</p> <p>11,842 > 10 acres</p> <p>1969</p>	<p>Yes For some Lake Classifications and Shoreland Zones</p>	<p>200’</p>	<p>Yes Lot size depends on the lake class (Natural, Recreational, or General); municipal or private septic; and Land Use District Rules.</p>	<p>Yes Local zoning ordinances regulate vegetation removal depending on the shoreland zone.</p>	<p>Towns administer and enforce shoreland zoning with assistance from Minnesota Dept of Natural Resources</p>
<p>Washington (200 feet)</p> <p>1972</p>	<p>Determined by required review.</p>	<p>Determined by required review.</p>	<p>Determined by required review.</p>	<p>Yes Towns can determine their own requirements, but they must have state approval for determining setbacks or vegetation removal. Based on land use and local ecology there can not be any net loss of shoreline ecological functions for development to occur.</p>	<p>State regulates the adoption of regulations by local governments and local governments enforce their regulations.</p>
<p>Quebec Province</p> <p>>500,000</p> <p>2002</p>	<p>Yes Minimum buffer of five meters seems to be the mandate in the Environment Quality Act.</p>	<p>No Local municipalities must get Minister approval for any project on lakeshore, including redevelopment</p>	<p>No Local municipalities must have Minister approval for all lakeshore development projects.</p>	<p>Yes Local municipalities can ask Minister of Development for changes to lakeshore vegetation requirements.</p>	<p>Local municipalities determine setbacks and lot size with approval from Minister of Development. Municipalities issue permits for small-scale projects under the Act Respecting Land Use Planning and Development. The Minister of Development of the Environment and the Parks issues permits for public/commercial/industrial projects under the Environment Quality Act.</p>

Appendix 2 - Vermont Municipal Shoreland Ordinances

This information is a compilation from records at VT Department of Environmental Conservation and the Vermont League of Cities and Towns. We apologize for any mistakes it may contain.

Town	Lake(s) 20 acres or larger	Lakeshore buffer width	Building setback from water's edge
Addison	Yes	-	100 ft
Albany	Y	-	-
Alburgh	Y	-	-
Andover		-	-
Arlington		-	-
Athens	Y	-	-
Averill	Y	50 ft	100 ft
Averys Gore		50 ft	100 ft
Bakersfield		-	100 ft
Baltimore		-	-
Barnard	Y	50 ft	50-100 ft
Barnet	Y	-	100 ft
Barre City		n/a	-
Barre Town		-	50 ft
Barton	Y	-	25 ft
Belvidere		-	-
Bennington	Y	-	50 ft
Benson	Y	-	75 ft
Berkshire		-	yes
Berlin	Y	-	75 ft
Bethel		-	-
Bloomfield		n/a	-
Bolton		50-100 ft	50-200 ft
Bradford		-	35-50 ft
Braintree		-	100 ft
Brandon		-	yes
Brattleboro	Y	n.a	50-100 ft
Bridgewater		n/a	-
Bridport	Y	-	-
Brighton	Y	30 ft	-
Bristol	Y	-	50 ft
Brookfield	Y	-	75 ft
Brookline		n/a	-
Brownington	Y	-	-
Brunswick	Y	-	-
Burlington	Y	-	50-250 ft
Cabot	Y	50 ft	75 ft
Calais	Y	50 ft	150 ft
Cambridge		-	-
Canaan	Y	-	50 ft
Castleton	Y	-	-
Cavendish	Y	-	-
Charleston	Y	-	-
Charlotte	Y	-	100 ft
Chelsea		-	35 ft
Chester		-	-

Town	Lake(s) 20 acres or larger	Lakeshore buffer width	Building setback from water's edge
Chittenden	Y	-	-
Clarendon		-	-
Colchester	Y	100 ft	100 ft
Concord	Y	-	35 ft
Corinth		n/a	-
Cornwall		n/a	-
Coventry		-	-
Craftsbury	Y	-	-
Danby	Y	-	-
Danville	Y	-	-
Derby	Y	-	25 ft
Dorset	Y	50 ft	50 ft
Dover		n/a	?
Dummerston		n/a	50 ft
Duxbury		n/a	-
East Haven		-	-
East Montpelier	Y	?	?
Eden	Y	-	-
Elmore	Y	40-100 ft	40-100 ft
Enosburg		-	-
Essex	Y	150 ft	150ft
Essex Junction		n/a	?
Fair Haven	Y	n/a	50 ft
Fairfax	Y	-	-
Fairfield	Y	-	75 ft
Fairlee	Y	-	50 ft
Fayston		n/a	?
Ferdinand	Y	50 ft	100 ft
Ferrisburg	Y	-	80 ft
Fletcher	Y	40 ft	40 ft
Franklin	Y	-	25-50 ft
Georgia	Y	50 ft	50 ft
Glastenbury		-	-
Glover	Y	-	-
Goshen	Y	-	-
Grafton		-	-
Granby	Y	-	-
Grand Isle	Y	75 ft	75 ft
Greensboro	Y	50-300 ft	150 ft
Groton	Y	-	40 ft
Guildhall		n/a	75 ft
Guilford	Y	-	-
Halifax	Y	-	75 ft
Hancock		-	-
Hardwick	Y	25 ft	75 ft
Hartford	Y	30 ft	-
Hartland	Y	-	-
Highgate	Y	-	10 ft
Hinesburg	Y	-	75 ft
Holland	Y	-	-
Hubbardton	Y	25 ft	25 ft

