



THE IMPORTANCE OF HEALTHY RIPARIAN BUFFERS AND THEIR STATUS IN THE NASHUA RIVER WATERSHED

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Executive Summary

According to the US Forest Service (2009), the Merrimack River is the most threatened in the country due to loss of private forested lands from housing pressure; as a result it is fourth in the country to threats to water quality.

Safeguarding the ecological functions and integrity of river buffer zones is one of the best and cheapest ways to protect both water quality and wildlife habitat values of wetlands, rivers and streams, saving costs on stormwater management, drinking water protection, and land conservation.

How wide should a buffer be to maximize its value for water protection? **100 feet.** The Vermont Agency of Natural Resources (2005) summarized 22 scientific studies recommending buffer widths for riparian ecosystem function. **Eighty percent of the studies recommended a mean width of 100 feet.** Wenger (1999) writes that a 100 ft. option, including adjacent wetlands "provides the greatest level of protection for stream corridors, including good control of sediment and other contaminants, maintenance of quality aquatic habitat, and some minimal terrestrial wildlife habitat." The EPA (2006) notes that nitrogen removal efficiencies of 80-90% are obtained for wetland buffers overall that are 30m, or approximately 100ft wide. In contrast, only 65-75% of nitrogen is removed for buffers 15m, or approximately 45 ft. wide. Grass buffers alone are only 75% effective at 28m; and only 50% effective at 16m. Water bodies with little or no riparian buffer zones are found to have two to three times the annual nitrate concentration of streams with buffers. Wenger (1999) reviewed 140 scientific studies and notes, "Reduction of various forms of nitrogen in surface runoff is reasonably well correlated with buffer width." Studies of sediment in surface runoff show that the most efficient width for sediment removal is 82 feet.

The report below examines the buffer zone provisions of select towns and cities within the Nashua River watershed that are part of the USDA funded project. The report then provides a short summary of the scientific literature on the necessary buffer widths to address various water quality and wildlife habitat parameters. This report is part of a riparian restoration and protection initiative funded by a 3-year US Forest Service grant to the Merrimack River Watershed Council and its partners (NRWA, UNH Cooperative Extension, MA Department of Conservation and Recreation, both state foresters).

If it is politically infeasible to require no-disturbance or no-build buffer zones of 100 feet on a town or city-wide basis, municipalities may consider requiring wider no-disturbance and/or no-build zones in **overlay districts** (e.g., Water protection districts) for the areas with the most important water bodies, whether they are water supply, significant rivers and streams, or large contiguous wetlands that serve as important wildlife habitat.

A) Recommendations from the Scientific Literature

A review of the scientific literature, as summarized in a report titled "Riparian Buffers and Corridors: Technical Papers", by the Vermont Agency of Natural Resources (2005), shows that most studies seeking to determine optimal widths of buffer zones do so for a particular wetland function or value, such as water quality, nutrient removal and wildlife habitat. Taken together, the optimal width is 100 feet. The values provided represent the recommended no-disturbance zones for each parameter.

Water Quality can be further subdivided into several parameters.

- **Sediment Control:** The Vermont study obtained four values for control of sedimentation into rivers and streams. The average is approximately 150 feet. as the needed buffer for *full* sedimentation control, as two of the studies cite this value, and the averages of the other studies come in very close to this value.
- **Nutrient Removal:** The two studies cited by Vermont for nutrient removal provide an average of 100 feet for control of nitrogen in winter, and one study provides an average of 175 feet for general nutrient removal. The USEPA found that for nitrogen removal, efficiencies of 80 – 90% are obtained with a 100 foot no-disturbance zone (NDZ), and efficiencies of 65 – 75% with a 45 feet NDZ.
- **Stream Temperature:** The Vermont document cites two studies on the buffer width needed to maintain the cool water temperatures needed by trout and other cold water species in streams and rivers. The average for these two studies ranges from 67-74 feet.

Wildlife Corridors and Habitat buffer recommendations are organized by wildlife type, both aquatic and terrestrial.

- **Trout Breeding Habitat:** The study recommends a **150 feet** NDZ for protection of streams containing trout.
- **Amphibians and Reptiles:** Amphibians and reptiles ideally need an average NDZ of **200 feet** to provide for their habitat requirements. However, some species of frogs and turtles make use of upland habitat even further away from water bodies.
- **Stream Macroinvertebrates:** Stream macroinvertebrates such as insect larvae and aquatic insects are vital parts of riparian ecosystems, supplying food to fish and bird. The VT study recommends a **100 feet** NDZ to safeguard water quality for macroinvertebrates.
- **Interior Forest Birds:** Two studies looked at by the Vermont Agency of Natural Resources cited a NDZ of **200 feet** to provide suitable nesting habitat and shelter for interior forest bird species. However, several other studies call for up to 660 feet to provide habitat for 'songbird community'.
- **Fur-bearing Mammals:** The study found that fur-bearing mammals such as mink, otter and beavers require a NDZ of **330 feet** to provide for their habitat requirements.

