

# VALUES OF RIPARIAN BUFFERS

## **Introduction:**

Of the myriad physical, chemical, hydrological, cultural and biological relationships that dictate the form and function of Vermont's surface waters, the riparian zone, or that transition area from the aquatic to the upland, represents not only one of the most critical system components but is also a physical element that may be most commonly degraded by human activities.

Diminution of the integrity of riparian corridors occurs not without measurable and staggering economic costs. An accounting of public and private damages associated with flash flooding in Vermont from 1995-1998 alone approached \$60,000,000. The vast majority of these damages are caused by human investments and encroachments within riparian zones that do not respect the physical response of fluvial (riverine) systems that have suffered loss of access to flood plains or removal of streamside vegetation. Similarly, the stable and ecological functions of lake and pond shorelands are directly related to human activities in riparian areas.

The magnitude of damages cited above may well be equaled by the economic losses associated with degraded recreational opportunities, diminished biological productivity, long term channel and shoreland instability and water quality degradation, among other consequences, that persist for years, if not decades, following disaster events.

There exists, at this time, no coordinated, directed, nor comprehensive commitment by state government to protect, manage and restore riparian corridors such that these critical zones can contribute to the economic, ecological, aesthetic and social well-being of Vermont's citizens. Nor has there been an adequate commitment by the state to educate, encourage or provide incentives to landowners and communities to avoid repeating or compounding the inappropriate encroachments and activities that have resulted in the degradation of riparian corridor functions in the past.

It cannot be overemphasized how degraded is the biological, recreational and economic potential of Vermont's surface waters due to the instability caused by and associated with riparian corridor encroachments and the failure to protect, appropriately manage or restore riparian zones.

## **Benefits of Riparian Buffers:**

Protection, management and restoration of riparian corridors through the adoption and institutionalization of a concept of **riparian buffers** will provide for the following public and private benefits:

A. **Protection of human land uses from hazards associated with stream dynamics and shore erosion:**

River and stream corridors and lakeshores often represent high risk areas for development even if located above flood elevation. Public infrastructure, private investments in property improvements and agricultural lands are at risk of damage or loss when the physical processes inherent to the functioning of fluvial systems and lakeshores are not considered. Using vegetated buffers and recognition of the relationship of flood plains and channel planform to stream stability to avoid conflicts with human investments represents cost effective protection against the hazards caused by flooding and shoreline and stream channel erosion. Vegetated buffers and riparian corridors, maintained in their natural state can continue functioning as part of the natural system without conflicts with human land use. Reduction of future flood damages, particularly to transportation infrastructure and agricultural lands can be realized.

B. **Soil conservation and agricultural productivity through stable banks and shorelines:**

Stable, well vegetated shorelines and streambanks increase the value and productivity of adjoining lands. Stable banks protect and enhance nearby land uses and render such uses more compatible with stream and lake dynamics and natural resource values. Lakeshores may be stable indefinitely where there is natural mixed vegetation (trees, shrubs, and ground cover) that can resist the forces of spring ice push and wave action. Most streams are dependent upon the roughness of banks and bed, the bed features (riffles, pools, runs), and access to flood plains for the effective distribution and dissipation of the energy of flowing water after storm events. Woody vegetation and their root systems on the banks and within the riparian corridor are critical to maintaining stable stream functions. Stable streams with a well vegetated buffer and access to flood plain so that it can maintain its required plan form or meander pattern will exhibit very low rates of lateral migration over time thereby greatly increasing the long term viability of adjacent land uses. Vermont's most productive agricultural soils are located in river valley flood plains. Soil erosion and ice and debris damages from storm flows across meadow land can be greatly reduced through the establishment and maintenance of vegetated riparian buffers.

C. **Filtration of sediments, nutrients, and pollutants in runoff:**

Pollution of surface waters by sediment and nutrient run-off is the most pervasive water quality problem in Vermont. The preponderance of sedimentation in most river systems is generated from channel instability manifested through erosion of the stream bed and banks. Discharge of phosphorus to surface waters is greatly exacerbated through instability of fluvial systems because of its association with soil particles. Stable streams, made possible, in part, through the existence of a vegetated riparian buffer suffer significantly reduced or negligible levels of sediment and sediment related nutrient

pollution. A well-vegetated buffer, consisting of trees, shrubs and grasses, with its plant trunks and stems, duff layer (leaf litter), and uneven ground topography will slow overland runoff and filter out sediments, nutrients, pathogens, and toxins originating from upland sources. These pollutants are broken down by and incorporated into plants, soil, and micro-organisms before reaching surface water. Reduction of soil erosion through protection, management, restoration and public education of the functions and values of riparian buffers may be the most cost-effective investment to accomplish sedimentation and nutrient reduction goals.