Town	Lake(s) 20 acres or larger	Lakeshore buffer width	Building setback from water's edge
Huntington		n/a	-
Hyde Park	Y	-	100 ft
Ira		n/a	-
Irasburg		-	-
Isle la Motte	Y	-	-
Jamaica	Y	-	-
Jay		n/a	-
Jericho		-	-
Johnson		-	-
Killington	Y	150 ft	200 ft
Kirby		-	-
Landgrove		n/a	-
Leicester	Y	-	75 ft
Lemington		n/a	50 ft
Lewis	Y	50 ft	100 ft
Lincoln		n/a	25 ft
Londonderry	Y		
Lowell	Y	-	-
Ludlow	Y	-	50 ft
Lunenburg	Y	-	-
Lyndon	Y	-	-
Maidstone	Y	25 ft	25 ft
Manchester			50 ft
Marlboro	Y	50 ft	75 ft
Marshfield	Y	25 ft	75 ft
Mendon		n/a	150
Middlebury		-	25-100 ft
Middlesex	Y	25 ft	75 ft
Milton	Y	25 ft	50 ft
Monkton	Y	-	-
Montgomery		n/a	-
Montpelier	Y	n/a	-
Moretown		-	25 ft
Morgan	Y	-	20 ft
Morristown	Y	-	50 ft
Mount Holly		-	-
Mount Tabor		-	-
Newark	Y	-	-
Newbury	Y	10 ft	100 ft
Newfane	Y	-	75 ft
Newport City	Y	-	-
Newport Town	Y	-	-
North Hero	Y	25 ft	75 ft
Northfield		-	-
Norton	Y	-	-
Orange	Y	-	-
Orwell	Y	50 ft	50 ft
Panton	Y	-	-
Pawlet		n/a	-
Peacham	Y	50 ft	-
Peru		-	-

Town	Lake(s) 20 acres or larger	Lakeshore buffer width	Building setback from water's edge
Pittsfield		n/a	-
Pittsford	Y	-	-
Plainfield		-	-
Plymouth	Y	50 ft	75 ft
Poultney	Y	-	50 ft
Pownal	Y	-	50 ft
Proctor		-	-
Putney		-	50-100 ft
Randolph		-	50-200 ft
Reading	Y	50 ft	50 ft
Readsboro	Y	-	-
Richford		-	-
Richmond	Y	-	50 ft
Ripton		-	-
Rochester		-	-
Rockingham	Y	-	-
Roxbury		-	-
Royalton	Y	-	-
Rutland City		-	-
Rutland Town	Y	-	-
Rupert		n/a	-
Ryegate	Y	50 ft	100 ft
Salisbury	Y	-	25-100 ft
Sandgate	Y	-	100 ft
Searsburg	Y	-	-
Shaftsbury	Y	~50 ft	50 ft
Sharon	Y	-	-
Sheffield	Y	-	-
Shelburne	Y	100 ft	100 ft
Shoreham	Y	-	20 ft
Shrewsbury	Y	-	100 ft
Somerset	Y	-	-
South Burlington	Y	-	-
South Hero	Y	-	75 ft
Springfield	Y	-	25 ft
St Albans City		-	-
St Albans Town	Y	50 ft	75 ft
St George		n/a	-
St Johnsbury		-	-
Stamford	Y	-	-
Stannard	Y	-	-
Starksboro		100ft	-
Stockbridge		n/a	10 ft
Stowe	Y	200 ft	50-200 ft
Strafford	Y	-	200-400 ft
Stratton	Y	-	-
Sudbury	Y	25-50 ft	-
Sunderland	Y	-	-
Sutton	Y	-	-
Swanton	Y	50 ft	50 ft
Thetford	Y	-	-

Town	Lake(s) 20 acres or larger	Lakeshore buffer width	Building setback from water's edge
Tinmouth	Y	-	50 ft
Topsham		-	-
Townsend	Y	-	-
Troy		n/a	-
Tunbridge		-	-
Underhill		-	100 ft
Vergennes		n/a	-
Vernon	Y	-	-
Vershire		-	10 ft
Victory		-	-
Waitsfield		n/a	-
Walden	Y	-	-
Wallingford	Y	-	-
Waltham		-	-
Wardsboro		-	-
Warners Grant		n/a	100 ft
Warren	Y	50-100 ft	100 ft
Warrens Gore	Y	50 ft	100 ft
Washington	Y	50 ft	?
Waterbury	Y	-	-
Waterford	Y	-	-
Waterville		-	-
Weathersfield	Y	50-100 ft	50-100 ft
Wells	Y	-	-
West Fairlee	Y	-	-
West Haven	Y	-	200 ft
West Rutland		n/a	-
West Windsor		-	50 ft
Westfield		n/a	50 ft
Westford		100 ft	100 ft
Westminster		-	50 ft
Westmore	Y	15 ft	50-100 ft
Weston	Y	-	-
Weybridge		-	-
Wheelock	Y	-	-
Whiting		n/a	-
Whitingham	Y	-	125 ft
Williamstown	Y	-	-
Williston	Y	150 ft	150 ft
Wilmington	Y	-	-
Windham	Y	-	-
Windsor	Y	50 ft	50 ft
Winhall	Y	-	200 ft
Winooski	Y	-	-
Wolcott	Y	100 ft	25-150 ft
Woodbury	Y	50 ft	100 ft
Woodford	Y	-	50 ft
Woodstock		-	50 ft
Worcester	Y	-	-