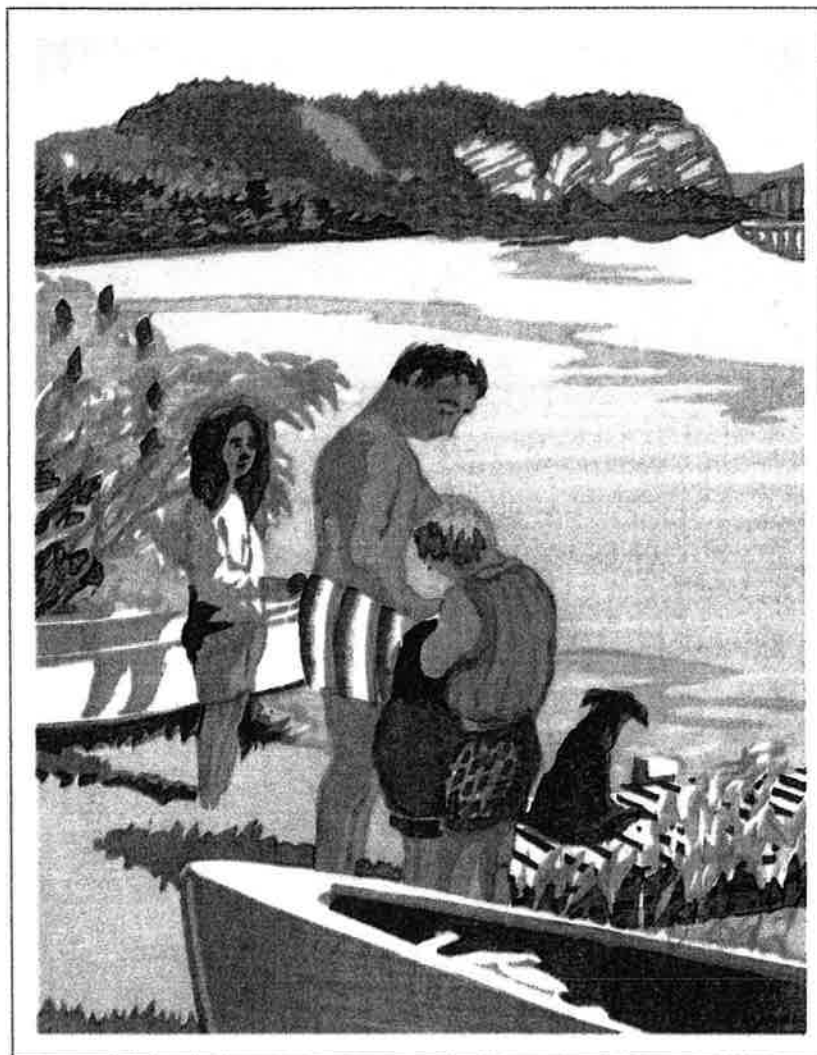


# **C**ONNECTICUT RIVER *Corridor Management Plan*



*Volume IV  
Upper Valley Region*

# C ONNECTICUT RIVER *Corridor Management Plan*



## *Volume IV Upper Valley Region*

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Prepared by  
Freda T. Swan  
and the  
Upper Valley Local River Management Advisory Subcommittee  
of the  
Connecticut River Joint Commissions

*t*he objective of this management plan is to protect the quality of the Connecticut River while permitting its existing uses and values to thrive. The goal is not to dictate, but rather to educate, encourage, and support steps that will accomplish that objective.

*p*repared for and dedicated to  
the Connecticut riverfront towns of:

Hanover, Lebanon, Lyme, Orford, and Piermont,  
*New Hampshire*



Bradford, Fairlee, Hartford, Norwich, and Thetford,  
*Vermont*

**VOLUME I:**  
Riverwide Overview  
**VOLUME II:**  
Headwaters Region  
**VOLUME III:**  
Riverbend Region  
**VOLUME IV:**  
Upper Valley Region  
**VOLUME V:**  
Mt. Ascutney Region  
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Connecticut River Joint Commissions  
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*June, 1997*



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*Cover illustration by  
Matt Brown of Lyme, New Hampshire  
"River finds in Fairlee"*

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## **T**he Connecticut River Joint Commissions

The Connecticut River Joint Commissions of New Hampshire and Vermont are advisory and have no regulatory powers, preferring instead to advocate and ensure public involvement in decisions that affect the river and its valley. The CRJC's broad goal is to assure responsible economic development and economically sound environmental protection.

The thirty volunteer river commissioners, fifteen appointed by each state, are citizens who live and work in the valley and are committed to its future. The CRJC believe that the most effective action takes place when all the players come to the same table to achieve consensus. Members represent the interests of business, agriculture, forestry, conservation, hydropower, recreation, and regional planning agencies on both sides of the river. The Commissions hold a joint meeting each month, and are supported by three staff: the executive director, communications coordinator, and administrative assistant.

The New Hampshire legislature created the Connecticut River Valley Resource Commission in 1987 to preserve and protect the resources of the valley, to guide growth and development here, and to cooperate with Vermont for the benefit of the valley. The Vermont legislature established the Connecticut River Watershed Advisory Commission in 1988. The two commissions banded together as the Connecticut River Joint Commissions (CRJC) in 1989, and also achieved the status of a non-profit organization.





# **I**NTRODUCTION

## *INTENT AND PURPOSE OF THE PLAN*

### **New Hampshire Rivers Management and Protection Program**

In 1992, the Connecticut River in New Hampshire was designated into the New Hampshire Rivers Management and Protection Program (RSA 483). It was the intent of the legislature that this program would complement and reinforce existing state and federal water quality laws, and that in-stream flows would be maintained along protected rivers, or segments thereof, in a manner that would enhance or at least not diminish the enjoyment of outstanding river characteristics including recreational, fisheries, wildlife, environmental, cultural, historical, archaeological, scientific, ecological, aesthetic, community significance, agricultural and public water supply so that these valued characteristics would endure as part of the river uses to be enjoyed by New Hampshire people. It was also the intent of the legislature that, through this program, the scenic beauty and recreational potential of such rivers would be restored and maintained, that riparian interests would be respected, and that nothing in this legislation would be interpreted to preempt any land and zoning authority granted to municipal bodies under RSA title LXIV. For more information on the New Hampshire Rivers Program, see Appendix A.

## *PLAN PROCESS AND PARTICIPANTS*

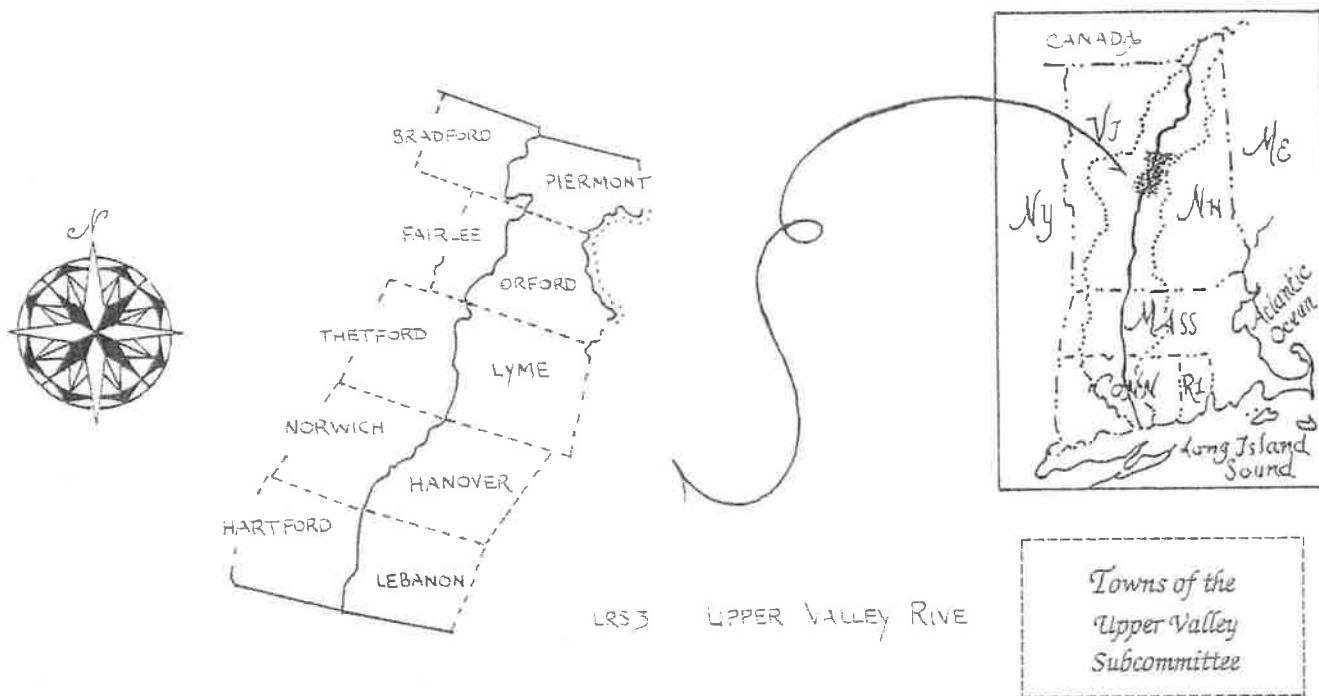
### **The local river subcommittees**

Section 483:8-a of the statute describes the composition and duties of the Local River Management Advisory Committees. In the case of the Connecticut River, New Hampshire's Connecticut River Valley Resource Commission was specified as the Local River Management Advisory Committee, whose duties include the development of a local river corridor management plan. The statute also specifies that a minimum of five subcommittees could be established by the Connecticut River Joint Commissions (CRJC). The Commissions delegated the responsibility of developing the local river corridor management plan to their subcommittees to ensure local leadership in its preparation. The subcommittees are also empowered by RSA 483 to review and advise state agencies on permits that can affect the river.

The Vermont legislature directed its riverfront communities to participate on these subcommittees. The CRJC asked the selectmen of all riverfront towns for nominations, and appointed two members and several alternates from each of the 53 New Hampshire and Vermont towns. Some 150 citizens have thus participated in the subcommittees' work.

### **Upper Valley River Subcommittee**

The Upper Valley River Subcommittee includes the New Hampshire communities of Piermont, Orford, Lyme, Hanover, and Lebanon, and the Vermont communities of Bradford, Fairlee, Thetford, Norwich, and Hartford.



The citizen members of the Upper Valley River Subcommittee, as directed by RSA 483, represent local business, local government, agriculture, recreation, conservation, and riverfront landowners. The Subcommittee also includes a regular member who manages Wilder Station, the major mainstem hydro dam in the Upper Valley region. Therefore, the members themselves represent a broad spectrum of interests and knowledge, and many perspectives from both sides of the river. Gathering monthly since January 1993, when the Subcommittee was formed, it also met with a large number of experts in various fields, including professional wildlife biologists, fish and wildlife officers, water quality experts, engineers, and farmers, and also with sportsmen and boaters.

### The planning process

Since the inception of work on the management plan, the Upper Valley Subcommittee has invited and welcomed comments and participation from member towns' officials and the public. Members met with their selectmen/city councilmen, planning boards/commissions, and conservation commissions to find out what they felt was important about the Connecticut River. They also asked about uses of the river in their communities as well as what uses they believed should be improved or enhanced.

This information was used to guide the Subcommittee and to formulate a questionnaire. In the spring of 1994, the Upper Valley River Subcommittee developed a survey concerning the attributes and uses of the river corridor, with the assistance of the Upper Valley/Lake Sunapee Regional Planning Commission. The questionnaire was sent to addresses comprising five percent of the voters on the checklist of the ten communities. Thirty-five percent were completed and returned. The results of the survey (see Appendix C) were used in the formation of the management plan for this segment of the river. The Upper Valley/Lake Sunapee Regional Planning Commission also assisted the Subcommittee in writing sections of this plan.

The Subcommittee was further aided in its study by a number of publications and maps which are described in Appendix I. The plan was written based on an outline drafted by the Connecticut River Joint Commissions.

### Purposes

The Connecticut River Corridor Management Plan is intended to guide local municipalities in forming and amending their own ordinances, and also includes suggestions for regional, state, and federal agencies and the private sector. Because it is written by local residents, the plan can reflect a special understanding of the Connecticut River as a resource and the opportunities for its use. The plan provides a coordinated approach to the management of the river corridor and demonstrates ways in which local residents and municipalities can practice good stewardship of this resource.

### Scope of the plan - the river corridor

RSA 483 defines the corridor for which this management plan was written as the river and the land area located within a distance of 1,320 feet (1/4 mile) of the normal high water mark, or to the landward extent of the 100 year floodplain as designated by the Federal Emergency Management Agency (FEMA), whichever distance is larger. Recipients of the Subcommittee's 1994 questionnaire were asked to define what they believed the corridor width should be and the largest response (27%) agreed with the statute's definition. The main thrust of the Subcommittee's study included this area.

### A broader view

At the same time, the Subcommittee also believes that it is impossible to have a complete understanding of the river and the factors which affect it, without including a much larger area. An example would be pollution entering the river from a tributary. The Subcommittee also believes it is important to understand that its members represented only the towns abutting the mainstem. Therefore, the main emphasis of the management plan is concentrated in a corridor including the river and the land area located within a 1/4 mile of it. However, the Subcommittee suggests that member towns as well as all towns within the Connecticut River watershed implement the applicable recommendations concerning their tributaries. The Subcommittee believes that, for the future, consideration should be given by the New Hampshire legislature to extending the formal jurisdiction of RSA 483 to include the river's watershed as a whole.

### Local adoption of the plan

The mechanism for adoption of this plan is the conventional local planning process. Planning boards and commissions can review the plan and adopt it internally as an adjunct to the master plan, and select recommendations to bring to townspeople for approval.

New Hampshire towns must adopt either this plan or the state's Comprehensive Shoreland Protection Act (see p. 20 and Appendix B).

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*"The Connecticut River comes from the mountains down. The only way to make it better is for everyone to participate, not just those who live along the river."*

*riverfront landowner,  
Orford*

---







# THE UPPER VALLEY SEGMENT

## New Hampshire Rivers Program designations

The Upper Valley segment of the river covers 39.86 miles, of which 28.76 miles are designated under RSA 483 as a *rural* river (from the Piermont/Haverhill town line to Storrs Pond Brook in Hanover). The law specifies that the "management of rural rivers and segments shall maintain and enhance the natural, scenic, and recreational values of the river and shall consider, protect, and ensure the rights of riparian owners to use the river for agricultural, forest management, public water supply and other purposes which are compatible with the instream public uses of the river and the management and protection of the resources for which the river or segment is designated."

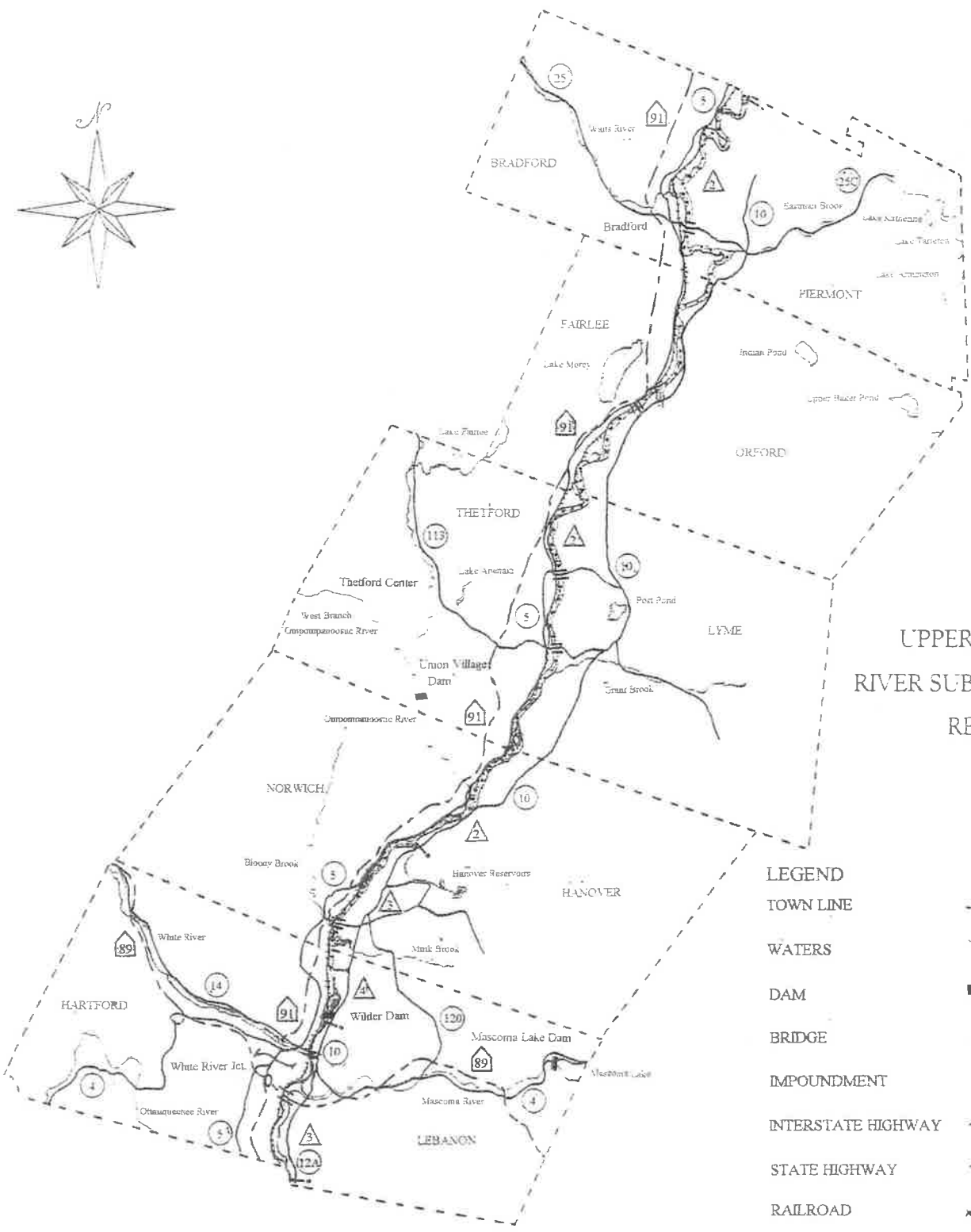
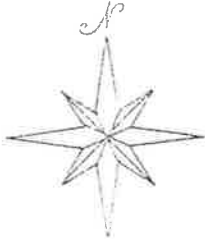
Of the remaining portions of the segment, 9.56 miles are designated as *rural-community* (from Storrs Pond Brook in Hanover to Dothan Brook in Hartford, and from a point 0.3 miles below Wilder Dam to the Lebanon/Plainfield town line), and 1.54 miles as *community* (from Dothan Brook to 0.3 miles below the Wilder Dam). In addition to the values and uses listed above for *rural* segments, the management of *rural-community* segments shall ensure that riparian owners may use the river for such uses as residential, recreational, commercial, industrial, and flood control as long as they are compatible with the instream uses and with the management and protection of the resources for which the segment is designated. Riparian landowners' uses in the portion designated as *community* shall also include hydroelectric energy production.