D. **Maintenance of optimal water quality for drinking water:**

Many Vermont communities rely on surface water sources for human use and consumption. Virtually all Vermont streams are hydrologically connected to groundwater which provides the source of most private and public water supplies. Vegetated buffers aid in the detention and assimilation of contaminants before they reach the waters of the state. Buffers thereby provide public benefits by reducing the costs of water treatment and offers lower risks of adverse health effects.

E. **Shading maintains cooler summer water temperatures:**

Cool water can contain more oxygen than warm water. Dissolved oxygen is essential to healthy, biologically diverse river and lake ecosystems. When the shoreline or streamside tree and shrub canopy is removed, water temperatures can increase and sensitive aquatic biota may succumb to thermal stress, low dissolved oxygen concentrations, or other stresses such as diseases, increased parasitism, or altered life cycles (maturation rates). Canopy cover also reduces the amount of light reaching the water, thus inhibiting excessive algal growth.

F. **Wastewater assimilation capacity of the stream:**

Most municipal wastewater treatment plants in Vermont discharge to surface waters. Water shaded by trees and shrubs is generally cooler than unshaded water and consequently holds more oxygen. Higher oxygen concentrations increase a stream's capacity to assimilate organic wastes from sewage plant discharges and nonpoint sources of pollution. If this capacity is lost, wastewater treatment systems must be designed to provide a higher level of effluent quality, and construction, operation and maintenance costs will be higher. Nonpoint source discharges will have a greater deleterious effect on water quality.

G. **Habitat for fish and other aquatic life forms:**

Insects falling from overhanging vegetation provide a principal summer food source for certain stream and lake fish species. In both lakes and streams, fallen leaves provide an

important food source for many aquatic insects which in turn are eaten by fish. Tree and shrub growth at the edge of the water provides overhanging branches, stable undercut banks, and in-water snags that offer stable substrate for aquatic macro-invertebrates and protective cover for fish species. For certain types of streams, bank vegetation and the contribution of large woody debris to the stream channel concentrates the flow and influences the meandering pattern of the stream. These flow processes create and maintain a diversity of habitat types (e.g., pools, runs, riffles) which, in turn, support a high diversity and abundance of aquatic organisms and a distribution of energy critical to channel stability. In lakes, overhanging vegetation helps create a diversity of habitat types within the littoral zone of warm and cool water, variable bottom types and aquatic plant assemblages.

H. **Habitat for wildlife species:**

Diverse and productive communities of amphibians, reptiles, waterfowl, raptors, song birds, and mammals, especially furbearer species like mink and otter, will thrive in well vegetated corridors along streams and lakes. These wildlife species are part of the food web that forms between plants and animals in and along the water. Streamside and lakeshore vegetation also creates corridors that are vital for wildlife passage within and between habitats. Birds and certain mammals rely on these corridors to move between different seasonal habitats to obtain food, cover, and nesting areas.

I. **Recreational and aesthetic pleasure of rivers and lakes:**

Stable streams made possible by a functioning riparian corridor with vegetated buffers and lakeshore vegetation protects or enhances river and lake environments for recreational uses such as hiking, camping, fishing, and boating. Clear water, free of noxious plant or algal growths, are important to swimmers and anglers. The scenic qualities of natural beauty, wildness, and privacy are enhanced by native streamside and lakeshore vegetation. In urban, residential, and campground areas, natural streamside and lakeshore vegetation provide visual contrast and relief, and buffers the noise from nearby highways.

J. **Preservation of archeological and historic sites located near the water's edge:**

To Vermont's native people, river and lake basins constituted key lands; they provided many varieties of food and other necessary materials, served as transportation arteries, and acted as geographic markers and boundaries. The remains of villages, hunting and fishing camps, seasonal special activity sites, and canoe portages are commonly found near the water's edge. Lakes and river corridors, in particular, provided relatively easy access into and throughout Vermont for 18th century Europeans. Commercial and industrial needs of the 19th century resulted in ever increasing development of lands adjacent to rivers and streams. Vegetated, stable streambanks and lakeshores help to preserve archeological and historic sites from erosion and other physical disturbances.

**Summary:**

Protection, management and restoration of riparian corridors need not be perceived as a threat to landowner rights and opportunities, nor as a needless constraint on community growth and economic development, nor as a burden on the mission of state agencies. Rather, recognition and implementation of a comprehensive riparian corridor protection, management and restoration strategy must be realistically perceived as a multi-objective approach to achieving Vermont's highest economic, biological, social and recreational potential.