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Implementing Greenway Strategies in the Connecticut River Watershed: *The Riparian Buffer*

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INTRODUCTION

A variety of riparian buffers exist in the Connecticut River Watershed from the state of New Hampshire and the state of Vermont to the state of Connecticut. Contiguous or fragmented, adjacent to the Connecticut River or along its tributaries, riparian buffers contribute effectively to enhance the water quality of the Connecticut River. From vast forested lands in Vermont and New Hampshire to more developed areas in Connecticut while crossing agricultural farm lands in Massachusetts, three specific riparian buffers can be examine in these different landscapes. This chapter will present, based on their geographic locations, the characteristics and issues related to these different riparian buffers. Likewise, strategies will be proposed at a state, regional and local level for a better management and protection of these zones. Also, the natural, social and economical benefits will be highlighted to support the proposed strategies.

1. GOAL

To enhance water quality in the Connecticut River watershed through management, protection and enhancement of riparian corridors using innovative land regulation strategies at a local, regional and state levels.

1.1. Objectives

- To strategize ways to coordinate the vastly different riparian approaches in the watershed.
- To study how riparian buffers might be tailored to specific geographic conditions.

2. The riparian corridor

2.1. Definitions

2.1.1. Riparian

The word riparian refers to anything connected with or immediately adjacent to the banks of a stream or other body of water. Streamside forests are riparian forests.

2.1.2. Buffer

A buffer is an area managed to reduce the impact of adjacent land use.

2.1.3. Riparian Area

The aquatic ecosystem and the portions of the adjacent terrestrial ecosystem that directly affect or are affected by the aquatic environment. This includes streams, rivers, lakes, and bays and their adjacent side channels, flood plain, and wetlands. In specific cases, the riparian area may also include a portion of the hill slope that directly serves as streamside habitats for wildlife (Palone & Todd, 1998).

2.1.4. Riparian Zone

The riparian zone is the area adjacent to a river, a transition between the stream and its upland. It may consist of wetlands, relatively level upland, or steep

hillsides that slope to the water's edge. It may be developed or undeveloped land (Grant MacBroom , 1998).

2.1.5. Riparian Forest Buffer

An area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies (U.S.D.A. Natural Resources Conservation Service).

2.1.6. Functions of Riparian Buffer

The riparian buffer is a fundamental element of the watershed. It represents a natural protection for surface and ground water quality threaded by urban, suburban and rural land use. Forested buffer acts as an ecosystem providing habitat for species and animals. It is essential to the mitigation and control of no point source pollution (Hawes, Ellen & Smith, 2005). Buffers are most effective when they are contiguous. They should include a mix of trees, shrubs and herbaceous plants native to the region and appropriate to the environment in which they are to be planted. Riparian corridors are generally structured in three distinct buffer zones.

2.1.7. Riparian Buffer Zones

- The Streamside Zone

  The primary role of the streamside zone is to prevent against streambank erosion, provide shade, filter pollutants and maintain habitat for aquatic organisms. The general size of the riparian buffer may vary following the typology of the buffer. A minimum width of 15 to 25 feet for the streamside zone is recommended. Trees and shrubs are the main vegetation comprise in that zone. Its management is preferably not allowed but might occur to stabilize the stream bank. The streamside zone has the greatest impact along small streams where its canopy covers most of the stream. Light and temperature are then regulated.

- The Middle Zone

  The major role of the second zone is to filter pollutants from runoff, remove nutrient and sediments and provide wildlife habitat. Its width should range between 25 and 135 feet. The zone is mostly composed of trees and shrubs. Removal of trees to maintain vigorous growth, constitute its management. Storm water management system, sensitive areas as well as low impact trails (hiking trails) can be considered in the buffer.

- The Outer Zone

  The third zone is located immediately upslope of the second and it terminates the buffer. It controls runoff, filters sediments and allows the water to filter in the ground. The outer zone is composed mainly of grass filter strips help to protect the wooded areas and set the stage so the forest buffer can perform at its maximum potential (Palone & Todd, 1998). The width of the buffer needs to be of a minimum of 30 feet. Bike trails

and hiking trails, playground and picnic areas might be designed and considered in this upper zone.