## Water quality classifications

The New Hampshire legislature has classified the Connecticut River in the Upper Valley segment as Class B, "acceptable for fishing, swimming, and other recreational purposes, and after adequate treatment, for use as a water supply." At the same time, Vermont has classified the water quality in all but 1.49 miles of the segment as Class B, which is water suitable for bathing and recreation, irrigation and agricultural uses, good fish habitat, good aesthetic value, and acceptable for public water supply with filtration and disinfection. The remaining 1.49 miles, located at the junctions of Mink Brook and the Mascoma river, are designated by Vermont as Waste Management Zones, which are waters authorized to receive the direct discharge of wastes which prior to treatment contained organisms potentially pathogenic to human beings.

## Present land uses

Agriculture is the primary land use of the segment of the river designated as *rural*. Numerous farms are located along the river banks in Piermont/Bradford and Orford/Fairlee. More residences are seen in Lyme/Thetford among the farms. The southern section of the segment is primarily residential with most commercial uses occurring south of the Wilder Dam. The land abutting the river is reasonably flat along most of its length in this segment. The major exceptions are the Fairlee Cliffs, an area bordering Route 5 south of Bradford, and in the river valley between the Ledyard Bridge and the Wilder Dam. The height of the riverbank varies.



UPPER VALLEY  
RIVER SUBCOMMITTEE  
REGION

**LEGEND**

TOWN LINE	---
WATERS	~~~~~
DAM	■
BRIDGE	H
IMPOUNDMENT	~~~~~
INTERSTATE HIGHWAY	==
STATE HIGHWAY	—
RAILROAD	—+—+—+—

NEW HAMPSHIRE RIVERS PROGRAM DESIGNATION

Natural		△	
Rural		△	
Rural Community		△	
Community		△	





# RESOURCE INVENTORY & ASSESSMENT

## WATER QUALITY

The section of the river in the Upper Valley segment which is impounded above Wilder Dam functions ecologically more as a lake than a river. The bottom is silted and the riverbanks are affected by fluctuation of the water level caused by Wilder Dam and by wave action from boat wakes as well as by natural factors such as ice and flooding. Below the dam, where the river is not impounded, it functions more like a free-flowing river and has areas which are quite rocky but is also subject to flows that vary in volume and velocity.

The States of Vermont and New Hampshire have both operated water quality monitoring stations along the Connecticut River and its tributaries. When *Along the Northern Connecticut River, An Inventory of Significant In-Stream Features* was compiled, the Upper Valley segment had 21 of these stations, with nine located on the mainstem and the remaining stations on Eastman Brook and the Waits, White, and Mascoma rivers. Information for the management plan was also taken from stations such as those of the River Watch Program, which had been monitored by volunteers, of which 17 were in this segment. Eight of these were on the mainstem and the remaining were on Rix Brook and the White, Mascoma and Ottauquechee rivers.

### Connecticut River Water Quality Assessment Report

The New Hampshire Department of Environmental Services (NHDES) and the Vermont Department of Environmental Conservation (VTDEC) completed an assessment of the river and its tributaries in September, 1994 for the CRJC. Two of the purposes of this 1994 interstate project, conducted by New Hampshire's Department of Environmental Services and Vermont's Agency of Natural Resources for the CRJC, were to assess water quality and to identify sources of pollution in both states. Water quality findings were addressed through the following questions:

*Can the fish be eaten?* The report did not definitely answer this question because the only relevant data available were from a limited New Hampshire study done in 1986-87. Although potentially harmful concentrations of chromium were noted in fish from the Hanover/Lebanon area, the report acknowledged that additional testing would have to be done to verify those original findings.

*Are existing dams contributing to a water quality problem?* When an impoundment is created by a dam it changes the pattern of flow which may have consequences for the chemical environment of a river. Water temperatures will increase as a result of the greater surface exposure to sunlight and the shallow river depths below the dam. Dissolved oxygen will become lower in the impoundment due to decreased turbulence and nutrients and organic matter will move through the river at a slower rate. Toxic substances will tend to settle out in impoundments. Turbidity that affects water clarity may occur at lower levels due to this settling, and lowers light penetration, which may in turn decrease the growth of plants and animals.

Based on chemical sampling for dissolved oxygen and other parameters, the volunteer Connecticut River Watch Program identified no water quality problems along

The  
Connecticut  
River and its  
corridor today

the mainstem of the river in this area. Vermont Dept. of Environmental Conservation found that the uses and values of the river that depend on high quality water were not impaired at the time of the study but that there are several pollution sources that threaten the Upper Valley segment. Wilder Dam, upstream flow regulation and upstream impoundments are contributing to that threat. The Vermont assessment states that riverbank erosion, turbidity, and sedimentation are of primary concern in this segment and that the operation of hydroelectric facilities is a contributing factor to this.

*Is the river healthy from an aquatic life point of view?* Studies done on the mainstem as well as on many of the tributaries have varied results. The Connecticut River Watch Program reported in 1992 that "the Mascoma River aquatic community is being adversely affected by one or more of the following: pollution, sedimentation, and the addition of fine organic material and warmer water from the combination of wetland complexes and Mascoma Lake. The results indicate that the impacts are cumulative and worsen progressively (from) upstream (to) downstream." River Watch also found that "some slight impact is affecting the aquatic community of Mink Brook. The communities appear healthy overall."

Communities of small invertebrate animals, such as worms and aquatic insects on which fish feed, inhabit the bottom of rivers. These macroinvertebrates vary in many ways. Some of them require cleaner water to survive, while others appear to thrive in a more polluted environment. By studying the relative percentages of each of these animals in an area, experts can read the health of a river.

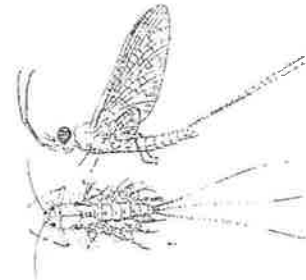
According to a River Watch report, the macroinvertebrate community is significantly different on the mainstem near Lebanon than at two upstream sites. Although there is a natural shift in a downstream direction to a community more dominated by filter feeding organisms that capitalize on fine particulate organic matter, these results may indicate a slight acceleration of this process, influenced by organic matter and nutrients entering the river from upstream impoundments, agricultural land uses, development, and eroded streambank soils. The aquatic habitat of the mainstem in this segment has been assessed by Vermont as threatened rather than impaired.

The River Watch report also states "most of the Vermont tributaries entering the river in the segment are in good condition biologically; however, a high percentage of these streams are found to have aquatic habitat that is threatened by erosion, sedimentation, and elevated stream temperatures. The most notable Vermont tributary impairment (perhaps in the entire Connecticut River watershed) is the acid mine drainage impacts documented in the Ompompanoosuc River watershed. Copper mine tailings are affecting both surface and groundwater at this time. Physical and chemical habitats in over ten miles of stream are considered partially or completely impaired by acidity and heavy metal contamination."

*Can I safely swim in the Connecticut River?* Bacterial violations affect the safety of swimming in the river and its tributaries. Such violations were noted by the Connecticut River Watch Program in 1993 in the Lebanon/Hanover area of the mainstem. Eastman Brook, Grant Brook, and the mainstem in the Lyme, Orford and Piermont area showed no such violations. Limited sampling of the Mascoma and Indian rivers in Canaan, the Mascoma River in Lebanon, and Mink Brook in Hanover resulted in evidence of bacterial contamination that may restrict swimming activity in these areas. Higher numbers of *E. coli* violations occurred during periods of high river flow on the mainstem between Thetford and Hartford indicating probable nonpoint sources of bacteria.

*Can I use the water for water supply, irrigation, and other purposes?* Both New Hampshire and Vermont agreed that at the time their report was prepared there were no known limitations to using the water from the mainstem for water supply or irrigation purposes.

*Can I discharge additional treated wastes to the river?* It appears questionable whether the Connecticut River in this segment could assimilate additional treated wastes. The report states that "variable flows may affect natural reoxygenation processes and affect the ability to assimilate treated wastes. River impoundments further limit reaeration since such areas act as lakes with limited turbulent mixing common in a flowing stream. In addition, such areas have the potential to encourage algae growth if nutrients are present and to depress oxygen levels due to temperature and water density layering affects which further limit the waste assimilation capacity." However, the report adds that the assimilative capacity is enhanced by the increased water volumes resulting from tributaries entering the mainstem.



## **RIVER ATTRIBUTES**

### **Dams**

There is one hydroelectric dam on this section of the river, the Wilder Dam, located at Hartford, Vermont. Operating since 1950, it has a total drainage area of 3,375 square miles and creates a reservoir with a surface area of 3,100 acres which extends approximately 45 miles upstream. The dam is 2,900 feet long and 59 feet high. A fish ladder was added in June of 1987 as part of an effort to re-introduce a salmon fishery to the river, and migrating fish may now travel both upstream and downstream past Wilder Dam.

The construction of the dam has added a number of benefits to the corridor. It has caused the formation of backwaters and wetland areas which are the habitats especially of waterfowl and fish but also of other wildlife species. It has formed a pool that is used for recreation and it acts to control flooding as well as providing adequate flows in time of drought. Certainly not to be ignored is the fact that it does generate clean, cheaper electricity.

There are 38 active dams on the tributaries in this segment. Four of these produce hydropower. The impoundments vary in size with 0.13 acres the smallest and 1,155 acres the largest. They include reservoirs, conservation ponds, swimming holes, and fishing ponds. The 21 inactive dams relate stories of our history.

### **Bridges**

There are six bridges over the river starting at the northerly end of the segment at Bradford/Piermont followed by Fairlee/Orford, Thetford/Lyme, Norwich/Hanover, and Hartford/Lebanon. These include three truss bridges, a rare tied arch bridge (Fairlee/Orford), and a replacement bridge under construction at Norwich/Hanover. At the southerly end is the largest, the I-89 bridge. Every town in this segment has direct access to a bridge over the river.

### **Gauging Stations**

Stream flow gauging stations measure water levels and are constructed and monitored by the U.S. Geological Survey. There are three such stations in this segment, one each on the White, Connecticut and Mascoma rivers. Minimum flow standards for the mainstem are presently being written by New Hampshire.

## **Water Withdrawal**

There are 22 sites of water withdrawal in this segment, eleven of which are from the mainstem. Hanover and Lebanon withdraw water for their water works and Hanover also uses river water for its waste water treatment plant. There are two withdrawals for the Cold Regions Research and Engineering Laboratory (CRREL) and two for New England Power Company at Wilder Dam. Dartmouth College withdraws water from the mainstem to irrigate the golf course in Hanover and also from Grant Brook in Lyme for snowmaking at the Dartmouth Skiway. Celley Mill (Eastman Brook), Eastman Brook Hydro (Eastman Brook), Split Ball Bearing (Mascoma River), Twin State Sand and Gravel (Mascoma River), Lebanon Crushed Stone (Connecticut River) and Brackett Brook Hydro (Brackett Brook) are the remaining users. There are numerous withdrawals, particularly from the mainstem, for agricultural irrigation.

## **Wastewater Discharge**

There are 19 municipal wastewater discharges into the river and tributaries of this segment including Hanover (Connecticut River), Hartford (Connecticut and White rivers), Lebanon (Connecticut and Mascoma rivers), Piermont (Eastman Brook), and Bradford (Waits River). Five non-municipal entities discharge into the Connecticut River (CRREL and Upper Valley Press, Inc.), the Mascoma River (Split Ball Bearing), the Ottauquechee River (Quechee Lakes Corp), and Rix Brook (MPB Corp.).

## **Whitewater**

There are no whitewater sections of the mainstem in this segment. There are four in Vermont tributaries, located on the Ottauquechee, various branches of the Ompompanoosuc, and the White rivers. The use of these 18.27 miles by kayaks and canoes varies from occasional to very popular. Some sections should only be run by experts.



## ***CORRIDOR NATURAL RESOURCE ATTRIBUTES***

### **Floodplain**

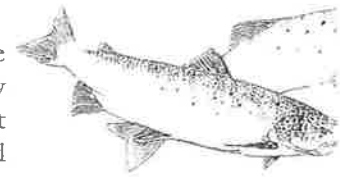
Many areas along the mainstem meet the criteria for floodplain established by the Federal Emergency Management Agency. Although many acres are flooded annually in the spring, most of these are used for agriculture with few of the more intensively used areas being adversely affected.

### **Fish Habitat**

Prime warmwater fish habitat is found in the backwaters of the main stem. Most of these backwaters are a result of the construction of Wilder Dam. The habitats vary in size and are all affected by changes in water level. The primary fish species are northern pike, walleye, and small mouth bass. The secondary types found include yellow perch, rock bass and other warm water fish. The Vermont and New Hampshire record walleyes were caught below Wilder Dam. Brown trout are found in deeper pools in the river, although not in large numbers. Brook, brown and rainbow trout are found in many of the tributaries. According to the U.S. Fish and Wildlife Service, shad spawn in the White River.

Much work has been done in an attempt to return the Atlantic salmon to the mainstem and its tributaries. Although scientists are not sure why there has been no measurable success in this segment of the Connecticut River, the smooth river bottom and warm and slower moving waters may be contributing factors.

Invertebrates appear to be prolific but no comprehensive aquatic invertebrate survey has been conducted in this region. The Connecticut River Water Quality Assessment Report states that fish community studies are needed to determine the impact of the flow regulation of Wilder Dam, whether habitat has been lost due to erosion and sedimentation, and whether certain fish species are unsuccessful due to the changes in the macroinvertebrate food base.



## Wildlife

Wildlife in the segment is typical for northern hardwood-mixed softwood forest habitat and associated streams and reservoirs. White-tailed deer flourish in the mosaic of the agricultural-forest landscape. Bear and turkey are hunted in the segment, although in much fewer numbers than deer. Some trapping of otter, muskrat, mink and beaver occurs along the waterways and occasionally fisher and bobcat are found in the more remote forested sections of the towns. The Upper Valley segment is rich with numerous species of songbirds, amphibians and other nongame animals. Heron are particularly evident on the mainstem. Although the Connecticut River is not a major flyway for waterfowl, they are quite evident during migration periods. Common mergansers, goldeneyes, blacks, mallards, and wood ducks concentrate between Wilder Dam and the southern reaches of the segment. Sandpipers are seen in concentrations up to 400 birds at the mouth of the Ompompanoosuc River. Waterfowl refuge areas managed by the State of New Hampshire are located in Orford and Lyme.



## Endangered Species

Many threatened and endangered species of both plants and animals are found in the Upper Valley segment, with the highest concentration in Hanover and Lebanon. They include the dwarf wedge mussel, the peregrine falcon, and approximately 50 species of plants. Bald eagles are frequently sighted over the river and at least one pair of nesting peregrine falcons lives in the area. Osprey have recently begun to frequent the area.

The upper end of the Connecticut River Rapids Macrosite is located in this segment. Starting at the mouth of the Ompompanoosuc, it runs south to Weathersfield Bow. The area is a focal point of interest because it is one of the most biologically rich stretches of the river and supports several rare, threatened, or endangered species -- dwarf wedge mussels, cobblestone tiger beetles, Jesup's milk-vetch -- as well as floodplain forests and riverside seepages. According to the U.S. Fish and Wildlife Service, there are only three surviving populations of Jesup's milk-vetch along the entire river.

Some significant ecological communities are found in the undeveloped areas of the segment, most notably the floodplain forest which sometimes includes large specimens of silver maple, cottonwood, and butternut. The Nature Conservancy owns approximately 15 acres of floodplain forest in this segment.

## CORRIDOR LAND USES AND DEVELOPMENT

### Recreation

Recreation is a major use of the river in the Upper Valley segment. Swimming occurs throughout the entire length wherever access is suitable. The Ledyard Boathouse in Hanover has an organized swimming area in the summer months.

Because of its quiet waters, beautiful scenery, and wildlife, the river is extremely popular with recreational canoeists. The area immediately below the Wilder Dam is a potentially dangerous place to canoe because of sudden water level changes. Primitive campsites are being developed along the river by the Upper Valley Land Trust and are very popular with canoeists. There is one commercial campsite on the river at Orford and New England Power Company operates a large picnic area just north of the Wilder Dam. There are organized canoe trips that provide overnight stays at local inns.

Power boats are very popular on the river and are used for fishing, water skiing, and sightseeing. There are presently 15 public boat ramp sites suitable for power boats in this segment of the mainstem. They vary in size, amount of parking, availability of picnic sites, and other amenities. There are also numerous private boat ramps and docks along the river. Additionally, there are many canoe and other roof-top boat access points. Lyme and Fairlee have no public boat ramps.

Bicycling is probably the most popular recreational activity that does not depend on the water, although it is significantly enhanced by the scenic quality of the river and its valley. Numerous commercial tours move through the segment, and local inns and bed-and-breakfast facilities are used for overnight accommodations. Hiking and jogging are also popular non-water dependent activities. Snowmobilers and cross-country skiers enjoy the flat terrain adjacent to the river and the open vistas. There are three public golf courses that abut the river and one more in the corridor. These attract many visitors to the area.

The scenic beauty of the undeveloped areas of the mainstem is often taken for granted. However, all of the Upper Valley segment enjoys such beauty. The Connecticut River Water Quality Assessment Report states that "enjoyment of rivers as a scenic experience is very dependent on the integrity of a river's environs. The Connecticut River from the I-89 bridge between Hartford, Vermont and Lebanon, New Hampshire is a scenic experience appreciated by more people than at any other point in either state. Considering the population centers and commercial activity that surround this segment of the Connecticut, the immediate river shore lands have been well maintained with mature trees. This gives people a good impression of the Connecticut River."





## **Agriculture**

Agriculture is an important land use in the northerly sections of the Upper Valley segment. Their prime agricultural soils are believed by some to be the best in either state. Large dairy farms and commercial vegetable/fruit farms actively work the fields on both sides of the river. Taking advantage of the prime soils and the availability of water for irrigation, a number of farms cultivate substantial areas to produce vegetables for local sale. There is a large commercial tomato growing operation in Thetford, Vermont. A growing number of farms in the segment are restricted from development through conservation easements.

## **Forestry**

Forestry is not a large land use in the corridor of the Upper Valley segment. Although there are areas where the corridor is forested, commercial operations do not usually take place here. In the eastern sections of the New Hampshire towns and the western portions of the Vermont towns, viable timber operations do occur.

## **Wildlife Refuge**

The Silvio O. Conte National Fish and Wildlife Refuge has recently been established in the Connecticut River watershed, particularly for the protection of fish and wildlife populations and habitats. The U.S. Fish & Wildlife Service will work with existing organizations, educational institutions, and willing landowners to conserve, protect, and enhance the native species of fish, birds and other wildlife.

## **Archeological Sites**

Uncovered in the spring run-off of 1993, 14 "lenses," believed to be remnants of long-houses constructed about the time of European contact, were discovered on a farm in Bradford. New Hampshire and Vermont archeologists informed the Subcommittee that the area probably also has other significant sites.

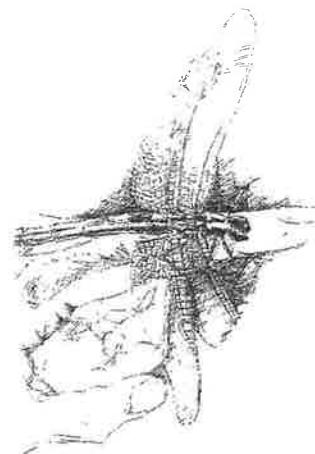
## **Highways**

Running adjacent to the river on both its east and west sides are highways, Vermont Route 5 and New Hampshire Route 10. A railroad line, on which service was ended in 1995, runs along the western bank of the river for the entire length of this segment. This railroad right-of-way greatly limits access to the river, and restricts development along it.

Route 10 has been designated by the State of New Hampshire as a scenic byway thereby making funds available for tourism and for protection of scenic areas. A scenic byway study is presently being conducted that involves the river from the Canadian border to central Massachusetts. There are many sites along both Route 10 and Route 5 that offer spectacular views not only of the river but also of the mountains, farms, and villages that form its background.

## **Residential Development**

Although the northern section of the segment contains only scattered housing, as one travels south to Lyme/Thetford residential development becomes denser. The number of new houses being constructed in the corridor shows that the Connecticut River is not immune from the desire for waterfront property. Most of the housing is single family. A large retirement complex looks over the river in Hanover and many multi-unit converted residences exist in the southern end of the segment.



## Commercial/Industrial Development

Higher density development, including commercial/industrial uses, occurs in Lebanon and the White River Junction area of Hartford. A large railroad yard adjacent to the White River gives evidence to the bygone days of the railroad. There is resurgence of activity on the rails and freight hauling appears to be successful. A park behind the Hartford Municipal Building provides an inviting view of the junction of the White and Connecticut rivers. The development along both rivers in this area is dense and includes everything; residences, retail stores, restaurants, shopping centers, a landfill, and a large stone and gravel business. In some areas, the riverbank itself is developed, while in others no structures can be seen from the river.

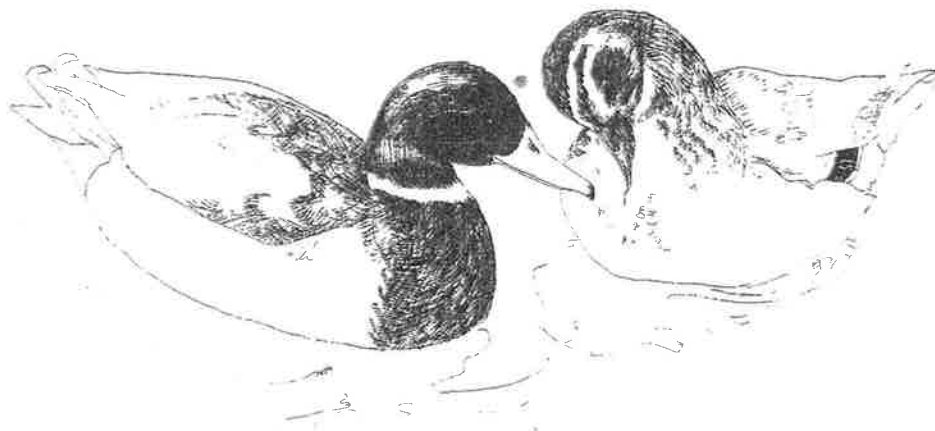
Bradford has six to eight units of industrial development located very close to the river. There have been reports of pollution problems in this location. A large sand and gravel pit is located in Norwich. Sawmills are located on the river in Fairlee and Hanover.

## Protected Parcels

Every town in the segment has riverfront properties which have been protected with conservation easements. They vary in number, size, and type. The towns of Lyme and Hanover have the largest acreage protected on the New Hampshire side and on the Vermont side, Norwich and Thetford have the largest amount of protected land. Although there are others, the three organizations mainly involved in land protection work in this area are the Society for Protection of New Hampshire Forests, the Upper Valley Land Trust, and the Vermont Land Trust. All of these organizations hold easements on properties in this segment of the Connecticut River Valley.

Some lands adjacent to the river presently remain undeveloped because New England Power Company purchased the flowage rights before construction of the Wilder Dam.

Land can be protected from development in a number of ways. These include the purchase for that purpose by a federal, state, or local agency or by an organization set up to conserve land. It can also be protected through the use of a conservation easement whereby the right to develop is sold or donated for a given length of time, usually in perpetuity. In most cases, the landowners continue to use their land for agriculture or forestry, but are restricted from development and soil extraction. This is a popular tool for protecting prime agricultural soils as well as for shielding the river from the impact of development. For more information on conservation easements, see Appendix H.



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*"We should suggest tax abatements for bonafide farms as a tool for towns to use. No development equals no services."*

*Norwich  
businessman*

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*"Conservation easements will help young people afford to get on the land because they will need to borrow less money."*

*Upper Valley  
farmer*

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## LOCAL LAND USE CONTROLS

All communities in New Hampshire and Vermont must comply with their state's regulations that protect water resources. Some communities, as listed below, have adopted various additional plans, ordinances, and regulations involving water resources including the river and land uses adjacent to it. The Upper Valley/Lake Sunapee Regional Planning Commission summarized and compared town plans and master plans and floodplain, subdivision, zoning, and health ordinances as they relate to water resource protection for all ten towns in the segment.

A review of the results shows very clearly that, while most town plans contain strong recommendations for water resource protection, in most cases these recommendations are not carried through by implementing regulations.

The following is a summary of relevant town regulations:

### Lebanon, NH

- ◆ Wetlands protection includes the prohibition of structures and alteration of surface configuration, but no buffer zone protection. Some special exceptions are allowed, but environmental impact assessments may be required.
- ◆ Some sediment and erosion control regulations (S&EC Regulations) appear in the site plan review regulations which require re-vegetation of graded areas and special erosion control measures on certain steep slopes. Minor provisions also appear in the subdivision regulations.

### Hanover, NH

- ◆ Shoreline protection includes no development within 75' of a water body; no alteration of terrain or drainage of more than 5,000 sq.ft. within 75' of a water body; no leaching field with 125' of a water body; and a floodplain overlay district complying with FEMA regulations.
- ◆ Wetlands protection includes the same separation requirements as for shoreline protection and is defined using soils, vegetation, and hydrology.
- ◆ Subdivision regulations contain typical standards for S&EC regulations.

### Lyme, NH

- ◆ Aquifer protection allows no "offensive uses" and the subdivision regulations limit septic disposal to 350 gallons per acre per day in aquifer recharge areas and areas of significant groundwater resources.
- ◆ There is a shoreland conservation overlay district including all lands within 200' of the Connecticut River and ponds greater than 5 acres and 100' of other surface waters which allows no structures or alteration of surface configuration with special exception allowing roads, drives and parking areas. Septic system setback is 200' from large ponds and 100' from other surface waters.
- ◆ A wetlands conservation overlay district applies an 100' buffer zone in which all structures and alteration of surface configuration is not allowed. There is 100' septic system setback which increases to 200' from a bog and 150' if steep or if certain soils are present.
- ◆ A flood prone area conservation overlay district includes those lands described under FEMA regulations and allows no structures or alteration of surface configuration, although certain special exceptions are allowed.



- ◆ S&EC regs provide for the removal or abatement of any use found to result in soil erosion during or after construction or any use found to result in sedimentation of surface waters.
- ◆ The subdivision regulations contain typical standards.

### **Orford, NH**

- ◆ Shoreline protection is contained in a floodplain ordinance and requires flood proofing only.
- ◆ S&EC standards are contained in the subdivision regulations.

### **Piermont, NH**

- ◆ Limited aquifer protection could be provided by a provision stating that non-residential uses need a special exception requiring a finding that the proposed site is an "appropriate location" for such use.
- ◆ Shoreline protection is provided by a floodplain overlay district along the Connecticut River where development requires a special exception with consideration to pollution of surface or ground water by sediment or sewage and the acceleration of erosion due to the removal or alteration of soil. All rivers, streams and lakes require setbacks of 75' for buildings; there are no added setbacks for septic systems.
- ◆ A wetlands overlay district provides the same protection as the floodplain overlay district.
- ◆ S&EC regulations do not exist except as "should be's" in the subdivision regulations.

### **Bradford, VT**

- ◆ Aquifer protection requires that all residential, commercial, and business properties must be connected to the sewer system.
- ◆ FEMA regulations are the only shoreline protection regulation.
- ◆ There are no wetlands or S&EC regulations.

### **Fairlee, VT**

- ◆ Subdivision regulations allow no pollution of ground or surface waters or an unreasonable reduction of the supply of groundwater in aquifer recharge areas.
- ◆ Shoreline protection is provided by subdivision regulations which require greater setbacks than those contained in Fairlee's zoning ordinance.
- ◆ The floodplain district (FEMA) allows only agriculture, forestry and wildlife refuges, and restricts new structures, although it allows upgrading existing uses without permits.
- ◆ A lake shore district applies to the Lake Morey and Lake Fairlee areas and includes a 50' setback. For any development within 500' of the lakes or the river, there is a leach field setback of 75' from the normal mean high water mark.
- ◆ There are no wetlands protection regulations.
- ◆ Subdivision regulations contain S&EC regulations.

### **Thetford, VT**

- ◆ Shoreline protection is provided through FEMA regulations.
- ◆ There are no wetlands protection regulations.
- ◆ Subdivision regulations contain S&EC regulations.

## Norwich, VT

- ◆ An aquifer protection overlay district allows only recreation, agriculture and forestry as permitted uses.
- ◆ A shoreline protection overlay district including the shores of the Connecticut and Ompompanoosuc rivers provides for 60' setbacks for buildings, 100' for septic systems, 100' for underground tanks, and 30' for all other structures. The district also restricts all hazardous material and provides S&EC standards; 30 degree slopes maximum; a buffer of 100' restricting existing tree cutting to 50% and requirements for building screening.
- ◆ A floodplain overlay district follows the FEMA requirements.
- ◆ There are no wetlands protection regulations.
- ◆ The S&EC standards appear in the subdivision regulations and in the shoreline protection overlay district.

## Hartford, VT

- ◆ Shoreline protection is found in the Flood Damage Prevention Regulations.
- ◆ The S&EC standards are found in the subdivision regulations.



## *OUTSTANDING RIVER USES & ECOLOGICAL VALUES*

The Upper Valley River Subcommittee considers the following activities, land uses, and values to be truly outstanding because of their extremely low negative impact and/or their extremely high benefit to the river corridor:

- ◆ Clean water
- ◆ Wetland ecosystems
- ◆ Endangered and threatened species
- ◆ Fish, bird, and wildlife habitats
- ◆ Riparian buffers
- ◆ Prime agricultural soils
- ◆ Historic and archeological sites
- ◆ Scenic views
- ◆ Fishing, swimming, birdwatching
- ◆ Primitive campsites



The Subcommittee considers the following activities and land uses to be worthy of recognition. However, because of their actual or potential negative impacts (boat wakes, trespassing on private property, fertilizers leaching into the river, etc.), they should be given some scrutiny (education, regulations, etc.).

- |                                      |                             |
|--------------------------------------|-----------------------------|
| ◆ Golf courses                       | ◆ Agriculture               |
| ◆ Canoeing/kayaking/rowing           | ◆ Boat ramps                |
| ◆ Bicycling                          | ◆ Industrial development    |
| ◆ Snowmobiling                       | ◆ Picnic areas/campgrounds  |
| ◆ Hiking/jogging                     | ◆ Power boating             |
| ◆ Water skiing                       | ◆ Discharges into the river |
| ◆ Hunting/trapping                   | ◆ Water withdrawals         |
| ◆ Cross-country skiing               | ◆ Hydropower generation     |
| ◆ Residential/commercial development | ◆ Sludge management         |

## Conditions Needed to Sustain these Uses and Values

Although the Subcommittee believes that clean water is the single most important condition needed to sustain and allow for future growth in the majority of the outstanding uses and values listed above, a number of other conditions must also exist. It is important to note that the conditions required to sustain these uses are inter-dependent. Clean water requires that surface waters be protected from nonpoint source pollution which, in turn, requires that development and agricultural practices adhere to certain standards. Sustaining wetland ecosystems will preserve healthy fish and wildlife habitat as well as furnish good swimming and fishing. The matrix in the table on the following page shows how these conditions and uses are inter-related.

## Potential outstanding uses

The Subcommittee believes that only those uses which complement or enhance, but do not detract from, the outstanding uses listed above should be encouraged in the future. The Subcommittee envisions that there will be significant increases or diversification of some of these existing outstanding uses and that such increases are likely to be dependent on the designation of each section of the river. For example, industrial and commercial development is more likely to take place in the *community* section of the river where municipal services exist, whereas residential development seems more likely to occur in the *rural* section. Because any potential uses would be influenced in some manner by the condition of the river itself, the conditions listed above for the existing uses would be needed.



## TOOLS TO PROTECT WATER QUALITY AND RIVER SHORES

The State of New Hampshire's Comprehensive Shoreland Protection Act sets minimum shoreland protection standards for shore lands along New Hampshire's great ponds, rivers, artificial impoundments and coastal waters. These standards are designed to minimize shoreland disturbance to protect the public waters, while still accommodating reasonable levels of development in the protected shoreland. Although this law sets minimum standards, Section 483-B:8 gives municipalities the authority to adopt land use control ordinances which are more stringent. This section also encourages communities to adopt ordinances to protect non-public waters. The Connecticut River, having been designated into the Rivers Management and Protection Program prior to 1993, is exempt from the statute provided a management plan is written and has been adopted by the municipalities along the river. (See Appendix B).

Section 1422 of Title 10 of the Vermont Statutes gives municipalities the authority to regulate shore lands to: prevent and control water pollution; preserve and protect wetlands and other terrestrial and aquatic wildlife habitat; conserve the scenic beauty of shore lands; minimize shoreland erosion; reserve public access to public waters; and achieve other municipal, regional or state shoreland conservation and development objectives. Other Vermont regulations set standards for management of agricultural land, silvicultural practices, and sediment and erosion control. In-stream water quality continues to be directly regulated by both states, including withdrawals and discharges from and into surface waters.

In 1993, the Upper Valley/Lake Sunapee Regional Planning Commission prepared a River Protection Overlay District Model Zoning Amendment as part of the Grafton County Nonpoint Pollution Project, which can be used by riverfront towns.



On the state  
level

CONDITIONS NEEDED TO SUSTAIN  
OUTSTANDING USES AND VALUES

	Clean Water	Wetlands	Rare & Endangered	Wildlife Habitat	Prime Agric. Soils	Historic/Archeological	Swimming	Fishing	Bird Watching	Canoe/Kayaking	Power Boating	Bicycling	Snowmobiling	Hiking & Jogging	Hunting & Trapping	Primitive Campsites	Golf Courses	Picnic Area/Campgd	Boat Ramps	Agriculture	Residential Devel.	Commercial/Industrial	Water Withdrawals	Discharges
Clean water	X	X	X	X			X	X	X	X	X				X	X		X	X				X	
Healthy Wildlife Habitat			X	X				X	X	X	X				X	X		X	X				X	
Undeveloped wetlands	X	X	X	X			X	X	X	X	X				X	X		X	X				X	
Surface waters free from nonpoint pollution	X	X	X	X			X	X	X	X	X				X	X		X	X				X	
Floodplains free from development			X	X				X	X	X	X				X	X		X	X				X	
Healthy Fish and Wildlife			X	X				X	X	X	X				X	X		X	X				X	
Riparian Buffers			X	X				X	X	X	X				X	X		X	X				X	
Natural Heritage Program			X	X				X	X	X	X				X	X		X	X				X	
Stabilized River and Streambanks	X	X	X	X			X	X	X	X	X				X	X		X	X				X	
Protected Historic/Archeological Sites					X	X										X								
Protected Prime Agricultural Soils					X											X								
Public Access							X	X	X	X	X					X								
Safe Swimming Areas							X	X	X	X	X					X								
Scenic Views				X				X	X	X	X			X				X	X					
Large areas of undeveloped land				X				X	X	X	X							X	X					
Adequate river width									X	X	X							X	X					
Boat Ramps									X	X	X							X	X					
Paved, well marked trails									X	X	X							X	X					
Well marked trails									X	X	X							X	X					
Picnic areas/campgrounds								X	X	X	X							X	X					
Adequate water levels				X				X	X	X	X							X	X					
Access to drinking water											X							X	X					
Access to municipal water and sewer											X							X	X					
Land suitable for septic systems											X							X	X					
Adequate highway system											X							X	X					
Education re river safety and boating regs							X	X	X	X	X					X		X	X					
Education re private property rights								X	X	X	X					X		X	X					

OUTSTANDING USES AND VALUES

The Southern Windsor Regional Planning Commission (VT) has developed "Suggested Criteria for Protection of Surface Water Quality." These criteria could be used to develop a shoreland protection ordinance. Further assistance is available from the regional planning commissions. See Appendix C of the Riverwide Overview.

## Model ordinances

In addition to the state statutes, many tools are available to communities and individuals to protect water quality; some are of a regulatory nature and some are non-regulatory. Local tools can include adopting a Master Plan (Town Plan) and/or Water Resources Management Plan with strong recommendations for protecting water quality, scenic views, agricultural soils, riparian buffers, prime wetlands, floodplains, open space, and wildlife habitat. These recommendations can then be carried through to regulatory documents such as Zoning, Subdivision and Site Plan Review requirements.

## On the local level

### Riparian buffers

The establishment of riparian buffers can be voluntary or by regulation. Vegetative buffers, which can take the form of strips of grass, shrubs, and trees growing along the banks of rivers and streams, are one of the best and most commonly used methods of protecting surface water. They can function to filter out sediment and debris from surface runoff; to trap pollutants that could otherwise wash into surface waters and groundwater; to stabilize streambanks and reduce erosion; and to absorb surface water runoff and slow water velocity. Vegetated buffers are relatively inexpensive, easy to install, and have the added advantage of providing and enhancing adjacent riparian habitat for both land-based and aquatic animal species. Shading streams with vegetation helps to optimize light and temperature conditions critical to the survival of certain species, e.g., trout. Naturally vegetated buffers promote high biological productivity and diversity.



Regulatory measures for protecting water quality can include requiring vegetated buffers along shore lands to prevent contaminants from entering surface water; separation of storm water and wastewater in municipalities with combined sewer overflows; reducing the amount of impervious surface created by new development to reduce the transportation of sediments and nutrients, and the use of sediment and erosion control measures during and after construction.

## Regulatory measures for controlling nonpoint pollution



Floodplain ordinances can prohibit construction in the floodplain. Floodplains provide flood storage and wildlife habitat and essentially act as buffers to protect water quality. Construction, development, or filling in of floodplains removes flood storage and displaces floodwater to locations further downstream. Such floodplain ordinances have the added benefit of protecting buildings from flood damage which costs taxpayers millions of dollars each year.

A community can also adopt a shoreland protection ordinance or a buffer overlay to its zoning ordinance, in which protection measures for surface waters can be more stringent than for the rest of the town. In both New Hampshire and Vermont, the requirements of the shoreland ordinance supersede that of the underlying zoning ordinance. In 1994, the New Hampshire Office of State Planning updated its model shoreland protection ordinance. The purpose of this model is to provide municipalities with a shoreland protection ordinance which is consistent with the requirements of New Hampshire's Comprehensive Shoreland Protection Act (RSA 483-B; see Appendix B).

Municipalities along the Connecticut River have the opportunity to examine their sections of the river and, in those sections where it is appropriate, recommend stronger controls than those set forth in the RSA 483-B. Recommendations might take into account the designation of the segment. For example, while the majority of the Upper Valley segment is designated as *rural*, the *rural-community* and *community* sections of the segment have included commercial/industrial centers for almost 200 years. Regulations for these sections need to enhance and maintain water quality without placing unnecessary burdens and restrictions upon commerce and industry.

Non-regulatory methods of controlling nonpoint pollution include conservation easements, acquisition of land or rights of way, and the purchase of development rights. Municipalities or conservation groups can use any of these tools to provide a buffer on land adjacent to surface waters and wetlands and hence protect water quality and provide public access without creating new regulations. Sites for rare and endangered species and historic and archaeological sites, when identified, can be protected in the same manner.

Educational programs conducted by schools and non-profit education and land use organizations should be used to increase the awareness of the general public regarding private property rights. Programs should emphasize the locations and use of existing public access points, as well as the need to ask permission before stepping on private property.

Prime agricultural soils can also be protected through conservation easements, purchase or donation of land or through programs with incentives to support agriculture on these soils such as the current use programs. Encouragement and support can be given to farmers to use the established and extensive resources of the Departments of Agriculture and the Natural Resources Conservation Services (NRCS) to develop and implement land management plans which incorporate the use of best management practices.

### Best Management Practices

Best management practices (BMPs) are recommended land treatment or operational techniques which reduce or prevent nonpoint source pollution, and have been written by the states to protect the quality of our water resources. They cover such activities as the operation of septic systems, erosion at road construction sites, road salting and snow dumping, site excavation and development, and agriculture, golf courses and lawns. For more information on BMPs, see Appendix E.

### Non-regulatory methods

*"It makes good sense not to plant corn right up to the river."*

*riverfront farmer, Fairlee*



# CHALLENGES TO THE CONNECTICUT RIVER

## *CURRENT PROBLEM AREAS*

The quality of the water in the mainstem of the river is the most important factor influencing all uses of the river. It is also the most important factor influenced by all the current problem areas. The following are some specific nonpoint source pollution problems that occur in this segment of the river.

### *BANK EROSION*

Bank erosion causes sedimentation which threatens the habitats of all aquatic life; the loss to landowners of acres of valuable soils; and damage to the scenic qualities of the river corridor. There is no absolute agreement on the degree to which various forces cause bank erosion. Engineers do agree that changes in the configuration of the bank caused by such factors as erosion and rip-rapping will have an affect on the bank in other areas. Moreover, while they believe that multiple forces are responsible, it is unclear exactly which ones are primarily responsible for erosion in this segment of the river. The engineers with whom the Subcommittee consulted agreed that to have a better understanding of what is happening to the riverbanks, it is necessary to have a better look at a number of different sites upstream of Wilder Dam to know what happens when there is a drop or rise in water level at the dam.

A 1979 study done by the U.S. Army Corps of Engineers listed ten causes of erosion. Of these, water level fluctuation caused by the Wilder Dam and power boat wakes were identified as the second and third most important causes of erosion after the velocity of the river flow. These two were the only man-made causes cited, the others being natural forces such as wind, ice and gravity. Other than the scouring effect below the dam of water released by the dam, these natural forces are, of course, the only causes of erosion on the 5.23 miles of the segment below the dam.

The study suggested that even though natural causes of erosion could not be controlled, man-made ones could be and that steps to limit pool fluctuations and the amount of wake-generating boat traffic, together with further vegetative stream bank stabilization measures, could be beneficial.

A Connecticut River Erosion Inventory done by the Grafton County Conservation District in 1992 found that 25 of the 40 miles of New Hampshire riverbank in the Upper Valley Subcommittee's segment were experiencing slight, moderate, or severe erosion. The results of the study agree with the precept that when lands adjacent to a river are intensively used, and very little if any buffer of perennial vegetation exists between the river and the land use, riverbank soils are more easily eroded. The study observed the greatest amounts of moderate to severe erosion in Orford and Piermont. The study states: "The most common erosive force was wave action in the slower sections, which comprise 85% of the bank length. Fluctuations in the river level due to power production averaged two feet, and the exposed shoreline and undercut banks are causing soil to fall into the water. Concave banks, where the current is forced

---

*"You might as  
well sell your  
riverfront land  
now before it  
falls in the  
river and goes  
to New  
Hampshire."*

*Vermont  
riverfront  
landowner*

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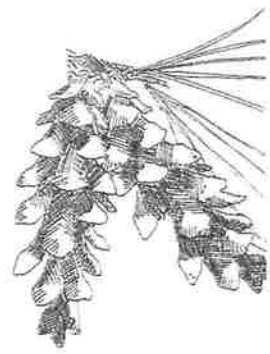
against the shoreline, are especially vulnerable to erosion. Seasonal flooding was evident, as well as erosion caused by periodic releases of water below dams. Ice action and freeze/thaw cycles also contribute to erosion, but these processes were not observable during the time of the field work."

*The Challenge of Erosion*, a guide recently prepared by the Connecticut River Joint Commissions, describes a number of causes of bank erosion, including pressure imbalance at the bank face. This occurs when pressure builds up behind the bank face because the groundwater table is higher than the surface of the river. Seepage occurs forcing soil particles to loosen. This pressure imbalance may take place when there is a rapid drawdown of the water level at Wilder Dam.

The Subcommittee is concerned about a long-standing policy of New England Power Company (NEP) to maintain a higher water level over weekend periods. Although the origins of the policy are unclear, a representative of NEP informed the Subcommittee that this 1974 policy calls for a minimum level of 382.5 feet at the dam for the benefit of recreational boaters on weekends during the summer months. The Subcommittee believes this policy may result in a large and fast drop in the water level on Mondays, which contributes significantly to bank erosion.

Siltation in the mainstem of the river is caused not only by actions taking place on the mainstem, but also in every tributary. It can be seen at the mouth of every stream entering the mainstem, where sedimentation is evident and it is particularly apparent at the mouth of the Ompompanoosuc River.

Although there does not appear to be a simple solution to the problem, the members of the Subcommittee believe that bank erosion is the greatest threat to water quality, aquatic habitats, water-based recreation, and landowner happiness in the Connecticut River corridor. As the population grows and the use of the river increases, this problem will certainly intensify.



### ***NONPOINT SOURCE POLLUTION***

Nonpoint source pollution is defined as contaminants that enter our water resources when water washes across the surface of the land or infiltrates to groundwater. A pollutant can enter the water directly in surface runoff or in seepage through the ground.

The clearing and grading of land for building sites, roads, and utilities removes vegetation and exposes and compacts soils. These changes increase runoff. Developing impervious surfaces, such as paved roads, parking areas, and buildings, increases the volume and velocity of runoff.

The maintenance of existing development increases runoff because of closely cropped lawns and compacted soils. The runoff often contains fertilizers, herbicides, and pesticides from lawns. Malfunctioning septic systems can result in surface or groundwater flow of effluent into water bodies. The snow removed from streets and parking lots and dumped into the river and its tributaries contains pollutants such as oils, fuels, and other chemicals that have fallen onto those areas from vehicles.

**Development**

**Existing  
development**

The construction, repair, and maintenance of roads can result in erosion and cause sediment to be washed into streams. As is the case with development, the increase in impervious or semi-impervious compacted surfaces increases the volume and velocity of runoff. Runoff from roads and parking lots can contain oil, gasoline, and salts from winter treatment which all contribute to pollution.

## Road construction

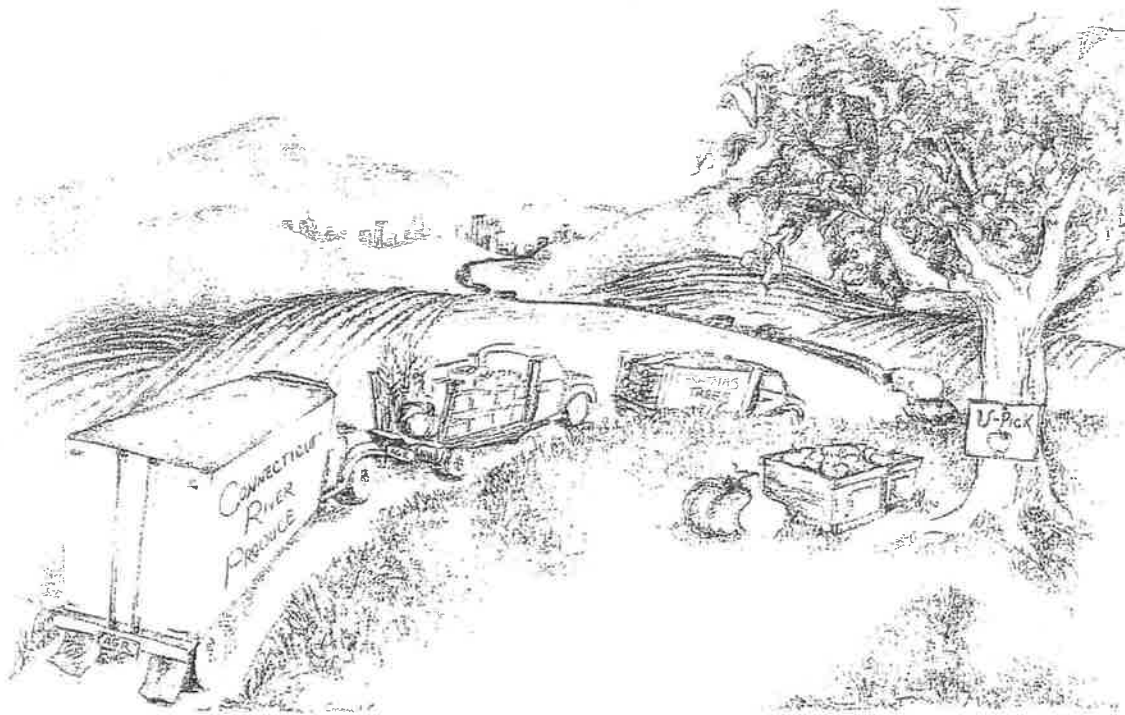
◆

Runoff from barnyards, manure piles, fields and other areas treated with pesticides and fertilizers may enter water bodies. Runoff from similar places can contain phosphorous and other nutrients, pathogens and/or toxic substances. This is particularly true if there are no vegetative buffers. Cultivation of fields up to the edge of stream banks can cause erosion and runoff of nutrients and sediments. Animals at pasture in and alongside streams can put manure into the water and can increase bank erosion by breaking up the banks and crushing vegetation.

## Agriculture

Agriculture is extremely important to the Connecticut River valley for reasons that include economic well-being and diversity, scenic values, wildlife habitats, maintenance of rich, valuable soils, and the availability of fresh produce. However, agriculture can also result in some negative impacts on the river which have been described above. Best management practices (BMPs) can correct these impacts but some are expensive, particularly those required of dairy farmers, and, therefore, are not always followed. As business people, farmers are unique in that they cannot pass on to the consumer as a cost of doing business the cost of pollution remediation or prevention practices and devices. Since the price that farmers get paid for their milk is fixed by the Federal Milk Order, a farmer is unable to raise the price he charges for his milk to cover a large expense such as construction of a manure storage pit.

## Farmers' Woes



## ***MUNICIPAL AND INDUSTRIAL DISCHARGES***

As noted earlier in this report, there are 19 municipal and five industrial discharges into the mainstem and its tributaries in this segment of the river. If this number increases, a problem could potentially occur because the lack of gradient in this segment affects the reaeration capacity, or the ability of the river to assimilate additional wastes, according to the *Connecticut River Water Quality Assessment* produced by the states. The impoundment area above the Wilder Dam acts as a lake without much of the mixing process found in running water. Such areas are apt to encourage the growth of algae when nutrients are present and oxygen levels are low, because of the effects of temperature and water density layering which further reduce the river's waste assimilation capacity. The mainstem in this segment does, however, have the advantage of increased volumes due to the entry of major tributaries, which increases the capacity of the water to assimilate additional wastes.

Lebanon's combined sewer overflow discharges to the mainstem as well as to the Mascoma River are also an issue during storm events, when they can affect water quality. Separation of the storm sewer network from the sanitary sewers is being addressed through the city's facility planning.



## ***BOAT WAKES AND PUBLIC ACCESS***

Increased public access in the form of additional ramps for the large power boats is a potential problem on the river. Presently, every town in the segment except for Lyme and Fairlee has public access sites for large boats and there are a number of private ramps. The Subcommittee submits that this is a sufficient number for the present time.

The potential problems arise from the bank erosion caused by the wakes of some power boats and by the apparent enforcement problems of the existing boating regulations. A ramp itself is apt to create problems similar to those caused by stone riprapping, including changes in course and velocity of the current and allowing direct runoff into the river without the benefits of filtration from vegetative cover.

## ***Inadequate Enforcement of Boating Laws***

As cited above, power boat wakes are one of the greatest causes of bank erosion on the mainstem above Wilder Dam. The wakes wash away soil at the base of the bank, undercutting it, particularly if it is unvegetated, which allows the unsupported bank material above to collapse into the river. New Hampshire law (RSA 270 D:2 paragraph 6) specifies that a boat may not exceed headway speed when it is within 150 feet of the shore, rafts, another boat, or a swimmer. In actuality, due to the width of the river in this segment, the 150 foot requirement means that boats must not exceed headway speed in most of this area. The boating laws are not adequately enforced, however, and boat wakes continue to erode the river banks.



## ***INADEQUATE WATER QUALITY MONITORING***

The Subcommittee has learned how important the quality of the water is to the uses and ecological values of the river. When *Along the Northern Connecticut River: An Inventory of Significant In-stream Features* was compiled for the Connecticut River Joint Commissions in 1994, there were nine governmental and eight lay water quality

monitoring stations on the mainstem and twelve governmental and nine lay stations on the tributaries in this segment. However, according to the Surface Water Quality Bureau of the New Hampshire Department of Environmental Services, in July of 1996, the State of New Hampshire was only testing at three sites on the whole length of the river and on none of the tributaries. It does not believe that Vermont is doing any monitoring of the river's water quality. The Connecticut River Watch Program, the lay group that had a very active water quality monitoring program in this segment, is also no longer monitoring due to lack of funds. Therefore, there is presently no regular, ongoing, monitoring of the water quality in the Connecticut River or its tributaries.

Because of the importance of water quality, the Subcommittee believes the present frequency and coverage of sampling is not sufficient and that if this is not corrected, the quality of the water could deteriorate undetected, causing damage to all habitats including those of endangered species.



### *DEVELOPMENT*

The river corridor section that is designated as "rural," the 28.76 miles from the Piermont/Haverhill town line to Storrs Pond Brook in Hanover, is a special place, one which contains values that do not exist outside the area and cannot be replicated elsewhere. Potentially, development in this special place is its greatest threat. The increased demand for level, easily developed soils and picturesque house sites can use up and fragment the open lands along the riverfront, thereby changing the overall visual quality of the river and threatening agriculture as a viable enterprise in the segment. Such development changes the bucolic feeling of the river, interrupts scenic vistas, suburbanizes the river corridor, degrades water quality, and endangers wildlife habitat. As the agricultural land is fragmented and the farms are subdivided, the agricultural support infrastructure, including equipment, seed, and feed dealers, is also lost, with an additional adverse effect on our local economy.

### *IMPERVIOUS SURFACES*

Increased demands for impervious surfaces (roofs, roads, driveways, parking areas) cause tremendous increases in runoff and in sources of pollution. In a recent article published in *Watershed Protection Techniques*, the authors presented scientific evidence that relates imperviousness to specific changes in aquatic systems. The following are some of the findings:

- ◆ The total runoff volume for a one-acre parking lot is about 16 times that produced by an undeveloped meadow.
- ◆ The quantity of pollutants found in runoff in an urban area is directly related to the imperviousness found in its watershed.
- ◆ Water temperatures in streams are strongly influenced by local air temperatures, and the higher temperatures appear to be directly related to the imperviousness of the surrounding watershed.
- ◆ Biological diversity in streams consistently became poor when imperviousness exceeded 10 to 15%.
- ◆ The number of fish species declines as watershed imperviousness increases.

The authors concluded: "The many independent lines of research reviewed here converge toward a common conclusion - that it is extremely difficult to maintain predevelopment stream quality when watershed development exceeds 10 to 15% impervious cover."

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## *AQUATIC EXOTICS*

The mainstem and its tributaries are threatened at present with a number of exotics, species that are not native to the area but which have been introduced. They have the potential to do great damage.

The zebra mussel was discovered in 1988 in the Great Lakes and has spread rapidly since then. Although scientists expected the primary spread to be overland by transient boat traffic, it has become apparent that zebra mussels are spreading faster through the major river systems. In Vermont, the mussel is found in Lake Champlain. In the two years since its discovery there, it has extended its range northward by approximately 78 miles. The zebra mussel has not yet been found in the Connecticut River or any of its tributaries.

### **Zebra Mussel**

Zebra mussels replace indigenous species by sheer numbers. They are the only freshwater mussels which secrete durable elastic strands, byssal fibers, by which they can securely attach to nearly any surface. They foul and close off openings to water intakes and discharges and cover every surface available, including boat hulls and motors. They filter microscopic plants and animals from the water so that in large numbers they compete with the fish populations for food sources.

Another exotic of local concern is Eurasian milfoil, a plant that at the very least interferes with boating, swimming and fishing but has the capability to do much more damage. Spread primarily by boats and boat trailers, milfoil can eventually replace all the beneficial native species of plants and will overpopulate every niche available to it. When large amounts of this vegetation die and decay under the ice, the process uses valuable oxygen needed by fish and may kill entire fish populations particularly in smaller bodies of water. Eurasian milfoil is capable of growing to 10 to 15 feet in vertical height and becomes so dense that it precludes movement by fish or man.

### **Eurasian Milfo**

Eurasian milfoil was discovered in the Connecticut River in 1995 at Charlestown, but has not yet been found in any tributaries. It is found in 23 other places in New Hampshire and at a number in Vermont, including Lake Morey in Fairlee.

The primary method of dispersal of all these exotics is by attachment to boat trailers and the hulls of boats. Adult and juvenile zebra mussels can be transported by waterfowl, and larval stage mussels can be carried in anglers' bait bucket water and boat engine cooling water. These aquatic exotics reproduce rapidly because they do not have any natural predators. Boats, trailers, and fishermen's equipment should be thoroughly washed before being used in a different body of water.



## *RECREATIONAL DEMANDS*

As population increases in the Upper Valley, recreational use of the river will follow. If the number of boat access points is not controlled, the number of boats will swell, increasing wake damage to riverbanks and increasing the potential for boating accidents.

## *SEPTIC SYSTEMS*

The failure of septic systems in the years to come can be expected. The potential for pollution from existing systems during flood periods is also a real threat. If development is allowed to occur in the floodplain, the probability increases that both of these problems will occur.



## *SILTATION*

The continued siltation of the mainstem, particularly in the impoundment area upriver from the Wilder Dam, caused both by bank erosion and runoff, will cause an increased threat to all aquatic habitats.



# *O*BJECTIVES OF THE CONNECTICUT RIVER CORRIDOR MANAGEMENT PLAN



The Connecticut River and its corridor provide an extraordinary quality of life for residents of the Upper Valley as well as for visitors. The river enhances recreational activities, land uses, and ecological values. The objective of this management plan is to protect the quality of the river while permitting the existing uses and ecological values to thrive. The goal is not to dictate, but rather to educate, encourage, and support steps that will accomplish that objective.





# RECOMMENDATIONS

## TO ADDRESS PROBLEMS & THREATS

### SHORELAND PROTECTION

With the understanding that these measures are to affect the corridor in both New Hampshire and Vermont and the water quality of both the river and its tributaries, the Subcommittee recommends that all municipalities within the segment adopt the following provisions:

1. Within 250 ft. of the riverbank, prohibit the establishment or expansion of salt storage yards, auto junk yards, and solid waste and hazardous waste facilities.
2. Considering the environmental impact to the river, apply fertilizers with great caution within 250 ft. of the river.
3. Within 250 ft. of the river, determine minimum lot size in areas dependent on septic systems by soil types.
4. Setback requirements of all leaching portions of new septic systems should be determined by soil characteristics but with a minimum setback of 75 feet and a greater setback of 125 feet where more porous soils occur.
5. New Hampshire's Comprehensive Shoreland Protection Act sets 50 feet as a minimum setback from the water body for all non-water dependent buildings. The Subcommittee recommends that communities consider the historic record of soil loss into the river and set such setbacks according to soil conditions.
6. Natural wooded riverbanks are important for the health of the river and, where it exists, a 150 foot buffer should be protected from clear cutting. Stumps and their root systems should be left intact within 50 feet of the shoreline. If it is necessary to remove vegetation of any size in a buffer area, the Subcommittee recommends that landowners seek professional expertise in order to minimize any impact on the river.

### WATER QUALITY

Primarily as a result of measures introduced under the federal Clean Water Act, the quality of the water in the Connecticut River has recuperated tremendously over the past 20 years. However, more improvement can be achieved and steps should be taken to stop any further deterioration. Many uses of the river ultimately depend on the quality of the water. The Subcommittee recommends that:

1. Water quality monitoring should be an ongoing activity. The number of monitoring sites should be increased. Volunteer organizations such as the Connecticut River Watch Program should be encouraged and funded.
2. Municipalities should implement recommendations in their master plans concerning water quality and shoreline protection measures by adoption of regulations supporting those measures.
3. Professional and financial assistance should be made available to riparian landowners to clean up nonpoint pollution sites.

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*"Would you really advise your neighbor to build his building 51' away from that river, the way it moves?"*

*riverfront  
landowner,  
Orford*

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*"There used to be a brown line along the riverbank. Now there isn't."*

*riverfront  
landowner,  
Piermont*

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4. Steps should be taken to protect the pollution filtration processes, the flood control capabilities, and the fish habitats of the wetland ecosystems along the river.
5. Measures should be taken to protect the river and its tributaries from run-off from impervious surfaces, by requiring suitable filtration of the run-off and minimizing all impervious surfaces adjacent to water bodies.
6. Financial assistance should be given to municipalities to separate existing combined sewer overflows.
7. Existing regulations that protect water quality should be enforced and the Clean Water Act should not be diluted.
8. To provide pollution filtration, buffer strips should be created and/or retained.

### **BANK EROSION**

Understanding that nature has the final word, the Upper Valley River Subcommittee strongly supports steps to protect the river bank from erosion. It recommends that this process include the following:

1. A study of the effects of water level fluctuations on bank erosion as well as upon fish habitat and populations of endangered species. The study should be conducted on-site, at multiple locations, and result in action recommendations.
2. A dialogue between New England Power, its successors, and independent engineers to ascertain what steps could be taken at Wilder Dam to reduce its effects on the banks of the river.
3. Continued research into methods of bank stabilization including the funding of test areas.
4. Increased education of riparian landowners concerning methods of stabilization such as targeted workshops in municipalities along the river.
5. Expanded programs offering professional and financial assistance to riparian landowners for bank stabilization.
6. A comprehensive program of education for boaters concerning the impact of boat wakes, with sufficient funding to enable increased enforcement of existing boat speed regulations.

### **WILDLIFE**

The river corridor is a vital habitat for many threatened and endangered species. The continued existence of other wildlife within the corridor, including fish, animals, birds, and plants, appears to depend on a delicate balance which determines whether their habitat is adequate or inadequate. With the understanding that all types of land uses in the corridor affect these wildlife habitats, the Subcommittee recommends:

1. A study to identify the fish species, population sizes, and their health/condition in the segment.
2. Creation and retention of buffer strips along the mainstem and the tributaries to help form wildlife corridors.
3. Consideration for protection of wildlife habitats during the planning of all land uses in the corridor.
4. Increased funding for research on endangered and threatened species.
5. Increased funding and development of innovative methods to enable landowners to protect and provide habitat.
6. Enforcement of existing regulations which protect endangered and threatened species while showing sensitivity to possible effects for landowners.

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*"Somebody  
should have shot  
the man who  
said all land  
should be taxed  
at its highest  
use."*

*Thetford farmer*

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*"We all should  
know and obey  
the law about  
endangered  
species, because  
it is the law."*

*Lebanon  
businessman*

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7. Increased funding for the state Natural Heritage Inventory programs.
8. Recognition of the value of working farms as habitat.
9. Support for the activities of the U.S. Fish & Wildlife Service in the Silvio Conte Wildlife Refuge that do not infringe on property owners' rights and which include procedures for incorporation of local recommendations and review in their decision-making process.

### **AGRICULTURE**

The benefits to all residents and visitors to our segment are increased many times over by the continued existence of agriculture in the river corridor. The Subcommittee supports the following steps:

1. Research and develop new marketable products from the area.
2. Develop additional markets for agricultural products.
3. Educate the public to the necessity and the advantages of local agriculture.
4. Take appropriate measures to relieve the cumulative negative impact that taxes have on the farming industry.
5. Support current-use assessment for property taxation.
6. Provide information for the public concerning the benefits of conservation easements.
7. Educate officials and voters about zoning techniques, such as clustering of development, that protects agricultural soils and the rural environment.
8. Adopt local regulations that support agriculture including local right-to-farm sections.
9. Promote availability of professional expertise for farmers.
10. Support research for agricultural advances.
11. Support the use of nutrient management plans by farmers.
12. Support programs that assist farmers in voluntarily adopting best management practices.
13. Support continued research, enforcement of rules and regulations, and public education concerning the spreading of municipal wastewater solids.

### **BOATING AND PUBLIC ACCESS**

1. The Subcommittee believes that car-top boat access for the use of canoes and other small craft, because of their low impact on the river, should be encouraged in the future and that access points for them should be placed more frequently along the segment. Parking should be screened from the river by a riparian vegetated buffer strip and a site for educational information should be provided.

2. Because of the negative impact of motor boats on riverbanks, the Subcommittee suggests that no new public boat ramps be built in this segment of the river. It also suggests that rules be written to guide the management of existing public and private landings, as well as the construction of new private ramps, which would include the maximum bank height allowed to be used, a riparian vegetated buffer strip, and a site for educational information dissemination.

3. The Subcommittee believes that enhanced education of boaters concerning the river is extremely important, and strongly supports steps to accomplish that goal. It recommends an emphasis on such topics as: existing regulations concerning boat wakes, for both the safety of all people using the river and the protection of the riverbanks; and aquatic exotics, stressing how they spread. Educational efforts should also emphasize respectful use of private land, such as asking landowner permission and avoiding littering.

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*"We pay property tax, federal income tax, social security, business profits taxes, medicaid taxes, workman's compensation taxes, unemployment taxes, (Vermont farms pay state income taxes), and finally estate taxes. Every bit of this comes out of a little hole at the end of a cow's teat."*

*dairy farmer,  
Piermont*

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The Subcommittee recommends that an increased charge for boat licenses could support such an educational program.

4. The Subcommittee recommends the promotion and continued funding of the primitive campsites presently being located on the river, in part because they can help to reduce trespassing on private land. For the same reason, the Subcommittee encourages inn-to-inn canoe trips, which have the added benefit of commercial value to local inn owners.

### **LAND-BASED RECREATION**

Although most land-based forms of recreation in the river corridor have little impact, the Subcommittee recommends the following:

1. Educate hikers, joggers, cross-country skiers, snowmobilers, and hunters and all others on the proper use of private land to help prevent unwanted trespassing and littering.
2. Work to enhance bicycle safety by promoting construction of low cost bike paths.
3. Promote the use of abandoned railroad rights-of-way as bike paths while continuing to permit landowners to access their own land.

### **MISCELLANEOUS**

The Subcommittee also recommends the following:

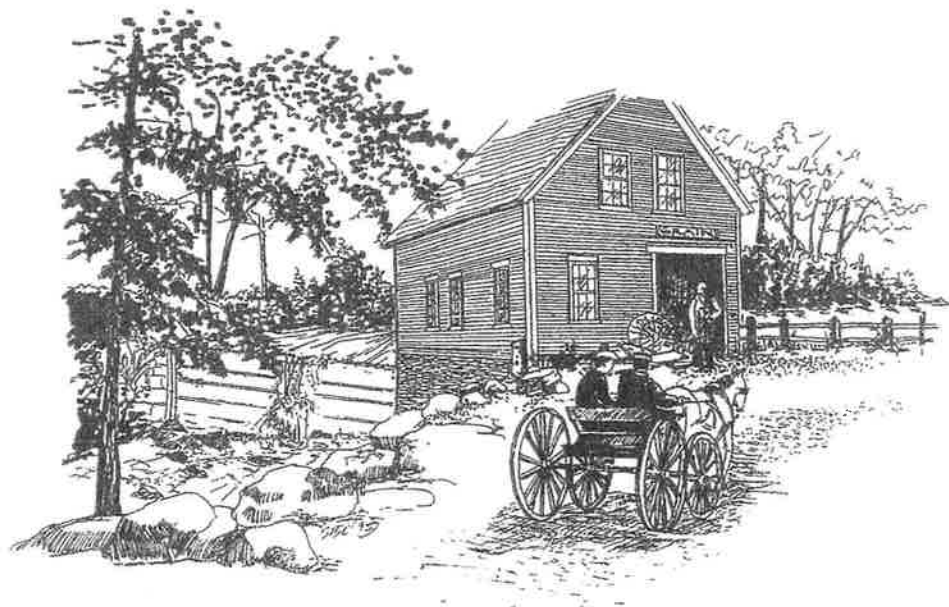
1. Encourage programs that will protect our historic and archeological sites along the river corridor including historic bridges and barns.
2. Encourage protection of scenic views of the river corridor.
3. Support better communication between groups/organizations/agencies which are concerned with the Connecticut River.

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*"When you sit  
in a room  
month after  
month, year  
after year, you  
reach a  
compromise  
somewhere in  
the middle that  
can be accepted  
by a broad  
range of people."*

*Freda Swan,  
Chair, Upper  
Valley River  
Subcommittee*

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# **R**ECOMMENDATIONS & RESPONSIBLE PARTIES

## **FEDERAL GOVERNMENT**

### **U.S. Congress *should:***

- ◆ enforce existing regulations that protect water quality
- ◆ take no actions to dilute the Clean Water Act
- ◆ increase funding for research on endangered and threatened species
- ◆ support increased funding for the Natural Heritage Inventory programs
- ◆ take appropriate measures to relieve the cumulative negative impact of taxes on the farming industry
- ◆ support better communication among groups/organizations/agencies concerned with the Connecticut River

### **Environmental Protection Agency *should:***

- ◆ support continued research into methods of bank stabilization
- ◆ provide financial assistance to municipalities to separate existing combined sewer overflows
- ◆ enforce existing regulations that protect water quality and avoid dilution of the Clean Water Act
- ◆ support study of the effects of water level fluctuations

### **U.S. Army Corps of Engineers *should:***

- ◆ conduct a study of the effects of water level fluctuations on bank erosion as well as fish habitat and populations of endangered species. The study should be conducted on-site, at multiple locations, and result in action recommendations.
- ◆ communicate with New England Power and its successors and independent engineers to ascertain what steps could be taken at Wilder Dam to reduce its effects on the banks of the river

### **Federal Emergency Management Agency *should:***

- ◆ take steps to protect wetland ecosystems along the river

### **USDA Natural Resources Conservation Service *should:***

- ◆ provide professional and financial assistance to riparian landowners to clean up nonpoint pollution sites and stabilize eroding banks
- ◆ continue research into methods of bank stabilization including demonstration projects
- ◆ educate riparian landowners concerning methods of stabilization; conduct targeted workshops in towns along the river

### **USDA Cooperative Extension Service *should:***

- ◆ develop diversified marketable agricultural products from the area
- ◆ support continued research, enforcement of rules and regulations, and public education concerning the spreading of municipal wastewater solids

### **U.S. Fish and Wildlife Service *should:***

- ◆ cooperate in a study of the effects of water level fluctuations on bank erosion as well as fish habitat and populations of endangered species
- ◆ identify the fish species, population sizes, and their health/condition in the Upper Valley segment
- ◆ increase funding for research on endangered and threatened species

- ◆ increase funding and develop innovative methods to enable landowners to protect and provide habitat
- ◆ enforce existing regulations which protect endangered and threatened species while showing sensitivity to possible effects for landowners
- ◆ support increased funding for state Natural Heritage Inventory programs
- ◆ ensure that activities of the U.S. Fish & Wildlife Service in the Silvio Conte Wildlife Refuge do not infringe on property owners' rights and include procedures for incorporation of local recommendations and review in their decision-making process

## ***STATE GOVERNMENT***

### **New Hampshire and Vermont legislatures *should*:**

- ◆ take no actions that would dilute the Clean Water Act
- ◆ arrange for professional and financial assistance to riparian landowners to reduce nonpoint pollution
- ◆ arrange for financial assistance to municipalities to separate existing combined sewer overflows
- ◆ support increased funding for the Natural Heritage Inventory programs
- ◆ increase funding and encourage development of innovative methods to enable landowners to protect and provide wildlife habitat
- ◆ allow for an increased charge for boat licenses that would be used to support boater education
- ◆ take appropriate measures to relieve the cumulative negative impact of taxes on the farming industry
- ◆ support current use assessment for property taxation
- ◆ support research for agricultural advances
- ◆ encourage programs that will protect our historic and archeological sites along the river corridor including historic bridges and barns
- ◆ support better communication among agencies/organizations/groups concerned with the Connecticut River

### **Water quality agencies *should*:**

- ◆ enforce existing regulations that protect water quality
- ◆ continue and increase water quality monitoring activity. Support volunteer organizations such as the Connecticut River Watch Program.
- ◆ provide professional and financial assistance to riparian landowners to clean up nonpoint pollution sites
- ◆ take steps to protect the pollution filtration processes, the flood control capabilities, and the fish habitats of the wetland ecosystems along the river
- ◆ protect the river and its tributaries from run-off from impervious surfaces by requiring suitable filtration of the run-off and minimizing all impervious surfaces adjacent to water bodies
- ◆ support a study of the effects of water level fluctuations on bank erosion
- ◆ educate riparian landowners concerning methods of riverbank stabilization
- ◆ expand programs that offer professional and financial assistance to riparian landowners for bank stabilization
- ◆ support continued research, enforcement of rules and regulations, and public education concerning the spreading of municipal wastewater solids

**Transportation agencies *should:***

- ◆ educate hikers, joggers, cross-country skiers, snowmobilers, and hunters and all others on the proper use of private land to help prevent unwanted trespassing and littering
- ◆ enhance bicycle safety by promoting construction of low cost bike paths
- ◆ promote the use of abandoned railroad rights-of-way as bike paths while continuing to permit landowners to access their own land
- ◆ encourage programs that will protect our historic/archeological sites along the river corridor including the historic bridges

**Department of Safety Services, Marine Patrol *should:***

- ◆ establish a comprehensive program of education for boaters concerning the impact of boat wakes, supported by increased charge for boat licenses
- ◆ provide sufficient funding to enable increased enforcement of existing regulations concerning boat wakes

**Agriculture departments *should:***

- ◆ perform research to develop diversification of marketable products from the area
- ◆ develop additional markets for agricultural products
- ◆ educate the public to the necessity and the advantages of local agriculture
- ◆ take appropriate measures to relieve the cumulative negative impact of taxes on the farming industry
- ◆ support current use assessment for property taxation
- ◆ promote availability of professional expertise for farmers
- ◆ support research for agricultural advances
- ◆ support the use of nutrient management plans by farmers
- ◆ support programs that assist farmers in voluntarily adopting best management practices

**Fish and game/wildlife and other natural resources agencies *should:***

- ◆ conduct a study to identify the fish species, population sizes, and their health/condition in the segment
- ◆ provide increased funding and develop innovative methods to enable landowners to protect and provide habitat
- ◆ support increased funding for the Natural Heritage inventory program
- ◆ encourage more car-top boat access for the use of canoes and other small craft, because of their low impact on the river. Parking should be screened from the river by a vegetated buffer strip and a site for educational information should be provided.
- ◆ discourage construction of new public boat ramps in this segment because of the negative impact of motor boats on the river. Rules should be written to guide the management of existing public and private landings, as well as the construction of new private ramps, which would include the maximum bank height allowed to be used, a riparian vegetated buffer strip, and a site for educational information dissemination.

**TOWNS *should:***

- ◆ implement recommendations in their master plans concerning water quality and shoreline protection measures by adopting regulations supporting those measures
- ◆ establish minimum setbacks from the water body for all non-water dependent buildings according to soil conditions, taking into account the historic record of soil loss into the river. New Hampshire's Comprehensive Shoreland Protection Act has set 50 feet as a minimum setback.

- ◆ determine setback requirements of all leaching portions of new septic systems by soil characteristics but with a minimum setback of 75 feet and a greater setback of 125 feet where more porous soils occur
- ◆ determine minimum lot size by soil types in areas dependent on septic systems within 250 ft. of the river
- ◆ prohibit the establishment or expansion of salt storage yards, auto junk yards, and solid waste and hazardous waste facilities within 250 ft. of the riverbank
- ◆ protect a 150 foot buffer from clear cutting where it exists. Natural wooded riverbanks are important for the health of the river. Stumps and their root systems should be left intact within 50 feet of the shoreline. If it is necessary to remove vegetation of any size in these buffer areas, the Subcommittee recommends that landowners seek professional expertise in order to lessen any impact on the river.
- ◆ encourage creation of buffer strips where they do not now exist
- ◆ encourage protection of scenic views of the river corridor
- ◆ take steps to protect wetland ecosystems along the river
- ◆ take measures to protect the river and its tributaries from run-off from impervious surfaces by requiring suitable filtration of the run-off and minimizing all impervious surfaces adjacent to water bodies
- ◆ adopt local regulations that support agriculture including local right-to-farm sections
- ◆ recognize the value of working farms as habitat
- ◆ take appropriate measures to relieve the cumulative negative impact of taxes on the farming industry
- ◆ support current use assessment for property taxation
- ◆ provide information to the public concerning the benefits of conservation easements
- ◆ encourage more car-top boat access for the use of canoes and other small craft, because of their low impact on the river; screen parking from the river with a vegetated buffer strip and provide a site for educational information
- ◆ discourage construction of new public boat ramps because of the negative impact of motor boats on the river
- ◆ educate recreationists on the proper use of private land to help prevent unwanted trespassing and littering
- ◆ enhance bicycle safety by promoting construction of low cost bike paths
- ◆ promote the use of abandoned railroad rights-of-way as bike paths while continuing to permit landowners to access their own land

## **PRIVATE SECTOR**

### **Riverfront landowners *should*:**

- ◆ create and retain buffer strips along the mainstem and its tributaries to provide pollution filtration and to help form wildlife corridors
- ◆ recognize the value of working farms as habitat
- ◆ use fertilizers with great caution within 250 ft. of the river
- ◆ support the activities of the U.S. Fish & Wildlife Service in the Silvio Conte Wildlife Refuge that do not infringe on property owners' rights and which include procedures for incorporation of local recommendations and review in their decision-making process



**Nonprofit organizations *should:***

- ◆ seek state support to encourage volunteer water quality monitoring (Connecticut River Watch Program)
- ◆ encourage creation and retention of buffer strips along the mainstem and the tributaries to filter pollution and provide wildlife corridors (land trusts)
- ◆ provide information to the public concerning the benefits of conservation easements (land trusts)
- ◆ continue establishment of primitive campsites located on the river, in part because they can help to reduce trespassing on private land. (Upper Valley Land Trust)
- ◆ educate officials and voters about zoning techniques, such as clustering of development, that protect agricultural soils and the rural environment (land trusts, regional planning commissions)
- ◆ support a study to identify the fish species, population sizes, and their health/condition in the segment (Trout Unlimited, bass fishing groups)
- ◆ encourage programs that will protect historic/archeological sites along the river corridor including historic bridges and barns (land trusts, historical societies)

**Farm bureaus *should:***

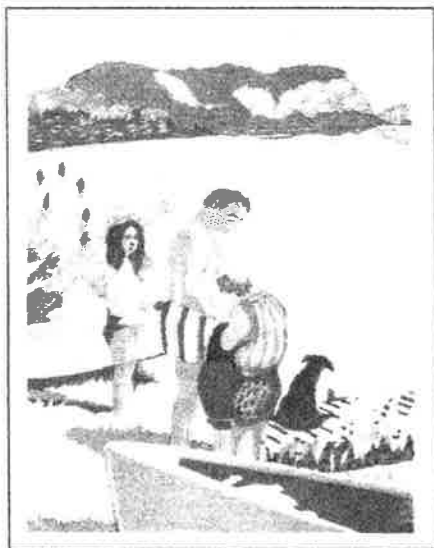
- ◆ encourage creation and retention of buffer strips along the mainstem and the tributaries to filter pollution and provide wildlife corridors
- ◆ help educate riparian landowners concerning methods of stabilization
- ◆ promote availability of professional expertise for farmers and research for agricultural advances
- ◆ support the use of nutrient management plans by farmers
- ◆ support programs that assist farmers in voluntarily adopting best management practices

**Business community *should:***

- ◆ encourage inn-to-inn canoe trips for their commercial value to local inn owners

**Hydropower industry *should:***

- ◆ participate in a study of the effects of water level fluctuations on bank erosion as well as fish habitat and populations of endangered species. The study should be conducted on-site, at multiple locations, and result in action recommendations.
- ◆ communicate with independent engineers to ascertain what steps could be taken at Wilder Dam to reduce its effects on the banks of the river





## ACKNOWLEDGMENTS

The strength of this plan lies largely within its creation by a cross-section of local citizenry. From time to time, however, the local subcommittee called upon the expertise of state agencies and other professionals to educate them about issues of particular concern. We would like to express our gratitude to those who lent their time to share information with the Upper Valley River Subcommittee:

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### *Illustrations*

The Connecticut River Joint Commissions are pleased to feature the artwork of Connecticut River Valley artists in this publication.

◆ *Matt Brown* of Lyme, NH created the cover illustration using a self-taught method which pursues the tradition of color woodblock printing developed in Japan during the 18th century. Each color is printed from a separate carved block, using rice paste as the binder and a hand-held baren and brushes as the printing tools. Matt is a state-juried member of the League of NH Craftsmen.

- ◆ *Joan Waltermire* of Flying Squirrel Graphics in Vershire, VT is the creator of pen and ink drawings of fish and wildlife, seen in Vermont Woodlands magazine and other publications.
- ◆ *Susan Berry Langsten* of Cottage Designs in Lebanon has contributed her pen and ink drawings to other CRJC publications, including the Challenge of Erosion and The Cultural Landscape of the Connecticut River Valley in New Hampshire and Vermont
- ◆ *Christine (Fuchslocher) Castenas* of Charlestown, NH and New York City, did the farm-to-market drawing.
- ◆ *Cheryl Sallen*, a freelance graphic artist of Reading, Vermont, created the maps in consultation with Bill Bridge of the Upper Valley Land Trust.

#### *Design & Printing*

Susan MacNeil prepared the design of this publication with the assistance of Kelly Short of Canterbury Communications in Canterbury, NH. Printing is by Letter Man Press of Claremont, NH.

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## APPENDIX A

### THE NEW HAMPSHIRE RIVERS MANAGEMENT & PROTECTION ACT (RSA 483)

*The 1992 designation of the Connecticut River into the New Hampshire Rivers Management and Protection Program established the following classification criteria and management practices.*

#### **FOR ALL RIVER SEGMENTS**

- ◆ management shall ensure rights of riparian owners to use the river for forest management, agricultural, public water supply, and other purposes compatible with instream public uses
- ◆ DES shall review and consider adopted local river corridor management plans before issuing permits
- ◆ water quality shall be restored to or maintained at least at the Class B level; significant adverse impacts on water quality or other instream public uses shall not be permitted
- ◆ no permanent channel alteration, including dredging, shall be permitted except for construction or maintenance of a project such as public water supply intake
- ◆ DES shall encourage vegetative bank stabilization
- ◆ land application of solid waste (except manure, lime, wood ash, sludge, septage) shall be immediately incorporated into the soil, and set back 250' from normal high water mark
- ◆ no new solid waste landfill within 500 year floodplain; any new landfill to be set back at least 100' from edge of floodplain and screened; may be 250' from river if outside 500 year floodplain
- ◆ any existing solid waste facility within 250' of river may continue to operate under existing permit provided it does not degrade beyond permit area
- ◆ protected instream flow level shall be established by DES
- ◆ no interbasin transfers of water shall be permitted
- ◆ motorized boats operating within 150' of shore shall travel at the slowest possible speed necessary to maintain steerage way, but at no time shall exceed 6 miles/hour (pre-existing state law)



#### **FOR A NATURAL RIVER SEGMENT**

*(One seven-mile segment of the Connecticut River between Brunswick, Vermont and Stratford, New Hampshire has been designated as "natural.")*

- ◆ free-flowing segment of at least five miles in length
- ◆ high quality of natural and scenic resources
- ◆ shorelines in primarily natural vegetation; river corridors generally undeveloped
- ◆ development, if any, is limited to forest management and scattered housing
- ◆ minimum distance to paved public road is 250' except where sight and sound are screened by natural barrier
- ◆ management shall perpetuate natural character as defined above, and ensure rights of riparian owners to use the river for forest management, agricultural, public water supply, and other compatible purposes (in addition to that described above)
- ◆ no dam or other structure that alters natural character of river shall be constructed
- ◆ no channel alteration activities except temporary alterations to repair or maintain bridge, road, or riprap which was in place at time river was designated
- ◆ water quality shall be maintained at Class A or B or restored to Class A

- ◆ no new solid waste facility permitted in corridor; existing, permitted and secure landfill cannot be expanded within 100' of the 500 year floodplain, and must be visually screened with vegetation
- ◆ no new hazardous waste facilities storing for more than 90 days permitted within corridor
- ◆ non-motorized watercraft only except for emergency purposes



***FOR RURAL RIVER SEGMENTS***

- ◆ river corridors are partially or predominantly used for agriculture, forest management, dispersed or clustered residential development
- ◆ some instream structures may exist, including low dams, diversion works, and other minor modifications
- ◆ no minimum distance for roads
- ◆ at least three miles in length
- ◆ existing water quality at least Class B or restorable to Class B
- ◆ management shall maintain and enhance natural, scenic, and recreational values of the river protection (in addition to that described above)
- ◆ no new dam shall be constructed; repair of failed dam permitted only at same location, same impoundment level within six years of date of failure
- ◆ new hydropower facilities may be allowed at existing dams only if they are run-of-the-river, include no significant diversions, and impoundment height is constant and not above maximum historic level



***FOR RURAL-COMMUNITY RIVER SEGMENTS***

- ◆ flow through developed areas with existing or potential community resource values such as those defined in official town plans or land use controls
- ◆ river corridor has combination of open space, agricultural, residential, commercial, industrial land uses
- ◆ readily accessible by road or railroad
- ◆ may include impoundments or diversions
- ◆ at least three miles in length
- ◆ existing water quality at least Class B or restorable to Class B
- ◆ management shall maintain/enhance the natural, scenic, recreational and community values of the river
- ◆ management shall include rights to use river for residential, recreational, commercial, industrial, flood control and other community uses as noted
- ◆ no new dam shall be constructed; repair of failed dam permitted only at same location, same impoundment level and only within 6 years of date of failure
- ◆ new hydropower facilities may be allowed at existing dams only if they are run-of-the-river, include no significant diversions, and impoundment height is constant and not above maximum historic level



***FOR COMMUNITY RIVER SEGMENTS***

- ◆ flow through developed or populated areas and possess existing or potential community resource values such as those identified in official town plans or land use controls
- ◆ combination of open space, agricultural, residential, commercial, industrial land uses; may include urban centers
- ◆ readily accessible by road or railroad
- ◆ may include existing/potential impoundments, hydropower diversions, flood control, water supply
- ◆ at least one mile in length
- ◆ existing water quality at least Class B or restorable to Class B

- ◆ management shall maintain/enhance natural, scenic, recreational, and community values of river
- ◆ management shall include rights to use river for hydroelectric energy production and flood control protection in addition to that described above)
- ◆ new dams permitted if consistent with protection of resources for which segment designated, and only if they are run-of-the-river, include no significant diversions, and impoundment height is constant and not above maximum historic level for site

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## DESIGNATIONS of the CONNECTICUT RIVER (RSA 483:15)

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*Rural river:* from outlet of Fourth Connecticut Lake to a point .3 miles above Second Lake Dam

*Community river:* from the point above Second Connecticut Lake Dam to a point .3 miles below dam

*Rural river:* from point below Second Connecticut Lake Dam to a point .3 miles above First Lake Dam

*Community river:* from point above First Connecticut Lake Dam to a point .3 miles below the dam

*Rural river:* from point below First Connecticut Lake Dam to a point .3 miles above Murphy Dam

*Community river:* from point above Murphy Dam to a point 2 miles below Murphy Dam

*Rural river:* from point 2 miles below Murphy Dam to Bishop Brook in Stewartstown

*Community river:* from Bishop Brook to Leach Creek in Canaan, Vermont

*Rural river:* from Leach Creek to confluence with Mohawk River

*Rural-community river:* from confluence with Mohawk River to the Columbia-Colebrook town line

*Rural river:* from the Columbia-Colebrook town line to Wheeler Stream in Brunswick, Vermont

*Natural river:* from Wheeler Stream to the Maidstone-Stratford Bridge

*Rural river:* from the Maidstone-Stratford Bridge to a point one mile above the breached Wyoming Dam

*Community river:* from one mile above to one mile below the breached Wyoming Dam

*Rural river:* from one mile below the dam site to a point .3 miles above the Simpson Paper Co. Dam

*Community river:* from .3 miles above the Simpson Paper Co. Dam to .3 miles below the dam

*Rural river:* from the point below the Simpson Paper Co. Dam to .4 miles above the Moore Dam

*Community river:* from .4 miles above the Moore Dam to .6 miles below the Moore Dam

*Rural river:* from the point below the Moore Dam to a point .3 miles above the Comerford Dam

*Community river:* from the point above the dam to a point .2 miles below McIndoes Falls Dam

*Rural river:* from the point below the dam to a point .3 miles above the Ryegate Dam (Dodge Falls)

*Community river:* from the point above the Ryegate Dam to a point .2 miles below the dam

*Rural river:* from the point below the Ryegate Dam to the Ammonoosuc River in Bath

*Community river:* from the Ammonoosuc River to the point where routes 135 and 10 meet in Haverhill

*Rural river:* from this intersection to Storrs Pond Brook in Hanover

*Rural-community river:* from Storrs Pond Brook to Dothan Brook outlet in Hartford, Vermont

*Community river:* from Dothan Brook to .3 miles below the Wilder Dam

*Rural-community river:* from .3 miles below Wilder Dam to the Lebanon-Plainfield town line

*Rural river:* from Lebanon-Plainfield town line to Blow-Me-Down Brook in Cornish

*Rural-community river:* from Blow-Me-Down Brook to northern end of Chase Island in Cornish

*Rural river:* from northern end of Chase Island to southern side of Williams River in Bellows Falls

*Community river:* from southern side of Williams River to the Saxtons River in Westminster

*Rural-community river:* from the Saxtons River to the bridge between Westminster Station and Walpole

*Rural river:* from the bridge to the Brattleboro-Dummerston town line

*Rural-community river:* from Brattleboro-Dummerston town line to Sprague Brook

*Community river:* from Sprague Brook to a point .3 miles below the Vernon Dam

*Rural river:* from below the Vernon Dam to the Massachusetts border



# APPENDIX B

## NEW HAMPSHIRE COMPREHENSIVE SHORELAND PROTECTION ACT (RSA 483-B)

Minimum protection measures defined by this Act appear below. The Connecticut River and others designated into the New Hampshire Rivers Management and Protection Program before January 1, 1993 are presently exempt. Shoreland protection for these rivers is the responsibility of riverfront communities and, in the case of the Connecticut River, the CRJC and the local subcommittees. In the event that the New Hampshire cities and towns along the river do not adopt the proposals made in the plan prepared by their local subcommittee, the legislature will re-examine the exemption provided in RSA 483-B and propose minimum standards defined by the Act for the area within 250 feet of the river's ordinary high water mark. In either case, the riverfront community must adopt river protection standards into its local zoning ordinance.

For further information, contact the Shoreland Coordinator at NH Dept. of Environmental Services at 603-271-3503.

### LIMITS WITHIN THE PROTECTED SHORELAND

250 ft

- Prohibited Uses:
  - Establishment/expansion of salt storage yards, auto junk yards, solid waste & hazardous waste facilities.
  - Use of fertilizer, except limestone, within 25 feet of the reference line. Low phosphate, slow release nitrogen fertilizer allowed beyond 25 foot zone.
- Uses Requiring State Permits:
  - Public water supply facilities
  - Public water & sewage treatment facilities
  - Public utility lines
  - Existing solid waste facilities
  - All activities regulated by the DES Wetlands Bureau per RSA 482-A

### OTHER RESTRICTED USES

- All new lots, including those in excess of 5 acres, are subject to subdivision approval by DES.
- Setback requirements for all of new septic systems are determined by soil characteristics.
- Minimum lot size in areas dependent on septic systems determined by soil type.
- Alteration of Terrain Permit standards reduced from 100,000 square feet to 50,000 square feet.
- Total number of residential units in areas dependent on on-site sewage & septic systems, not to exceed 1 unit per 150 feet of shoreland frontage.

### NATURAL WOODLAND BUFFER RESTRICTIONS

- Where existing, a natural woodland buffer must be maintained.
- Tree cutting limited to 50% of the basal area of trees, and 50% of the total number of saplings in a 20 year period. A healthy, well-distributed stand of trees must be maintained.
- Stumps and their root systems must remain intact in the ground within 50 feet of the reference line.

### NEW SEPTIC SYSTEM LEACHFIELD SETBACKS

- 125 feet where soil down gradient of leachfield is porous sand & gravel.
- 100 feet where soil maps indicate presence of soils with restrictive layers within 18 inches of natural soil surface.
- 75 feet where soil map indicates presence of all other soil types.
- 75 feet minimum setback from rivers.

### PRIMARY BUILDING LINE\*

- Primary buildings setback behind line.

### REFERENCE LINE

- For coastal waters = highest observable tide line
- For rivers = ordinary high water mark
- For natural fresh water bodies = natural mean high water level
- For artificially impounded fresh water bodies = water line at full pond

\* If a municipality establishes a shoreland setback for primary buildings, whether greater or lesser than 50 feet, that defines the Primary Building Line for that municipality.



## APPENDIX C

### CONNECTICUT RIVER CORRIDOR QUESTIONNAIRE RESULTS

#### Method

The Upper Valley River Subcommittee sent out a survey in April, 1994 to 5% of the people on each Upper Valley community's voter check list, with the assistance of the Upper Valley/Lake Sunapee Regional Planning Commission and the support of NH Department of Environmental Services. Postage paid return envelopes were provided and follow-up letters were sent to those who had not responded after three weeks. While the surveys were coded to permit this follow-up, the survey was designed to allow responses to remain anonymous. In an excellent response to this type of survey, a total of 35% of the 1211 surveys were returned.

#### Highlights of Survey Results

◆ *The most important features of the Connecticut River which contribute to the quality of life in their community.*

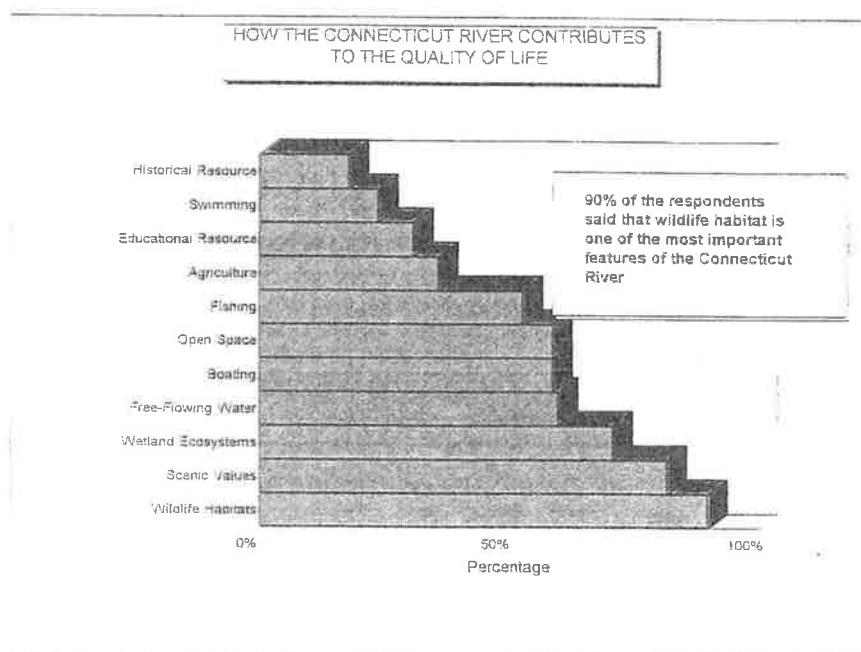
90% of the respondents selected wildlife habitat, 82% selected scenic values, and 71% selected wetland ecosystems. Boat ramps and camping areas were considered the least important.

◆ *The availability of various uses in the river corridor.*

A large percentage of residents, 44% and 31% respectively, think there are not enough trails or canoe/swimming access points along the river. The majority of respondents think that there is too much opportunity for industrial development (62%) and commercial development (63%). While 54% believe that the opportunity for residential development is adequate, 42% think there is too much opportunity. Although the majority of respondents feel that the availability for the use of motor boats is adequate, 27% believe that there is too much opportunity.

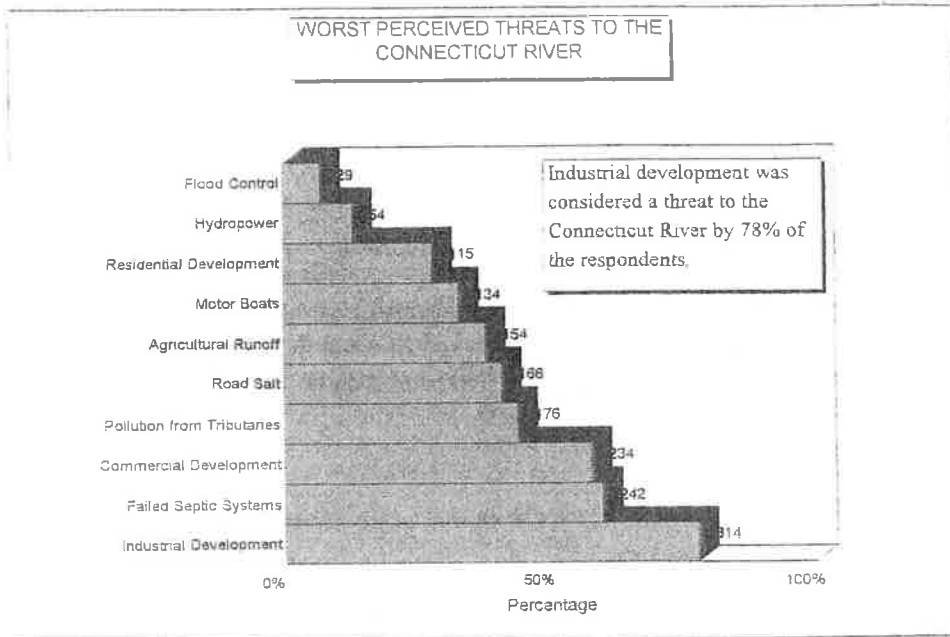
◆ *Assist the Subcommittee in defining the river corridor.*

The NH state definition (river and land area located within 1/4 mile of the high water mark or the landward extent of the 100 year floodplain, whichever is greater) received the most checks (27%), although 17% chose the entire Connecticut River watershed.





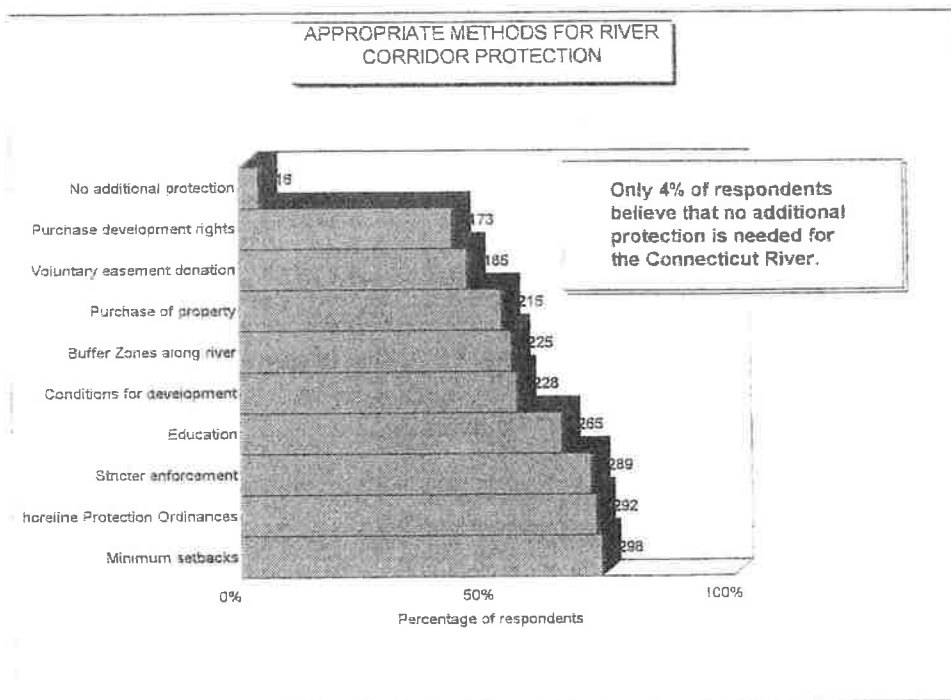
◆ *The four worst threats to the Connecticut River.*



87% selected industrial development. Failed septic systems and commercial development were also perceived to be threats by more than 55% of respondents.

◆ *Should local governments take action to protect the river?*

The response was overwhelmingly (92%) Yes! Stricter enforcement of existing regulation (73%), minimum setbacks for new construction (75%), shoreline protection ordinances (74%), and education (64%) were the most frequently checked methods for river protection. Only 4% felt that no additional protection was necessary. Seventy percent of the respondents who are riverfront landowners, which comprise 6% of the total respondents, agreed that governments should take action to protect the river.





# APPENDIX D

## EXISTING PROGRAMS

A large number of programs exist which assist landowners and municipalities in protecting the river and its tributaries. What appears below is not a complete list and it is recommended that people also contact those groups listed in the final section. The Subcommittee apologizes to sources whose programs are inadvertently omitted.

1. Montshire Museum programs
2. Clean Water Act funding to the states through Section 319 for nonpoint pollution remediation and Section 604b for planning to address water quality issues
3. Environmental Quality Incentive Program, a cost-sharing program through the Farm Services Agency to assist farmers and other landowners in using best management practices
4. Connecticut River Joint Commissions Partnership Program
5. Connecticut River Agricultural Network of the Connecticut River Joint Commissions
6. Federal Emergency Management Agency's flood insurance and hazard mitigation programs
7. Upper Valley Land Trust's programs
8. The Vermont Housing & Conservation Trust's program
9. Heritage Trail program
10. Scenic Byway program
11. Vermont and New Hampshire Natural Heritage Inventory Programs
12. Partners for Wildlife Program through the U.S. Fish & Wildlife Service
13. Grant program of the Silvio Conte National Fish & Wildlife Refuge
14. Vermont Wetlands Office, Agency of Natural Resources
15. New Hampshire Wetlands Bureau, Dept. of Environmental Services
16. County Conservation Districts
17. Farm Bureaus
18. Federal, state and local regulatory authorities
19. Vermont's "Barn Again" program
20. Regional planning commissions
21. Local volunteer groups



# APPENDIX E

## SELECTED BEST MANAGEMENT PRACTICES

Long experience with the water quality impacts of various kinds of land management has led the States of Vermont and New Hampshire to develop detailed guidance for landowners and towns in how to best manage land to minimize nonpoint pollution. Below is a general summary of selected practices for a variety of activities.

Each state has its own approach to these land management practices. For instance, spreading of manure in the winter, when it is likely to wash into streams because the frozen ground cannot absorb it, is highly discouraged by New Hampshire but prohibited between December 15 and April 1 by Vermont's rules for "acceptable agricultural practices." Contact the New Hampshire Dept. of Environmental Services or Vermont Agency of Natural Resources, or your county office of the Natural Resources Conservation Service, for information on the guidance or regulations which apply in your area (see Appendix G).

### CONSTRUCTION SITES

*Ensure good oversight of erosion and sedimentation control.*

- ◆ provide erosion, sedimentation, and stormwater management plans
- ◆ use all natural resource information, including soils, topography, and geology

*Minimize the amount of bare soil exposed.*

- ◆ limit clearing on building sites and rights-of-way
- ◆ cluster buildings; build one phase at a time
- ◆ mulch all bare soil as soon as possible, before storms or rainfall
- ◆ stabilize, seed and mulch the area when soil will be exposed for an extended period

*Minimize water-impervious surfaces that increase runoff.*

- ◆ minimize the area of roofs, roads, sidewalks, and parking lots
- ◆ leave undisturbed as much of the site's natural vegetation as possible
- ◆ consider using porous pavement

*Direct water away from construction areas.*

- ◆ don't concentrate stormwater into channels
- ◆ redirect clean water that could otherwise drain onto the construction site
- ◆ schedule work during periods of low water, low rainfall, and when vegetation can best be established
- ◆ work with the natural contours of the site; use natural drainways (not man-made ones or streambeds)
- ◆ avoid building roads up and down steep slopes
- ◆ provide ditches and channels of sufficient stability and capacity to handle storm runoff velocities
- ◆ install ditch turnouts so that runoff flows into vegetated areas
- ◆ use natural ground cover (such as grass) on slopes and in drainage ditches
- ◆ use wet (retention) ponds to trap sediment and phosphorus
- ◆ ensure that storm and other drainage systems (not wastewater systems) empty into adequately sized channels and don't enter sewage systems

*Protect existing stormwater inlets and culverts from sediment.*

- ◆ mulch all bare soils
- ◆ install silt fencing and hay bale filters
- ◆ use sediment traps in larger ditches
- ◆ install a temporary, perforated riser at culverts

*Make sure your erosion control measures are effective.*

- ◆ adjust, maintain, and repair erosion controls after every storm event
- ◆ remove all temporary measures once construction has ceased and vegetation has taken root

### DEVELOPED AREAS

*Minimize pollutants washed into waterways from developed sites.*

- ◆ use natural vegetation or new landscaping to act as a filter or buffer
- ◆ limit the amount of clearing
- ◆ divert runoff around sites where it could pick up pollutants
- ◆ keep parking areas, outdoor storage areas, and streets clean of debris
- ◆ maintain catch basins to prevent backup
- ◆ use grassed swales, constructed wetlands, detention ponds, wet ponds, and catch basins
- ◆ direct water away from unpaved road surfaces and keep runoff velocities low

## TIMBER HARVESTING

### *Control erosion on exposed soils.*

- ◆ construct water bars, turn-ups, and ditches on sloped trails and haul roads to divert runoff into the forest
- ◆ use appropriate method of wetland or water crossing for size of stream and traffic it must bear  
cross streams at right angles
- ◆ keep steep road pitches to a minimum and run skid trails at an angle to the slope
- ◆ size culverts properly; use on all truck road crossings of permanent streams
- ◆ maintain filter strips between logging operations and water bodies
- ◆ locate landings and roads on level or gently sloping ground, away from water bodies
- ◆ install water diversions at log landings to prevent sedimentation
- ◆ keep all slash away from streams and water bodies
- ◆ seed and mulch trails and exposed soils once operations are complete

## AGRICULTURE, LAWNS, and GOLF COURSES

### *Keep fertilizers from fertilizing waterways.*

- ◆ tailor the application of manure and fertilizer to the nutrient needs of the crop
- ◆ use soil tests to determine current nutrient levels and soil pH
- ◆ diversify crop rotations and plant cover crops after harvesting to use residual nutrients
- ◆ avoid spreading manure or fertilizer on frozen or snow covered ground
- ◆ incorporate manure into the soil as soon as possible after spreading
- ◆ do not store manure in the floodway or near wells
- ◆ maintain filter strips between surface waters and fields and feedlots
- ◆ control livestock access to water bodies
- ◆ divert runoff away from high animal use areas
- ◆ keep accurate fertilizer application and crop yield records
- ◆ manage milkhouse and parlor wash water
- ◆ store manure in properly constructed and located facilities

### *Control sedimentation and erosion.*

- ◆ plant crops along contour lines
- ◆ rotate crops that provide limited ground cover with those that provide generous ground cover
- ◆ maintain filter strips between fields and surface waters
- ◆ plant cover crops or maintain residue cover on the fields after harvest
- ◆ construct and stabilize diversions to control runoff across cropland and control erosion in gullies
- ◆ keep livestock off bare streambanks
- ◆ set farm buildings back from streams

### *Use pesticides carefully.*

- ◆ apply pesticides only when needed
- ◆ consider using integrated pest management to reduce pesticide use
- ◆ apply, store and handle pesticides properly
- ◆ obtain training in pesticide application or hire a licensed applicator
- ◆ do not spray or apply pesticides on windy days or before a heavy rain storm

## ROAD SALTING AND SNOW STORAGE

It is illegal in both states to dump plowed snow directly into water bodies.

### *Keep salt, sand, and other pollutants in winter snow piles out of waterways.*

- ◆ store disposed snow near flowing surface waters, but at least 25' from the high water mark, in order to dilute the salt with river water and avoid impacts to ground water, lakes, and wetlands; solid materials contained in the snow remain on the land surface and should be removed each spring
- ◆ avoid storing snow near water supply wells
- ◆ store salt piles under cover and on a flat, impervious surface so salt does not wash into the ground
- ◆ remove sand from streets in early spring

### *Apply road salt carefully.*

- ◆ identify sensitive areas such as public water supplies and ponds, and consider de-icing alternatives
- ◆ give salt time to work; know when to plow and reapply salt
- ◆ determine salt application rates and frequency for all roads in a service area
- ◆ apply salt in a 4-8' wide center strip along lesser traveled roads
- ◆ use ground-speed controllers on spreaders

## CHEMICAL AND PETROLEUM PRODUCTS

*Keep these pollutants out of ground and surface waters.*

- ◆ ensure that chemicals are recovered, recycled, or reused wherever possible
- ◆ have a spill prevention and response plan, with containment equipment readily available
- ◆ store containers and transfer chemicals only in areas that will contain spills, and away from waters, storm drains, and wells
- ◆ inspect regularly for leaks or potential contact with stormwater
- ◆ schedule routine cleanup operations
- ◆ do not allow floor drains and work sinks to discharge into or onto the ground

## SEPTIC SYSTEMS

*Keep the system working well to prevent groundwater pollution.*

- ◆ know the location of septic tank and leach field; mark tank cover
- ◆ inspect tank frequently and pump it out at least every 3 years
- ◆ use water conservatively
- ◆ keep vehicles and livestock off the system
- ◆ do not use kitchen garbage disposal, which can clog the system
- ◆ do not pour caustic or toxic materials down the drain; these may kill necessary bacteria and contaminate sludge later intended for land application
- ◆ do not flush bulky items such as disposable diapers or sanitary pads into the system
- ◆ avoid putting food waste and grease into the system
- ◆ keep deep rooted trees and shrubs away from the leach field

*Encourage local oversight.*

- ◆ consider a town septic system education and inspection program
- ◆ consider adopting a local health ordinance for septic system regulation

## DOCKS, MOORINGS, AND MARINAS

*Ensure that new marinas are properly constructed to minimize water pollution.*

- ◆ minimize the amount of paved, impervious surface
- ◆ limit use of pressure-treated lumber
- ◆ retain natural, vegetated buffers along the shore where possible
- ◆ provide erosion, sedimentation, and stormwater management plans

*Prevent pollution from marina and boating activities.*

- ◆ use only phosphate-free detergents and treat wash water before it enters the waterbody
- ◆ perform engine maintenance out of the water
- ◆ use propylene glycol as an antifreeze
- ◆ conduct painting and scraping where debris will not enter the water
- ◆ provide for spill containment
- ◆ install catch basins around boat launches to trap pollutants
- ◆ provide public restrooms and pumpout facilities to limit input of wastewater into water bodies
- ◆ use an on-board holding tank

*Avoid introducing exotic species.*

- ◆ remove plant fragments from boats and trailers
- ◆ wash boat and flush cooling system; leave boat out of water for 48 hours after boating in a contaminated waterbody

## SAND AND GRAVEL EXCAVATION

*Avoid pollution of nearby drinking water supplies and surface waters.*

- ◆ investigate proposed pit areas during planning; allow space for mild pit slopes, diversions, and setbacks from abutters, water bodies, and drinking water supplies
- ◆ provide buffer strips of natural vegetation
- ◆ maintain 5 feet of unexcavated material above the seasonal high water table as a filter
- ◆ do not store petroleum products in the pit area
- ◆ develop spill prevention plan and clean up spills immediately
- ◆ maintain and wash equipment outside the pit area
- ◆ control dust to prevent nuisance and public hazard; use water rather than calcium chloride; never use oil
- ◆ use retention basins to trap fine material; clean out regularly
- ◆ use anti-tracking pads at gravel pit access roads to dislodge mud from tires

*Reclaim excavations.*

- ◆ leave surface soil which can sustain vegetation, and plant with grass or seedlings to prevent erosion
- ◆ grade slopes to at least the natural angle of repose
- ◆ restore original, natural drainage

## BIOSOLIDS

*Reduce risk of nutrient contamination of surface or subsurface water.*

- ◆ do not store or apply biosolids near surface water or wells
- ◆ do not apply biosolids during time of high water table
- ◆ total available nitrogen should not exceed crop requirements

*Reduce risk of contamination of feed crop lands.*

- ◆ prioritize non-cropland or non-food crop lands for application
- ◆ for feed crop land, apply in fall before soil freezes or prior to planting
- ◆ avoid application where food crops are grown, especially leaf and root crops
- ◆ manage and monitor the land carefully

*Apply and monitor carefully.*

- ◆ select weather conditions when odors will dissipate quickly
- ◆ test soil nitrate levels annually
- ◆ calibrate equipment for uniform application rates
- ◆ avoid use of heavy equipment on wet soil
- ◆ do not apply on frozen, excessively wet, or snow-covered ground
- ◆ monitor the site and maintain at pH 6.5 long-term
- ◆ keep good crop records on individual fields



## PUBLICATIONS

### NEW HAMPSHIRE

- ◆ *Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials*, NH Dept. of Environmental Services, 1994.
- ◆ *Best Management Practices for Urban Stormwater Runoff*, NH Dept. of Environmental Services, 1996
- ◆ *Stormwater Management / Erosion and Sedimentation Control Handbook for Urban and Developing Areas in New Hampshire*, NH Dept. of Environmental Services, 1992
- ◆ *Best Management Wetland Practices for Agriculture*, NH Dept. of Agriculture
- ◆ *New Hampshire's Manual of Best Management Practices for Agriculture*, NH Dept. of Agriculture, 1993
- ◆ *Resource Manual: Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*, NH Division of Forests and Lands, 1991.
- ◆ *Best Management Practices: Biosolids*, UNH Cooperative Extension, 1995

### VERMONT

- ◆ *Vermont Agricultural Nonpoint Source Pollution Reduction Program Law and Regulations*, VT Dept. of Agriculture, Food and Markets, 1996
- ◆ *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont*, VT Dept. of Forests, Parks, and Recreation, 1987
- ◆ *Vermont Handbook for Soil Erosion and Sedimentation Control on Construction Sites*, VT Agency of Natural Resources, 1982
- ◆ *Vermont Streambank Conservation Manual*, VT Agency of Natural Resources, 1987
- ◆ *Vermont Better Backroads Manual*, George D. Aiken/Northern VT Resource Conservation & Development Councils, 1995
- ◆ Wetland Fact Sheets: "Erosion Control," "Agricultural Activities in Wetlands," "Stormwater and Wetlands," VT Dept. of Environmental Conservation, 1992
- ◆ "Road Salt and Salted Sand Storage Guidelines," Dept. of Environmental Conservation, 1993

### CONNECTICUT RIVER JOINT COMMISSIONS

- ◆ *The Challenge of Erosion in the Connecticut River Watershed*, 1996
- ◆ *The Watershed Guide to Cleaner Rivers, Lakes, and Streams*, 1995
- ◆ *A Homeowner's Guide to Controlling Nonpoint Source Pollution in the Connecticut River Valley*, 1994



# APPENDIX F

## GUIDE TO PERMITS

### GET THE RIGHT PERMITS FOR PROJECTS NEAR RIVERS AND STREAMS

Any work you do near a river or stream can affect other landowners and public values such as water quality, fish, wildlife, and flood control. To protect the public's interests, federal, state and local governments have developed laws, rules, and ordinances for projects in or near rivers and streams. Permits and approvals are necessary for streambank stabilization, construction, and other earth disturbances on the bank or in the bed of a stream. It is important that the necessary approvals and permits are obtained before any work is begun. Penalties exist for unauthorized work.

#### LOCAL CITY OR TOWN

*Contact:* Selectmen's Office/Town Manager/Zoning Administrator  
*Provides Information About:* Local Zoning Regulations and/or Federal Emergency Management Agency (FEMA) regulations for work in the floodplain and wetland protection.

#### STATE OF NEW HAMPSHIRE

All projects in New Hampshire must be reviewed by the NH Wetlands Board, which has been charged by the legislature with protecting the State's submerged lands and wetlands from despoliation and unregulated alteration (RSA 482-A). A wetlands permit is required to excavate, remove dredge, fill, or build a structure in or on the bank of any surface waters or wetlands in the state. Surface waters include lakes, rivers, brooks and perennial or seasonal streams, but exclude sheet runoff in the absence of a defined channel or wetland vegetation. Projects that significantly expose raw earth may require an Alteration of Terrain permit.

##### I. Wetlands Permit

- A. Obtain Application from your Town Clerk or Wetlands Bureau
- B. Primary Permit Requirements are explained in: NHDES fact sheet, "Wetland Permits for Bank Stabilization" (Technical Bulletin #WRD-1991-5)
- C. Contact for Information: Wetlands Bureau, NH Dept. of Environmental Services, 6 Hazen Drive, P.O. Box 95, Concord, NH 03301 • Phone: (603) 271-2147 -- Fax: (603) 271-6588
- D. Fee Schedule: Minimum filing fee of \$50 for all Minimum Impact Projects. Additional filing fee may be required for Minor or Major Projects at \$ .025/square foot of requested jurisdictional area impact.
- E. Other Considerations: Contact Rivers Coordinator at NHDES • Phone (603)271-1152
  1. New Hampshire Rivers Management and Protection Act (RSA 483): Projects on the Connecticut River and others designated under this program must meet the requirements of the law. Copies of all permit applications needing NHDES approval are also reviewed by the Rivers Coordinator and the local river management advisory committee. (Technical Bulletin NHDES-CO-95-2)
  2. Comprehensive Shoreland Protection Act, (RSA 483-B): Projects located on fourth order or higher rivers, except the Connecticut River and others designated for protection under RSA 483 prior to January 1, 1993, must comply with the minimum standards of this law which are usually added as a condition of the Wetlands Permit. Phone: (603)271-6876.

##### II. Alteration of Terrain Permit

- A. Obtain Permit Application and Information from: Water Supply & Pollution Control Division (WSPCD), NH Dept. of Environmental Services, 6 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095 • Phone: (603) 271-3503 Fax: (603) 271-2867
- B. Primary Requirements for Permit: Projects with significant alteration of 100,000 sq. ft. or more. Projects with significant alteration of 50,000 sq. ft. or more on rivers which fall under the jurisdiction of the Comprehensive Shoreland Protection Act (see above).
- C. Fee Schedule: 50,000 - 199,000 sq. ft of disturbance requires a fee of \$100. Add \$100 for each additional 100,000 sq. ft thereafter.
- D. Other Considerations: New Hampshire Rivers Management and Protection Act: (see above)

### III. Federal Clean Water Act Section 404 Permit and Section 401 Water Quality Certification

New Hampshire implements a State Program General Permit (NHSPGP) through the U.S. Army Corps of Engineers for activities involving dredge or fill in waters of the state and work affecting navigable waters. The NHSPGP excludes certain activities and is generally limited to minor or controversial activities. Projects which require a Section 404 permit from the Corps must also obtain a Section 401 Water Quality Certificate from NHDES-WSPCD.

- A. *Contact for Information:* U.S. Army Corps of Engineers, Regulatory Division for Permits in NH, 424 Trapelo Rd., Waltham, MA 02254-9149 • Phone: (800)343-4789 -- Fax: (617)647-8303
- B. *Obtain Water Quality Certificate and Information from:* Surface Water Quality Bureau, Water Supply & Pollution Control Division, NH Dept. of Environmental Services, 64 North Main St., Concord, NH 03301 Phone: (603) 271-2457 Fax: (603) 271-7894
- C. *Project Types:*

**Minimum Impact Project:** work can proceed following receipt of Wetlands permit (see above)

**Minor Impact Project:** work must wait 30 days after Wetlands Board approval for reply from Army Corps

**Major Impact Project:** work cannot proceed until after Wetlands Board approval and until Army Corps sends written confirmation that the project has been approved.

## STATE OF VERMONT

The Vermont Stream Alteration Law, Title 10, Chapter 41, requires that all stream alteration projects which seek "to change, alter or modify the course, current or cross-section of any water course having a drainage area greater than 10 square miles by movement, fill or by excavation of 10 cubic yards or more of material." require a permit from the Stream Alteration Engineers of the VT Agency of Natural Resources.

### I. Stream Alteration Permit

- A. *Obtain permit application and information from:* (For projects located on the Ompompanoosuc River and north AND the Winooski River and north): VT Agency of Natural Resources, 184 Portland Street, St. Johnsbury, VT 05819 • Phone: (802) 748-8787 Fax: (802) 748-6687  
(For projects on the White River and south AND Lewis Creek and south): VT Agency of Natural Resources, 450 Asa Bloomer Bldg, Rutland, VT 05701-5903 • Phone: (802) 786-5906 Fax: (802) 786-5915
- B. *Fee Schedule:* \$100 per permit

### II. Federal Clean Water Act Section 404 Permit and Section 401 Water Quality Certification

Water Quality Certification is required for all projects regarding discharge and dredged or fill materials in waters of the U.S., regardless of the size of the watershed. Contacts are same as for stream alteration permits, above.

### III. Wetlands Permit

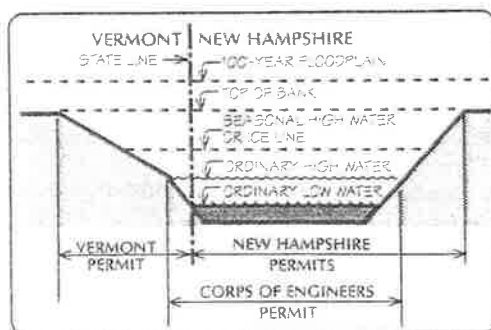
If the proposed project is located in or near a wetland, a site visit may be necessary. Impacts may be addressed under Title 10 VSA, Chapter 37, Section 905(a), 401 Water Quality Certification and Act 250.

- A. *Obtain permit application and information from:* Wetlands Coordinator, Water Quality Division, VT Agency of Natural Resources, Building 10N, 103 So. Main St., Waterbury, VT 05671 • (802) 241-3770

### IV. Connecticut River Projects

The Ordinary Low Water mark (OLW) is the New Hampshire/Vermont state line. By agreement with the VT Agency of Natural Resources, permit applications involving the Connecticut River are reviewed by the local river management advisory subcommittee.

- A. *For projects on the Vermont side of the Connecticut River riverward of the Ordinary Low Water mark,* contact NHDES to see if additional permits are required at: Wetlands Bureau, NH Dept. of Environmental Services, 6 Hazen Drive, P.O. Box 95, Concord, NH 03301 • Phone: (603) 271-2147 Fax: (603) 271-6588
- B. *For projects on the Connecticut River landward of the Ordinary Low Water mark,* contact the U.S. Army Corps of Engineers for information about jurisdiction and application procedures at: U.S. Army Corps of Engineers, Regulatory Division, Camp Johnson, