

# NEW HAMPSHIRE DRINKING WATER QUALITY BUFFER MODEL ORDINANCE



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# New Hampshire Drinking Water Quality Buffer Model Ordinance

## *Protecting Water Resources at the Local Level*

### INTRODUCTION

The guidance in this document provides an approach to protecting the long-term quality and availability of New Hampshire's surface water being used as a source of drinking water by a public water system. The guidance considers the current literature involving the role of buffers in maintaining water quality as well as other factors including site specific conditions, and land use best management practices.

Protecting public and private drinking water resources is most often accomplished through the following approaches:

- local water resource protection and conservation that engage community stakeholders and water users and promote best practices in water management, investments in protective measures, and sound land use planning and policies;
- land use regulation and management focused on pollution prevention best practices and limiting development and impervious surfaces in drinking water supply watersheds;
- land conservation practices focused on protecting source waters and their contributing drainage and recharge areas; and
- application of best available science on water quality protection, drought, climate change, water conservation, and water resource and demand management.

### Overview of Vegetative Buffer Functions

Shoreland areas of New Hampshire are among the state's most valuable and fragile natural resources. The removal of vegetation from shoreland areas can deteriorate water quality. Vegetative buffers protect water quality because the plants, soil, and soil microbes in those buffers filter pollutants from water as it flows over the landscape on its way downhill or as it infiltrates into the ground. Native trees and shrubs are considered the most effective buffer plants for water quality goals. The filtration carried out by intact vegetative buffer plants is both mechanical and biochemical. The cleaner water is entering drinking water treatment systems, the more efficient and cost effective the treatment will be in providing high quality drinking water to communities.

- Plant structures, like leaves, stems, and roots, reduce the force of precipitation and slow the flow of water over the ground. This reduction in force reduces the likelihood that soil and sediment will be disturbed and carried away.
- Plant stems, roots, and soil particles capture pollutants and prevent them from traveling into waterbodies. Excess amounts of the nutrient, phosphorus, cause problems by stimulating algal blooms, especially in fresh water. Phosphorus clings to sediment, so reducing erosion reduces the potential for phosphorus-loaded runoff.

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Algal blooms create excessive aquatic plant growth, reduce aquatic oxygen levels, and disturb aquatic ecology.

- In the soil, nitrogen compounds, which also stimulate marine and aquatic algal blooms, are biochemically converted into less polluting forms of nitrogen through the action of soil microbes living in association with healthy plants. Microbes in wetlands are especially effective at converting nitrogen compounds into less polluting forms.

## State Buffer Protection and Related Water Supply Watershed Regulations

Buffer protection adopted into local zoning codes should be consistent with New Hampshire state law and regulations that afford buffer or setback protection to surface water sources and the water supply watersheds. Contact NHDES' Source Water Protection Program regarding current protections in place.

### State Buffer or Setback Protection

The following is a short summary of key state protections:

- New Hampshire's Water Quality Shoreland Protection Act (RSA 483-B) under state administrative rule Env-Wq 1400, requires a 50 foot "Waterfront Buffer," limiting vegetation and tree removal along 4<sup>th</sup> order streams and great ponds (greater than 10 acres).
- Protecting the Purity of Surface Water Sources of Drinking Water (Env-Dw 902) establishes minimum land use setbacks from certain surface water sources and/or their tributaries in water supply watersheds through a process outlined in the rule.
- The Alteration of Terrain rules (Env-Wq 1500) administered by NHDES limit stormwater discharges within 100 feet of a source or tributaries located in "Water Supply Intake Protection Areas" as defined in the rule.

### Limits to Municipal Authority

Current state law limits municipal zoning authority to regulate agriculture and timber harvesting activities. For example, RSA RSA 672:1 (III-b) limits "unreasonable" limitations on agriculture through municipal zoning while RSA 674:(1)VI prohibits the planning board from regulating timber harvesting operations that are not part of a subdivision application or a development project subject to site plan review. Final zoning or other regulatory language to adopt any vegetative buffer should reflect the authority granted to municipalities to regulate agricultural and timber harvesting activities as provided for under state statute.

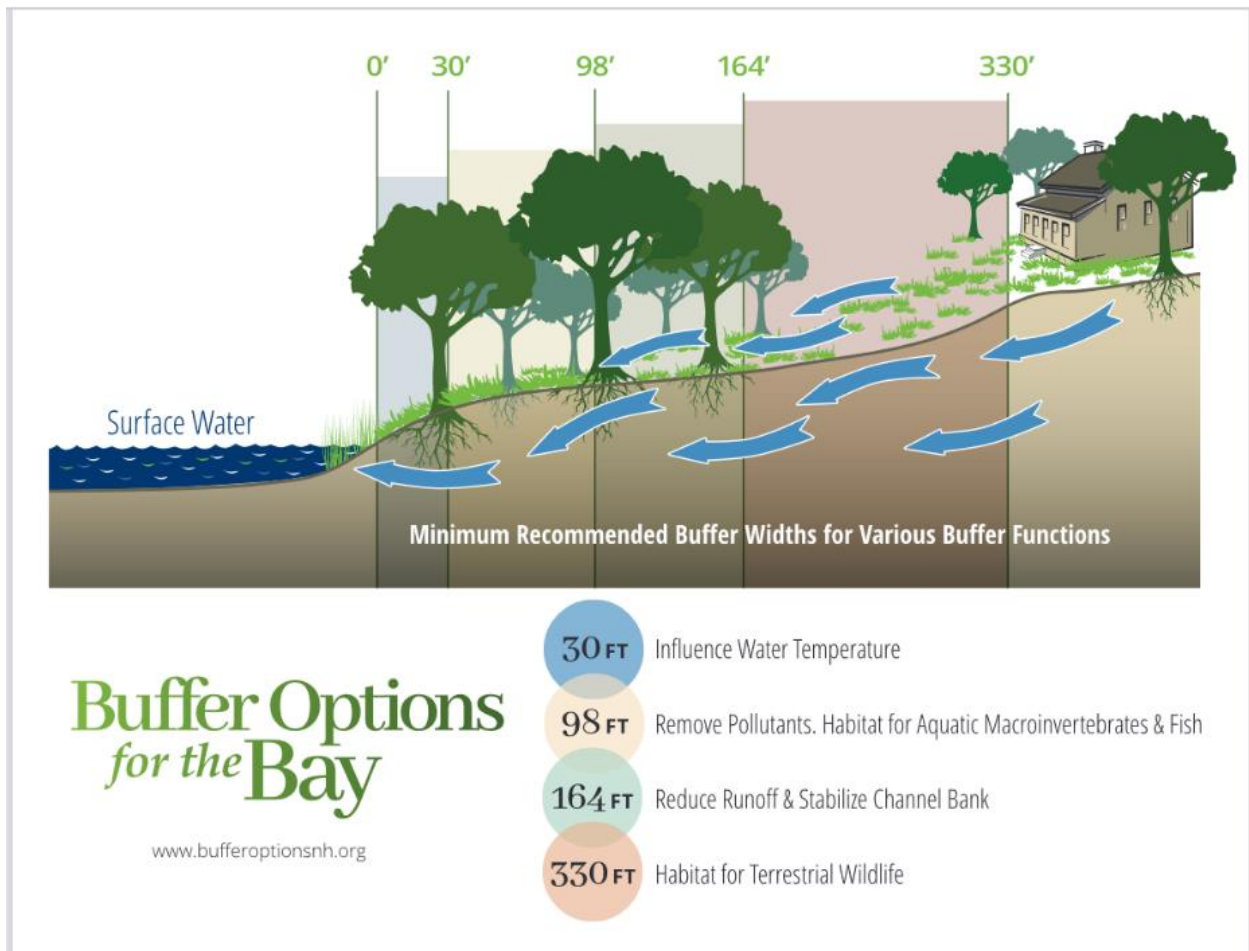


Figure 1. The graphic above shows varying recommended buffer widths for specific buffer functions including attenuation of contaminants such as Phosphorous and Nitrogen, protecting water temperature and aquatic habitats, reducing runoff and stabilizing soil.

### CHECKLIST OF BEST PRACTICES AT THE LOCAL LEVEL

The following is a checklist of best practices to protect water supplies and how the model buffer regulation may help achieve them.

Best Practice	Protection Type	Implementation Method(s)
<b>Training for municipal staff and elected officials</b>	Inform management of facilities and infrastructure	Annual as part of MS4 Good Housekeeping actions
<b>Training for land use boards, commissions and committees</b>	Raise awareness and preparedness, prepare for taking action	Planning Board, Zoning Board, Conservation Commission, Open Space/Lands, Heritage
<b>Mapping and data collection</b>	Inventory of conditions, identify opportunities for restoration and protection	Utilize NH GRANIT and Coastal Viewer data, and local/regional research and studies

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<b>Community Outreach and Engagement</b>	Pollution prevention and mitigation, buffer restoration	MS4 Permit messaging, community events, social media, municipal website
<b>Demonstration projects</b>	Lead by example (e.g. rain gardens, stormwater projects, buffer plantings, shoreland cleanup)	Partner with local, regional and state service providers and programs (RPC's, UNH Coop. Ext., PREP)
<b>Partnerships</b>	Implementation including funding, technical assistance, examples and tools	Local, regional and state resources

**CHECKLIST OF WATER QUALITY PROTECTIONS AT THE LOCAL LEVEL**

The following is a checklist for review/evaluation of existing drinking water quality protections and guidance about how to cross-check existing protections.

<b>Where to Cross-check</b>	<b>Guidance</b>
<b>Zoning Ordinance</b>	Review resource protection overlay districts, zoning districts, and criteria for permitted and prohibited uses, special exceptions and conditional use permits
<b>Site Plan Review Regulations</b>	Review stormwater management and erosion and sediment control standards, road and parking lot construction standards, setbacks versus buffers
<b>Subdivision Regulations</b>	Review stormwater management and erosion and sediment control standards, road and parking lot construction standards, setbacks versus buffers
<b>Capital Improvement Plan</b>	Identify and/or map where infrastructure improvements are planned in the next 10 years within 500 feet of drinking water source areas and evaluate potential impacts on drinking water sources.
<b>Hazard Mitigation Plan</b>	Identify and/or map local areas at high risk of flooding within 500 feet of drinking water source areas. This can include evaluating risk of a hazardous material spill within a drinking water source area.
<b>Master Plan</b>	Review goals and objectives in the following chapters: Vision, Land Use, Natural Resources, Municipal Facilities/Infrastructure
<b>Land Conservation/Open Space Plan</b>	Review goals and objectives for water quality protection measures

**Guidance on Incorporating Opportunities to Protect and Improve Water Quality Protections**

Local strategies and initiatives to protect and improve water quality protections often involve a wide range of community stakeholders, from elected officials, board/commission/committee members, to residents and business owners.

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- Convene a local drinking water quality or water resources committee to coordinate municipal strategies and activities.
- Cross-check other zoning requirements involving a municipal buffer (e.g., wetland buffer) as well as planning documents for common objectives and alignment of actions and priorities; create a coordinated implementation plan.
- Conduct a community survey to gain input about community perspectives regarding drinking water sources, pollution sources and willingness to participate in community actions.
- Engage the Planning Board, Select Board and City Council in discussion about ways to protect drinking water sources.
- Seek funding sources to implement protective measures for drinking water sources and identifying future sources if needed.
- Engage the public in outreach and engagement activities such as demonstration projects and neighborhood campaigns.

Check buffer language already adopted in local ordinance(s), such as in a wetland protection district for consistency with the language in this model. Add a reference to buffers already established in local ordinance in the final Model Drinking Water Quality Buffer.

Adoption of a local buffer to protect drinking water sources should reflect community values and local perspectives regarding environmental and public health protection, community character, and economic values, among others. A useful resource for local officials and volunteers entitled [\*Buffer Options for the Bay: Exploring The Trends, Science and Options for Buffer Management in the Great Bay Watershed: Key Findings from a Community Assessment\*](#) (see Appendix C) explores the local factors influencing buffer-related decision-making in New Hampshire’s seacoast communities. The key findings from this assessment include:

- Buffer-related decisions are inherently complex, requiring municipalities to balance many factors including property rights, community character, natural resource protection, abutters’ concerns, and economic growth.
- People may not understand the individual and social benefits of buffers.
- Buffer oversight and enforcement can be logistically difficult and lack capacity.
- Developers want consistent requirements, flexibility in the review process and not a “one-size-fits-all” rule.

### MUNICIPAL ADOPTION AND APPLICABILITY

The language within this model that establishes buffers around lakes/reservoirs and rivers used as sources of drinking water should be reviewed carefully against current zoning requirements, revised and then adopted as a zoning ordinance overlay district. Delineation of “Drinking Water Quality Buffers” (as defined in the model language) and other landscape features, such as wetland areas, would be required on a site-specific basis for any activity requiring municipal approval.

This type of model ordinance would be required to follow the adoption process of require a majority vote of a warrant article through a town meeting vote or town/city council vote per

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[RSA 675](#). The ordinance would apply to all new development, redevelopment or construction requiring a building permit, unless specifically exempted. The ordinance would not apply to vested pre-existing uses under RSA 674:39.



# MODEL DRINKING WATER QUALITY BUFFER ORDINANCE

## I. TITLE AND AUTHORITY

- A. Title: The title of this district shall be the Drinking Water Quality Buffer Overlay District as adopted as a zoning ordinance.
- B. Authority: This ordinance is adopted as an amendment under the authority granted to the municipality pursuant to RSA 674:16-21 Innovative Land Use Controls.

## II. PURPOSE AND GOALS

Drinking water quality buffer standards are adopted for the purpose of protecting municipal and public drinking water sources and surface waters resources. This ordinance applies to all new development subject to Planning Board authority, as appropriate. Drinking water quality buffer standards are adopted to achieve the following goals:

Provisions of this model ordinance do not apply to matters outside Planning Board jurisdiction, such as building permits or development activities subject to review by the Zoning Board of Appeals.

- A. Prevent the destruction of or significant environmental changes to drinking water sources, surface water resources, and wetlands.
- B. Protect the continuation of natural flow patterns and hydrology of surface waters, streams and other water courses and wetlands including maintenance of groundwater recharge and stream flow during dry periods.
- C. Provide for nutrient attenuation and prevention of nonpoint source pollution from stormwater runoff.
- D. Prevent erosion and excess sedimentation from entering drinking water sources, surface water resources and their associated wetlands.
- E. Preserve, protect, and maintain ecological services that protect water quality.
- F. Prevent the expenditure of municipal funds for the purposes of providing and/or maintaining essential drinking water related services and utilities which might be required as a result of abuse or inharmonious use of water resources.
- G. Protect wetlands, watercourses, surface and groundwater supplies and waterbodies from degradation of their functions.

## III. DRINKING WATER QUALITY BUFFER DEFINITION, CRITERIA AND REQUIREMENTS

### A. Definition and Delineation of Drinking Water Quality Buffer

A drinking water quality buffer is a naturally vegetated no-disturb segment of land directly adjacent to a surface water resource, such as a lake, stream, river, pond, or wetland. Its purpose is to provide protection to surface water used as a source of drinking water from

the impacts of human activities by establishing an area of limited use and disturbance immediately adjacent to these resources.

The Drinking Water Quality Buffer shall be delineated on a site-specific basis:

1. By an applicant or their consultant when activity is proposed that creates land disturbance as defined under this ordinance on any area of a lot that may contribute stormwater to the Drinking Water Quality Buffer, a contributing surface water or wetland, or directly into a surface water source.
2. By an applicant or their consultant as part of a proposal that requires a building permit, Planning Board Site Plan Review application, Planning Board Subdivision Application, or application for zoning relief by the Zoning Board of Adjustment.

#### **B. Drinking Water Quality Buffer**

1. A minimum of 100 feet to ensure water quality protection is supported by scientific literature.<sup>12</sup>A Drinking Water Quality Buffer of 100 feet shall be established from the following:
  - a. Surface waters actively used as a source of drinking water by a public water system,
  - b. Contiguous wetlands contributing to the source, as defined by {insert name and section reference of an existing municipal wetlands zoning ordinance}, that are adjacent to the source.
2. The total buffer width shall be measured as a perpendicular line on the land surface from the reference line, or ordinary high water line, as defined under the New Hampshire's Shoreland Water Quality Protection Act.

#### **C. Permitted Uses in the Drinking Water Quality Buffer**

Consistent with applicable state statute and regulations, the following activities are permitted in the buffer. All other activities and uses are prohibited except as allowed by a Conditional Use Permit issued by the Planning Board.

1. Non-motorized recreation including walking paths and trails located no closer than 50 feet from the source, perennial tributaries or contributing wetlands and be

The Drinking Water Quality Buffer applies to: 1) surface waterbodies actively used as a source of drinking water, 2) adjacent wetlands as defined by local wetlands ordinance.

To extend buffer protection beyond the 100 foot Drinking Water Quality Buffer, consider adopting or revising existing buffer protections afforded to wetland, erodible soils and steeply sloped areas. For example, apply these protections within the source's Hydrologic Area of Concern (HACs) that contribute water to the source. HACs are the primary watersheds defined by NHDES that contribute water to a public water supply source.

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<sup>1</sup> [Buffering the Buffer](#) (Reid and Hilton, USDA Forest Service Gen. Tech. Rep. PSW-GTR-168. 1998)

<sup>2</sup> [Effects of Urbanization on Stream Quality at Selected Sites in the Seacoast Region in New Hampshire](#) (Deacon, Soule and Smith, US Department of the Interior and US Geological Survey, Scientific Investigations Report 2005-5103)

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constructed so as to cause minimal land disturbance to install or maintain (e.g., removal or trimming of surface vegetation, minor grading, installation of fencing, establishment of a pathway, or slope stabilization).

2. Water access areas no wider than 6 feet, with minimal disturbance to land and vegetation, and located in the safest, most direct pathway to the water resource. A consultation for review and recommendations by the Conservation Commission the delineated buffer is required for approval of this activity.
3. Installation of utilities to service existing lots of record.
4. Removal or control of invasive species and removal of dead or diseased trees. A plan prepared by a licensed forester is required.
5. Buffer restoration activities including but not limited to replanting of vegetation, soil replacement and amendments, and limited grading and landscape contouring. A plan prepared by a licensed forester, arborist or landscape architect is required.
6. Wildlife or fisheries management.
7. Scientific research and educational activities.
8. Residential uses that involve a disturbance area of less than 500 square feet.

The model language allows “water access areas” as a permitted use but “water access structures” are not listed as a permitted use in the Primary Drinking Water Quality Buffer. These structures can be regulated under the state Shoreland Water Quality Protection Act. The term includes decks, beaches, and patios, but does not include docking structures. These structures may be allowed under the state regulations but are not allowed under this ordinance. See [NHDES’ Protected Shoreland FAQ](#).

**D. Conditional Uses in the Drinking Water Quality Buffer**

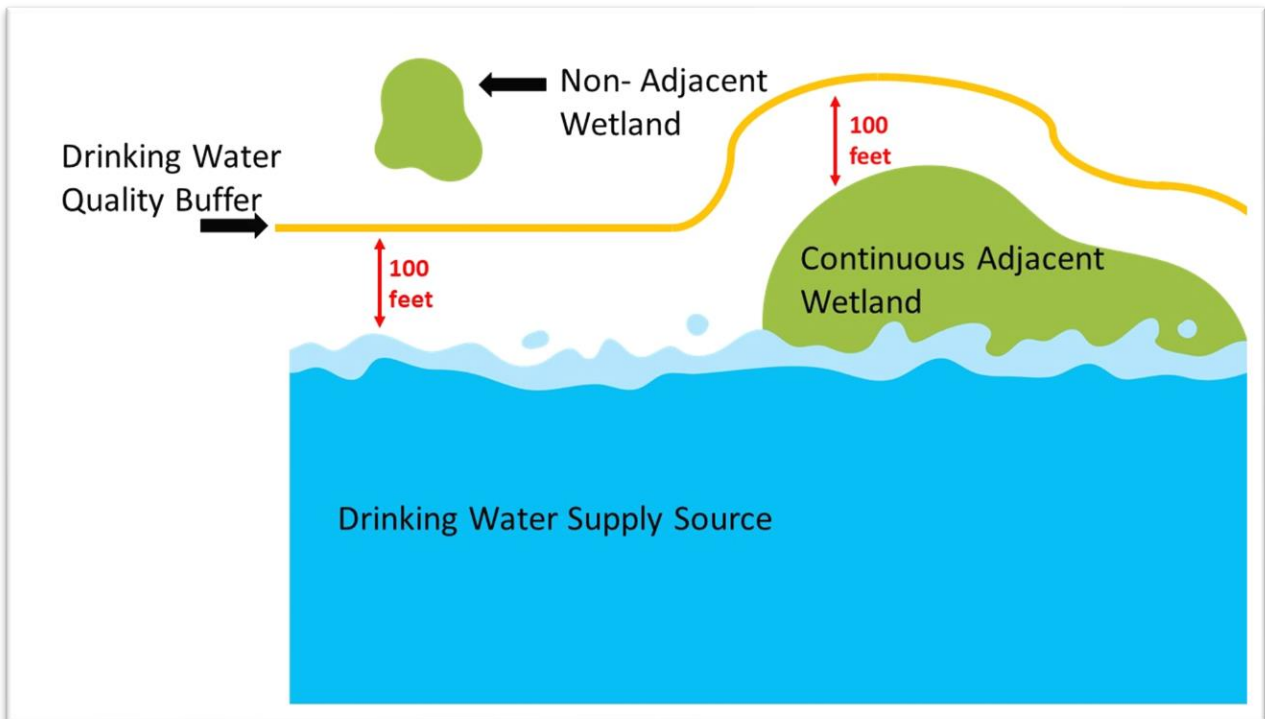
1. All activities in the Drinking Water Quality Buffer not listed in Section C. Permitted Uses above are presumed to have the potential to impair water quality or wetland functions and values unless proven otherwise by the applicant as provided below in Section E. The following uses maybe granted by a Conditional Use Permit from the Planning Board
2. Construction of primary access roads and driveways no closer than 75 feet, and absent any other feasible option.
3. New or replacement accessory structures in the Drinking Water Quality Buffer associated with legally preexisting primary structures if it is demonstrated that no practicable alternative exists elsewhere on the lot and stormwater runoff and erosion controls are installed to protect water quality.
4. The repair or maintenance of streets, roads, and other existing access ways, including driveways, footpaths, bridges, and utility right of way easements including power lines and pipelines, if essential to the productive use of the land. These uses shall be located and constructed in such a way as to minimize any detrimental impact upon the drinking water source and consistent with state recommended design standards, and only if no viable alternative is available.

**E. Criteria for Conditional Use Permits in the Drinking Water Quality Buffer.**

The Planning Board may grant a Conditional Use Permit for those uses listed above only in Section D after written findings of fact are made that all of the following are true:

1. The proposed activity minimize and prevent pollutant contributions to drinking water source waters, including principal sources and surface waters within the contributing drainage area a
2. The proposed activity maintains, to the practical extent possible, natural landscape hydrologic functions to sustain drinking water source areas, including but not limited to infiltration, overland flow, natural drainage pathways to wetlands, groundwater recharge, and floodplain functions.
3. The proposed activity minimizes or mitigates potential impacts from landscape changes, such as but not limited to impervious cover, removal of forest canopy and groundcover, erosion, and nonpoint source pollution
4. All stormwater is managed and treated to prevent water quality impacts {Optional: Include that stormwater is to be treated to the same standard as municipal stormwater regulations {site regulation number}}

Figure 2. The graphic below depicts the methodology for expansion of the 100 foot Drinking Water Quality Buffer on a site due to a contiguous and contributing wetland.



#### IV. DEFINITIONS

- A. Drinking Water Quality Buffer** - A naturally vegetated no-disturb segment of land directly adjacent to a surface water resource, such as a lake, stream, river, pond, or other wetland. Its purpose is to provide protection for drinking water sources and their contiguous and contributing wetlands, groundwater and surface waters from the impacts of human activities by establishing an area of limited use and disturbance immediately adjacent to these resources.
- B. Disturbance** – land excavation, grading or removal of soils and subsurface material or removal of trees, or other vegetation, and be at least as restrictive as applicable state statutes and/or regulations.
- C. High Water Line** – NHDES Env-Wt 103.49 “Normal high water line” for lakes or ponds means the natural mean high water elevation.  
(<https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/env-wt100asof09-2020.pdf>)
- D. Source (Drinking Water)** – A surface waterbody, such as a lake, reservoir or river/stream that is used as a source of drinking water by a public water system as permitted by NHDES.
- E. Water Access Structure** - means an accessory structure without a roof or cover that, as a matter of operational necessity, is located adjacent to the shoreline because its purpose is to provide a means of entry to a surface water for swimming and similar water-related recreational activities (other than boating) or a location for the direct observation of swimmers or other individuals engaged in water-related recreational activities. The term includes decks, beaches, and patios, but does not include docking structures. The size, location, and construction of water access structures are regulated under RSA 483-B.

## APPENDIX A - LEGAL RATIONALE FOR NEW HAMPSHIRE

Excerpted Executive Summary from the publication *Vermont Law School. New Floodplain Maps for a Coastal New Hampshire Watershed and Questions of Legal Authority, Measures and Consequences. (2012).*

[http://100yearfloods.org/resources/pdf/2012\\_VermontLawSchool\\_LampreyRiverReport.pdf](http://100yearfloods.org/resources/pdf/2012_VermontLawSchool_LampreyRiverReport.pdf)

**1.3 Executive Summary** This study assesses various types of legal risks communities may be concerned about as a result of adopting new environmental regulations and policies. This report provides specific recommendations on how to reduce legal risk when taking regulatory and other actions to protect the welfare and safety of the community.

To assess these risks the study identified four potential legal challenges related to: (1) municipal liability, (2) enabling authority, (3) the use of climate maps as evidence, and (4) takings. In general, the risk of municipal liability is low, so long as municipalities follow sound planning principles. Not only is the level of risk low, the federal government encourages communities to enact certain types of regulations designed to reduce flood hazards. This encouragement provides states and municipalities an additional layer of assurance with respect to adopting and defending revised or new environmental regulations. Under many federal guidelines, states and municipalities are encouraged to establish more stringent regulations above and beyond minimum federal requirements.

This report provides a list of additional regulatory and non-regulatory tools communities can use to both help reduce risk of flood hazards and avoid legal challenges. With emphasis on New Hampshire, the study provides examples, case studies, and legal review of relevant judicial precedents to help communities reduce risk. Several topics are expanded upon below.

Municipal Liability: It is very unlikely that a municipality could be held liable for a planning activity, such as the policy choice to reference or adopt environmental protections.

Recommendations: There is no need for municipalities to take action related to municipal liability for failing to adopt floodplain maps. Note that it is possible –though extremely unlikely –that the New Hampshire legislature may reverse municipal liability protections.

Enabling Authority: In New Hampshire, towns cannot enact regulations unless they are authorized to do so under enabling statutes. There are many potential sources of enabling authority for regulations based on environmental. A list of statutes is provided in section 4. Courts almost always find that New Hampshire municipalities soundly act within their enabling authority. Unless a statute specifically describes the limits of the authority and the municipality exceeds an express limit, the regulation will be upheld.

Under RSA 647:21, New Hampshire municipalities are given expressed authority to adopt “environmental characteristics zoning”.

Recommendations: Clearly identify the enabling statute or statutes authorizing municipal actions. Check the language of the statute to make sure specific authorizations are not being exceeded. When enacting new ordinances related to or referencing environmental, use the list of potential enabling statutes from this document as a resource.

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The Use of Projected Future Climate Conditions: Climate science may be challenged in court and during administrative hearings as being unreliable. The municipalities may rely in part on new climate data and published science or climate projections based on model output to justify the enactment of new regulations. Given the susceptibility of climate data and model output in court, it is important to know whether climate science could be questioned if an ordinance based on current or future climate conditions is challenged. In New Hampshire, scientific data is very rarely needed to justify the enactment of ordinances.

Recommendations: To ensure the use of future climate conditions and related floodplain maps stands up in court, identify in the ordinance the reason you are adopting or referencing the maps. As long as you have a reasonable justification for using reliable data sources, the approach will be upheld. Examples of a reasonable basis for an ordinance include protecting the health and welfare of the community from the dangers of water quality impairment.

Takings: A municipality can be subject to takings claims when a regulation deprives a landowner of all economically viable uses of his land or when the regulation goes “too far” and infringes on private property rights.

Recommendations: Regulatory mechanisms should be enacted in a way that preserves some economically viable use of the land. For example, do not create distance requirements for setbacks that cover an entire parcel and thereby prohibit the landowner from being able to build on any part of the property. Indicate that the purpose of the regulation is to promote hazard mitigation. Make the basis for floodplain regulation clear in the master plan. If necessary, amend your plan to include goals and policies for floodplain management and indicate that the purpose includes the health, safety, and welfare of citizens in the community. This guidance document analyzes each of the four legal risks in detail. The document may be used as a reference and resource for municipalities drafting new ordinances or facing legal challenges to flood management based ordinances. Several cases are analyzed for the benefit of local planners, decision makers, and legal staff, as well as the general public interested in flood management. The decisions and outcomes of these cases are applied to the most likely situations municipalities in the region will face in the coming years.

Refer to the project fact sheet for an additional summary of the VT Law School reports findings at

<https://scholars.unh.edu/cgi/viewcontent.cgi?article=1054&context=sustainability>

## APPENDIX B - REVIEW OF BUFFER SCIENCE AND RESEARCH

[Buffer Options for the Bay \(BOB\)](#) is a resource developed to inform policy and land use decisions involving buffers. It aims to recommend how buffers can be implemented to protect water quality and aid communities and landowners on regulatory buffers use. The project website includes reports, summaries of interviews and topical issues, maps, and an action plan to help support ongoing initiatives.

The 1995 NH Audubon report on [Buffers for Wetlands and Surface Waters: A Guidebook for New Hampshire Municipalities](#) recommends a 100-foot buffer width for water quality protection.

In 2007, Horsley Witten, Inc was contracted by the EPA to work with NHDES to evaluate the effectiveness of shoreland vegetated buffers in protecting surface water supply sources from major non-point source pollutants in the state. Their recommended minimum uniform vegetated buffer width was 300 feet as a benchmark for a conservative approach to significant pollutant removal on the majority of pollutants of concern recognizing that in some instances a lesser or greater buffer width may be needed. The authors noted other important factors control the effectiveness of the buffer width, including slope, soils and vegetation in the buffer. Other management practices and limitations, such as limiting stormwater discharges into the buffer, were noted as important to consider along with a vegetated buffer. To request a copy of this report, contact Pierce Rigrod at the NH Department of Environmental Services Source Water Protection Program, Drinking Water & Groundwater Bureau at [Pierce.Rigrod@des.nh.gov](mailto:Pierce.Rigrod@des.nh.gov) and (603) 271-0688.

The report [Buffering the Buffer](#) (USDA Forest Service Gen. Tech. Rep. PSW-GTR-168. 1998) discusses the roles and functions of riparian buffer strips and then describes preliminary results of a study that examines the stability of riparian buffer strips.

The Complex Systems Research Center at the University of New Hampshire's [Stream Buffer Characterization in Coastal NH](#) is a characterization of 2nd order and higher streams within the Piscataqua/Coastal Basin of coastal New Hampshire. A [suite of factors were mapped](#), including land use, impervious surface coverage, and transportation infrastructure, within standard buffers around each stream segment. These factors were then analyzed to produce a categorical indicator representing the status of buffers to surface waters.

The study [Effects of Urbanization on Stream Quality at Selected Sites in the Seacoast Region in New Hampshire](#) selected water-quality and macroinvertebrate community data conducted at 10 stream sites in the Seacoast region of New Hampshire to determine if a relation is present between stream quality and the extent of urbanization in a watershed. The result of this study concluded that watershed urbanization and the quantity and quality of a stream buffer appeared to have caused noticeable changes in the stream quality at sampled sites; buffers dominated by forested land appear to help maintain a better level of stream quality than buffers dominated by urban land.

### **Buffer Options for the Bay Project Resources**

Buffer Options for the Bay (BOB) technical resources include:

- [Two-Page Factsheet](#) introduces buffers and the BOB project, while also showing how buffers can be an effective tool for climate adaptation.



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- [Buffer Width Recommendations](#) is a graphic displaying recommended buffer widths for different functions based on literature reviews.
- [Buffer Options for the Bay](#): Exploring The Trends, Science and Options for Buffer Management in the Great Bay Watershed: Key Findings from a Community Assessment
- [Maps](#) are meant to help landowners, community, resource managers, and policy in four ways: locating important buffer areas, prioritizing buffers based on benefits, improving buffer management, and applying for funding opportunities.

**APPENDIX C- - Buffer Options for the Bay: Exploring The Trends, Science and Options for Buffer Management in the Great Bay Watershed: Key Findings from a Community Assessment**

Available at: <https://bufferoptionsnh.org/>