B) Range of Town protection measures within the 100 foot WPA buffer zone

The towns and cities included in this analysis are all in Massachusetts, and include Ashburnham, Ayer, Bolton, Fitchburg, Gardner, Groton, Harvard, Lancaster, Leominster, Lunenburg, Pepperell, Princeton, Shirley, Townsend and Leominster. Most of these municipalities have local wetlands protection bylaws (LWB) that supplement the protections afforded by the Massachusetts Wetlands Protection Act (WPA). Only Leominster and Princeton lack a LWB.

A **No Disturbance** zone is where no alteration of the existing, natural vegetation and soils is permitted, with some allowances for limited trimming of trees and vegetation in some cases. A **No Building** or **No Structures** zone designates how close building foundations and primary or accessory structures are allowed to the edge of the wetland or river

Of the thirteen (13) municipalities with a LWB, nine (9) specify no-disturbance and/or no-building zones within the wider 100 foot buffer zone set by the WPA. Six (6) of these have minimal no-disturbance zones of 25 to 35 feet, which does not provide adequate protection of water quality as described in the scientific literature or as determined by other states based on the literature.

As seen in the table below, the current averages widths set by Conservation Commissions or towns in this area are narrow. The **mean** ND zone is 35.6 feet. The No Disturbance (ND) zones range from a low of 25 feet in Shirley and Westminster to a high of 50 feet in Groton, Harvard and Pepperell. The **mean** NB zone is 54.2 feet, The No Building or No Build (NB) zones ranges from a low of 40 feet in Shirley to a high of 75 feet in Harvard.

Several towns have additional provisions within the ND and NB zones. Gardner allows site work and driveways in the area between their ND and NB zones, which are 30 and 60 feet respectively. Harvard designates a ‘chemical-free zone’ within 100 feet of any stream or river bank or wetland. Leominster, which currently does not have a local wetlands protection bylaw, has a 200 foot no-disturbance zone for the North Nashua River, though not for other wetlands. Pepperell does not allow any disturbance or structures within 100 feet of any perennial stream.

COMPARISON OF HUC 12 RIPARIAN BUFFER ZONE PROVISIONS

TOWN	No Disturbance Zone	No Building (structures) Zone	Other Provisions
Ashburnham			
Ayer			
Bolton			
Fitchburg			
Gardner	30	60	site work and driveways are allowed between 30 and 60 feet
Groton	50	50	
Harvard	50	75	There is a chemical free zone within 100 feet of the bank or wetland
Lancaster	25		
Leominster			200 foot no-disturbance zone for the North Nashua River
Lunenburg	30	50	
Pepperell	50	50	No disturbance or structures allowed within 100 feet of a perennial stream
Princeton			

Shirley	25	40	
Townsend	35		Inner River Protection Zone = 100 feet / outer = 200 feet
Westminster	25		Inner River Protection Zone = 100 feet / outer = 200 feet
Mean	35.6	54.2	
Median	30	50	

Notes: If a cell has no value, the town either does not have a LWB, or does not specify buffer zones that differ from the Wetlands and River Protection Acts.

Initial Findings: Of the towns that have specified no-disturbance and/or no-build zones within the wider 100 foot WPA buffer zone, the **mean no disturbance** area is 35 feet, and the **mean no-build** area is 54 feet.

C) Comparison of Town Buffer Zone Provisions to the Recommendations in the Scientific Literature and other states:

The “Planner’s Guide to Wetland Buffers for Local Governments” states that “*Wetland buffers protect the water quality of wetlands by preventing the buffer area itself from serving as a source of pollution, as well as by processing pollutants that flow from upland areas.*”

"Buffers of less than 50 feet (here meaning no disturbance areas) were more susceptible to degradation by human disturbance. In fact, no buffers of 25 feet or less were functioning to reduce disturbance to the adjacent wetland".

Note that The State of RI reviewed the scientific literature on no-disturbance zones in 2012, and concluded that "*the scientific literature supports the conclusion that a 50-foot perimeter wetland (i.e., 50 ft. no disturbance zone) as currently defined in state freshwater wetland regulations...is not sufficient to fully protect the functions and values of these wetlands.*" In 2015, the state legislature passed legislation mandating a broader no-disturbance zone...

We respectfully suggest that the municipalities with minimal no-disturbance areas may want to consider increasing the no-disturbance zone to at least 50 feet, and to 100 feet in environmentally sensitive areas.

There is local precedence: Three (3) of the municipalities do have no-disturbance zones of fifty (50) feet, with one specifying an additional no-building setback of 75 feet.

Whereas extending such zones town or city-wide for all wetlands may be politically difficult, the overlay zone approach may be better received, especially when a clear nexus exists between the expanded zones of protection and the natural resource that is being so protected, such as critical water bodies or wellhead protection areas.

As summarized in the scientific review above, providing useful wildlife habitat usually requires a no-disturbance buffer well in excess of even 100 feet. Though this may be impractical as a regulatory requirement, bylaws can specify that a certain percentage of the land area in these more outlying areas be left in their natural state in order to provide as much wildlife habitat as possible. This practice is especially suited to the overlay district approach; as such extensive buffers may not be politically feasible town-wide.

Bibliography and Sources

Vermont Agency of Natural Resources. (2005) “Riparian Buffers and Corridors: Technical Papers”
 Environmental Law Institute. (2008) “Planner’s Guide to Wetland Buffers for Local Governments”
 Pennsylvania Dept. of Environmental Protection. (2010) “Riparian Forest Buffer Guidance”