2.2. Riparian Buffer Benefits

The riparian buffers provide a fair amount of benefits to our urban, suburban and rural environment. In the Connecticut River Watershed and to support the general greenway vision, riparian buffers provide important functions: water quality, recreation facilities and wildlife habitat.

2.2.1. Water quality

Maintaining and enhancing a healthy, vegetated buffer along the main stem, streams and tributaries will help mitigate effects of stomwater run-off as well as stream bank erosion (Blanchard, Sweetser, Walker, 2001). Many communities in the Connecticut watershed take their water out of rivers or from public and private wells drawing from the stratified drift aquifers near rivers (Connecticut River Joint Commission, 2005). Keeping these streambank vegetated should lower the cost of water treatment by providing a natural system of water treatment.

2.2.2. Recreation facilities

Rivers and streams are a major attraction to outdoors activities. Waterways are used for activities such as, boating, rafting, kayaking and fishing. Accesses to these activities are provided along these corridors. Likewise passive recreation facilities can be provided within the buffers. Trails and campgrounds can be found along the Connecticut River. These facilities must have a low impact in the buffer while maintaining an ecological balance.

2.2.3. Wildlife habitat

The systematic protection or creation of riparian buffers can connect non-contiguous fragments of forest that create a valuable community resource (Palone & Todd, 1998). Riparian buffers like wetland areas contain a great diversity of species. Many wildlife species need water and forest habitat to survive. The buffer provides a wide variety of food and shelter. In the mean time, dams, bridges, culverts as well as housing and commercial development constitute a threat to the continuity of the riparian corridor as they represent a physical barrier dividing ecological habitat.

2.2.4. Economic value associated with riparian forest buffer

Economic values related to riparian buffers are multiple. The following is a brief enumeration and description of values associated with riparian buffers.

2.2.5. Water treatment

A stormwater treatment that integrates natural system such as riparian buffer is less expensive that the constructions of a storm drain system and more environmental friendly. Buffers can reduce the cost of water treatment. In the Washington, DC area, the wastewater treatment facilities have an annual cost of $2 to $10 million per year per facility, which equates to $3 to $5 per pound of nitrogen removed (Palone & Todd, 1998).

2.2.6. Pollution prevention

The capability of trees to trap and filter air pollution is a benefit that riparian corridor offer. In Fairfax, VA, open space trees and buffers are estimated to have reduced the cost of traditional air pollution controls by over $4.5 million in 1995 (Chesapeake Bay Committee, 1998).

2.2.7. Property value

Studies have shown that forest and buffers increase the value of a property. A study (Netusil, 2005) concluded that property owners, in the Fanno Creek Watershed in Portland Oregon, are placing a premium on lots with habitat providing the highest ecological values and a discount on lots with lower-valued habitat. The amount and quality of riparian corridors within ½ mile of properties is also being capitalized into the sale price of properties (Netusil, 2005). Also, builders in Amherst, MA reported that added costs of forest detention on site are usually recouped in increased sales prices.

2.2.8. Wildlife habitat

Riparian buffers are home for many species and wildlife. Shrubs and trees provide food and shelter to support and protect wildlife habitat. A report in 1994 says that nearly 60 percent of suburban residents actively in wildlife viewing near their homes are willing to pay premiums for locations in settings that attract wildlife (Palone & Todd, 1998)

2.3. Threats to Riparian Corridor

2.3.1. Developed areas

- Urban and suburban development

The land use zone in which the corridor is located as well as the land use adjacent to it is a serious threat as it disturbs the riparian corridor. In dense or less dense areas such as industrial, commercial or residential, buffers have a little or no vegetated riparian corridor. The high percentage of impervious surface in urban area combined with a weak riparian buffer enhance the low water quality if the waterways. The buffer can treat and infiltrate the stormwater run-off.

- Agriculture

Due to the less amount of impervious surface, agricultural uses are less incline to perpetuate a threat to riparian buffer. However, when agriculture land is directly adjacent to waterways, it exist an important water contamination due to polluted run-off such as pesticide.

- Non developed areas

Undeveloped land within the riparian corridor, are subject to degradation and or subject of development. If the land is not under any type of protection, it will always be susceptible to change and therefore become a threat to the well being of the corridor.

In order to protect and preserve riparian corridors against issues mentioned below, regulations have been voted at a federal, state and local level. In the four states crossed by the Connecticut River Watershed, it is noticeable that the state regulations do not fully regulate riparian corridors. However, most of the states recognized the importance of riparian buffers along waterways but only in form of technical guidelines. The following paragraph presents these regulations by respective states.

3. STATE-LEVEL REGULATIONS

3.1. New Hampshire

- The Comprehensive Shoreland Protection Act (RSA 483-B)

The Protection Act recognizes that the shorelands of the state need to be protected in order to maintain the integrity of public waters. Municipalities may adopt land use control ordinances relative to all protected shorelands. The act protects existing natural woodland buffers within 150 feet of the public boundary line on all 4th order streams. In its section 483-B: 9 Minimum Shoreland Protection act requires standards.

- The Basal Area Law (RSA 227-J:9) requires that within 150' of 4th order streams and great ponds, 50% of the pre-harvest basal area must be maintained, and that 50% of the pre-harvest basal area must be maintained within 50' of all perennial streams, rivers, and brooks (Connecticut River Joint Commission, Guidance for Communities, 2005).

3.2. Vermont

- Riparian Buffer Guidance

The Agency of Natural Resources has adopted the Riparian Buffer Guidance and has issued associated Riparian Buffers and Corridors Technical Papers. The Guidance will be used in establishing Agency recommendations and testimony in the Act 250 process; and assisting applicants in designing Act 250-regulated projects that incorporate appropriate buffer zone widths for protecting riparian functions (Vermont Agency of Natural Resources, 2005). The Agency recommended a buffer along streams with a width of minimum 50 or 100 following the specific attributes of the site.

- Act 250, Land Use and Development or State Land Use

Act 250 authorizes regional citizen panels to review almost all major residential and business development proposed in Vermont. The law does not supplant local zoning. Instead, it provides a broader context for reviewing a proposed project's impact on a community and its region (Bressor, 2005). It evaluates the impact of a development project under a number of environmental criteria. An Act 250 permit is required for commercial construction of improvements on more than one acre, or ten acres (if the town has permanent zoning and subdivision regulations). The law does not suggest any protection for the riparian corridor but suggest that any development or subdivision of lands adjacent to the banks of a stream will, whenever feasible, maintain the natural condition of the stream, and will not

endanger the health, safety, or welfare of the public or of adjoining landowners (Act 250, Vermont).

- Wetland Rules

The Vermont Wetland Rules have been adopted by the Vermont Water resources Board. With the first two classes of wetlands (wetland category I&II) is associated and protected a 100-foot buffer zone for class I wetlands, and 50-foot buffer zone for class II wetlands.

3.3. Massachusetts

- The Massachusetts River Protection Act

The riverfront area is a 200-foot wide corridor on each side of a perennial river or stream, measured from the main annual high-water line of the river. However, the riverfront area is 25 feet in the following municipalities: Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Malden, New Bedford, Somerville, Springfield, Winthrop, and Worcester; and in "densely developed areas," designated by the Secretary of the Executive Office of Environmental Affairs (Massachusetts Department of Environmental Protection, 2005). Also, the Rivers Protection Act clearly states that there is no Buffer Zone associated with the Riverfront Area and the River Act is not applicable to intermittent streams. A minimum of a 100 foot wide area of undisturbed vegetation must be provided closest to the river. If not possible, as much of the undisturbed existing vegetation must be preserved. Beyond the 100 foot vegetation corridor, alteration in the riverfront area may be allowed for up to 5,000 square feet or 10. The goal is to permit development on only 10 percent of the land within 200 feet of the river.

3.4. Connecticut

Connecticut's Inland Wetlands and Watercourses Act give municipalities the authority to regulate activities in or affecting wetlands. Some municipalities have regulated areas associated with wetlands and watercourses. These setback distances tend to vary from town to town. For guidelines on regulatory setback distances from watercourses and wetlands in Connecticut see CTDEP's Guidelines for Upland Review Area Regulations under Connecticut's Inland Wetlands and Watercourses Act.

4. FOCUS AREA

The Connecticut River Watershed encounters an important number and types of riparian corridors. Following the Chesapeake Bay Riparian Handbook, there is four land uses on which riparian corridor can be described: Forested Landscape, Agricultural Landscape, suburban/Developing Landscape, and Urban Landscape. These categories are important to understand as they are present throughout the watershed and as they will influence specific implementation to create, preserve and protect riparian corridors. The focus area will examine how municipalities can create strategies based on existing regulations occurring in their respective state. It is always easier for municipalities to create regulations on property that are not yet developed When it comes to protect riparian buffer on private land the task can be gargantuan. Municipalities should examine educational strategies to educate and inform its population and its landowners about the benefits of riparian corridors on their properties, neighborhoods and towns. The focus area will observe the State of Vermont for the *forested landscape* riparian buffer. The *agricultural, suburban and developing landscape* will be considered for the State of Massachusetts and Connecticut.

4.1. State of Vermont, the Headwater Region: Forested Landscape

Photo by Francois Verhoeven

In the Northern Region (NY, VT, NH, MN), 21 million of the 26 million acre of forested land is managed by private forest owner (Northern Forest Lands Council, 2005). Covering more than 4.6 million acres, Vermont is 78 percent forested. The Headwaters segment runs 80 miles from the river's source at Fourth Connecticut Lake at the Canadian border in Pittsburg, New Hampshire, south to Northumberland and Maidstone, Vermont (Connecticut River Joint Commission, Local River Subcommittee, 2005). The forest industry is a major landowner, major employer, and major contributor to local taxes. However, the constant changes in forestland ownership patterns in the Northern Region make difficult a sustainable management of forested land and impact riparian corridors. Heavy cutting and slash disposal along waterways have contributed to arm the existence of these buffers. The timber management practice is affecting water quality and aquatic resources are modified. Where the landscape is managed for wood production, the riparian zone is called “Streamside Management Zone” and is characterized by a more natural diversity than commercial species used for wood production. The riparian should be a corridor of 25 < 300 feet.

4.1.1. Regulations

While the Act 250 regulates the impact of future development, the Riparian Buffer Guidance will be used in establishing Agency recommendations and testimony in the Act 250 process. Appropriate buffer zone widths for protecting riparian functions should be incorporated in every projects related to the Act 250. Few regulations protect riparian corridor against excessive cutting and slash disposal along streams and rivers. These regulations impact indirectly the management and preservation of the riparian buffer.

4.1.2. Acceptable Management Practices

The 1986 Vermont Legislature passed amendments to Vermont's water quality statutes, Title 10 V.S.A. Chapter 47: Water Pollution Control which stated that, "it is the policy of the state to seek over the long term to upgrade the quality of waters and to reduce existing risks to water quality" (Vermont Division of Forestry) The law requires a permit for any discharge of waste in any waters in the State. The permit is not required if the logging operation id followed by an acceptable Management Practice. In AMP's are intended to prevent mud, petroleum products, and woody debris from getting into streams, ponds, lakes, and rivers. AMP's help maintain natural water temperatures by requiring that trees be left along streams and water bodies.

4.1.3. Objectives and Strategies

In order to protect and preserve the quality of the riparian corridor in the forested landscape buffer, some objectives and strategies should be clearly defined.

- Preserve Riparian Corridor through responsible management

  Maintain a riparian buffer with a various size along streams and rivers. Riparian buffer should be planted with non commercial and native plants to support wildlife and core habitat. Existing programs are offered by the Vermont Division of Forestry to landowners interested in responsible forest land management.

- The objective of the ***Forest Land Enhancement Program*** is to encourage long-term stewardship and management enhancement of non-industrial private forest lands for economic, environmental, and social benefits by sharing the cost of developing and carrying out an approved Vermont Landowner Forest Stewardship Plan (Vermont Department of Forests, Parks & Recreation).

- ***The Vermont's Use Value Appraisal Program*** enables landowners who practice long-term forest management to have their enrolled land appraised for property taxes based on its value for forestry, rather than its fair market value.

4.1.4. Protection and preservation of riparian corridor along waterways

- Land acquisition along waterways and/or conservation easement. Municipalities purchase the riparian area to guarantee protection and public access but are usually expensive for the municipality. The conservation easement results from a legal agreement between the municipality or land trust and the landowner. This operation is less expansive and may results in property tax saving for the landowner.

- Existing logging regulations at the state level should be enforced to promote a better forest management while discouraging intense cutting along streams and waterways.

- Acceptable Management Practice guidance should be actively supported by the state, counties and towns regulations.

4.2. State of Massachusetts: Agricultural Landscape

Photo by Francois Verhoeven

In agricultural areas, buffers when existing play an important role by trapping and removing pollutants and pesticides from the surface runoff and subsurface grounds water flows. The small amount of impervious surface existing in agricultural zones adjacent to waterways, do not represent a high priority threat to water quality compared to areas densely developed where the impervious surface is generally high. However, waterways banked by agricultural uses are frequently fragmented. Riparian buffers are reduced or inexistent and are characterized by a width of 10 to 25 feet. In Massachusetts, most of the farm lands are situated along the Connecticut River. However, many tributaries of the Connecticut River cross agricultural lands and have also a direct impact on the water quality. Two sources threatening the water quality have been noticed and are directly related to the management of the land by farmers. Because of its intensity of use as well as its management, croplands have been identified as a important non point source pollution. Likewise, pastureland management such as grazing has been identified as a non point source solution. Continuous season long grazing is the most damaging grazing regime to riparian sites because livestock congregate and spend most of their time in these zones (Natural Resources Conservation Service). Therefore, at a large extent, farm management has an impact on the large ecosystem of our environment. While retrofit zoning action to preserve and protect riparian corridor might be a perilous step to overcome, planning and education of conservation program to protect water quality in farm management should be supported by local officials. In the program would be included the protection and preservation of riparian buffer along waterways.

4.2.1. Regulation

The Massachusetts River Act create assign a riverfront area of 200-foot wide on each side of a perennial river or stream, measured from the mean annual high-water line of the river. Also, a minimum of a 100 foot wide area of undisturbed vegetation must be provided closest to the river.

4.2.2. Strategies

- Cropland

To evaluate and implement strategies for a better management of croplands along waterways, municipalities should fulfill an inventory of the current condition of streams along croplands. A particular attention will be brought to the condition of existing riparian buffers. The assessment will include soils survey, proximity of croplands to adjacent streams, erosion of stream banks. Base on the result of the inventory, conservation practices will be elaborated for a more environmentally management such as: 1) a conservation tillage and crop rotation; 2) use of terraces to reduce sheet and rill erosion; 3) a better nutrient and pesticide management; 3) preservation or creation of riparian buffer with consistent width and 4) a conversion from croplands to a less intensive land use when directly adjacent to a stream.

- Pastureland

To evaluate and implement strategies for a better management of pastureland along streams and rivers, a study of current conditions of these lands along waterways should be fulfilled. The inventory should include the followings information: 1) hydrologic setting of the stream valley; 2) soils type; 3) designated uses of the stream; 4) number of livestock; 5) the grazing duration and the grazing time, etc. Base on the result of the inventory, conservation practices will be elaborated to address identified concerns. Rotation of pasture or limitation in the duration of grazing and animals access is primordial as livestock represent a major threat to riparian buffer. Management of pesticide utilized in pastureland should appropriate and not excessive. Interdiction of access in the riparian buffer to livestock by the use fences along riparian corridor, etc.

- Program

The Farm Security and Rural Investment Act of 2002 (Farm Bill) represents the single most significant commitment of resources toward conservation on private lands in the Nation's history. The legislation responds to a broad range of emerging natural resource challenges faced by farmers and ranchers, including soil erosion, wetlands, wildlife habitat, and farmland protection (USDA, 2002).

The "Conservation of Private Grazing Land Program" and the "Agriculture Management Assistance" program are offered to owners and managers of agriculture land to address issues such as water quality, water management and erosion control by incorporating conservation practice in their farm management. Agriculture Management Assistance is a voluntary program that provides financial assistance through long-term contracts to agricultural producers on private lands while Conservation of Private Grazing Land Program is a voluntary program that provides technical assistance to owners and managers of private grazing land.

- Easement Purchase

Purchase of agricultural conservation easement programs compensates property owners for restricting the future use of their land.

4.3. State of Massachusetts & Connecticut: Developed Landscape

Photo by Streams & Dreams

The urban riparian corridor is often interrupted and narrow due to the intense development that occurs in urban areas. Where forest has been protected from development, the quality of the riparian corridor is the best. These contiguous forests serve as refuge for animal, create habitat connections and are usually frequently used by surrounding residents. The riparian corridor in suburban areas is the

forested area border by development, parks, roadways and commercial and residential zone. The challenge in these areas is to preserve and protect them in the long term. Forested areas are cleared to permit residential development. Also, the increase of impervious surface form commercial areas reinforce polluted run-off in waterways. In suburban areas, the importance of the riparian buffer plays an vital role in many different ways. Protection of properties adjacent to streams susceptible of flood damage, recharge aquifers, protection of water quality of the communities and a support for tourism industry portray the economic advantages that a healthy riparian corridor can convey to a community. Likewise, the buffer will enhance protected areas from development, improve air quality, protect fish and wildlife habitat and store excess sediments from any development. To preserve and protect riparian buffer, strategies will take under consideration that riparian zones are located either in properties already developed or in properties to be developed. This distinction will be supported by two distinct strategies of protection. To enhance the quality of riparian zones, local officials will propose zonings strategies by adequate master plan and zoning ordinances while for undeveloped areas, officials will support a more educational strategy to inform its population about the benefits of riparian buffers. While there is different ways to protect riparian buffers, the following paragraphs will summarize the major riparian protection strategies prone by many states include Massachusetts.

4.4. Regulation

The Massachusetts River Protection Act
Connecticut's Inland Wetlands and Watercourses Act

4.5. Strategies

4.5.1. Master Plan

By town a master plan should be elaborated to support zoning ordinances in order to help preserving and protecting waterways and connected land already protected. A natural resources inventory should be delineate streams and flood plains. The town should state its objectives and goals to protect specific land. Site planning review, special permit, subdivision regulations should be voted not stop economic development but to assure a perfect respect between natural resources and town growth.

4.5.2. Ordinances and Zoning

The following zoning strategies to protect and preserve riparian buffer are taken from the Chesapeake Bay Riparian Buffer Handbook (Palone & Todd, 1998). These strategies could be implemented in the Connecticut Watershed towns if not already applied.

4.5.3. Acquisition

The acquisition is a purchase of the riparian area by a municipality or a land trust organization to guarantee its protection and its public access. Following the specific location of the riparian area the purchase can revealed itself to be very expansive.

4.5.4. Easement purchase

The easement purchase is usually less expensive than the acquisition process. The municipality purchases limited right to the riparian area and the land owner receive the tax benefits. The riparian is then protected and public accessible.

4.5.5. Overlay Zoning

The overlay zoning is quite common in the zoning bylaws of towns located in the watershed. It principle apply an overlay zoning restriction on the existing zoning. Special requirements can be impose for the protection of riparian zones.

4.5.6. Transfer of Development Right

Transfer of development rights refers to a method for protecting land by transferring the "rights to develop" from one area and giving them to another. What is actually occurring is a consensus to place conservation easements on property in agricultural areas while allowing for an increase in development densities or "bonuses" in other areas that are being developed. The costs of purchasing the easements are recovered from the developers who receive the building bonus (Lawrence, 2005). TDR permit to municipality to preserve riparian corridor for preservation. TDR is another form of overlay zoning. However, it is usually used in more dense suburban development than the ones occurring in Massachusetts.

4.5.7. Bonus / Incentive Zoning

Density bonuses allow developers to build more units than would normally be allowed in a zoning district in exchange for preserving and enhancing designated resources such as riparian buffers or providing other public benefits. The bonus zoning is relatively similar to the Transfer of Development Right.

4.5.8. Clustering development

A cluster subdivision generally sites houses on smaller parcels of land, while the additional land that would have been allocated to individual lots is converted to common shared open space for the subdivision residents. As part of the open space can be include the riparian buffer zone. Generally, the open space can be preserved by a conservation easement that restricts any development in perpetuity. At the long term and to provide a maximum protection to the riparian buffer, the conservation easement should be assign to a minimum of two organizations. I.e. home owner association, local government or land trust

4.5.9. Streambank Setback

On a property not yet developed the local government can protect riparian areas through and established riparian buffer. Depending on the site, the buffer might prohibit development within 200 feet or less than 200 feet.

4.6. Funding

- USDA Farmland Protection Program provides funds to help purchase development rights to keep productive farmland in agricultural uses. USDA provides up to 50 percent of the fair market easement value.

- NH Water Supply Protection Program provides state funds to purchase land or conservation easements most critical to public water supplies. Lands must be located within the source water protection areas for existing or planned public drinking water sources. State grants must be matched 75% from local sources, which can include donated land or easements which also lie within the source water protection area.

- Wildlife Habitat Incentive Program (WHIP) helps private landowners restore riparian buffers, wetlands, grasslands, early successional habitat, and aquatic habitat. Pays up to 75% of project costs.

4.7. General recommendations

Based on the strategies cited above, a list of some general recommendations should be submit to region and local agencies to enhance the protection, preservation and good management of riparian corridors in the Connecticut River watershed. These recommendations are the followings:

4.7.1. Coordination of existing programs at the region level

- Create teams through partnership between regional planning agencies (PVPC), Land Trust organizations and, responsible for riparian buffer protection and management funded by existing Federal and State Grants
- Simplify process to access to federal and State cost-share and assistance.

4.7.2. Local

- General inventory of riparian conditions
- Developed watershed base plan for actions
- Plants riparian buffer & management plan
- Integrate riparian buffer with local stormwater management regulations
- Support with tax brakes land preserve for riparian buffers.
- Allow specific uses in the riparian supported with appropriate management guidelines
- Education program

4.7.3. Private Sector

- Create and inform landowners about federal, state tax advantages and conservation easement tax benefits.
- Create flexible state Tax incentives to promote riparian buffers

REFERENCES:

Blanchard, B.; Sweetser, W.; Walker, A. Fall 2001. Reach II, Connecticut Watershed Action Plan Final Report. University of Massachusetts at Amherst

Bressor, James, 2005. Act 250 and the Agency of Natural Resources. http://www.anr.state.vt.us/

Connecticut River Joint Commission. 2005. Urban Buffers for the Connecticut River Valley. http://www.crjc.org/riparianbuffers.htm

Connecticut River Joint Commission, 2005 Guidance for the Communities in the Connecticut River Watershed. http://www.crjc.org/riparianbuffers.htm#intro

Connecticut River Joint Commission, 2005. Local River Subcommittee. Headwaters Region. http://www.crjc.org/headwaters.htm

Enviro Source, 2005Act 250: Vermont's Land Use and Development Law, Title 10, Chapter 151, Subchapter 4, Section 6086.
http://www.enviro-source.com/vt/vt6a.html

Grant MacBroom, J., 1998. The River Book. Connecticut Department of Environmental Protection.

Hawes, E; Smith, M. April 2005. Riparian Buffer Zones: Functions and Recommended Widths. Yale School of Forestry and Environmental Studies.

Lawrence, J, 2005. Transfer of Development Right. Ohio State Fact Sheet. No date.
http://ohioline.osu.edu/cd-fact/1264.html

Massachusetts Department of Environmental Protection, 2005. Massachusetts Rivers Protection Act. http://www.mass.gov/dep/water/laws/rpa01.htm

Natural Resources Conservation Service, January, 2005. National Range and Pasture Handbook. Chapter 7.

Netusil, N. July 28, 2005. Economic Effects of Riparian Corridors and Upland Wildlife Habitat. Working Paper.

Northern Forest Lands Council, April 25, 2005. 10th Anniversary Forum, Final Report. North East State Foresters Association

Palone, R & Todd, A. 1998. Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. Section 11.

Palone, R & Todd, A., 1998. Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. Section 1. USDA Forest Service. Radnor, PA.

Palone, R & Todd, A., 1998. Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. May 1997.

Palone, R & Todd, A. 1998. Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. Section 12.

United States Department of Agriculture. Natural Resources Conservation Service. Conservation Practice Standard. Riparian Forest Buffer. Code 391.

United States Department of Agriculture, May 2002. Natural Resources Conservation Services. Farm Bill 2002. Conservation Provisions Overview.

Vermont Forest Enhancement Program Handbook of Forest Land Enhancement Program Handbook. Forestry Division. Vermont Department of Forests, Parks & Recreation. Agency of Natural Resources

Vermont Agency of Natural Resources, 2005. Riparian Buffer Guidance Document. http://www.anr.state.vt.us/site/html/buff/anrbuffer2005.htm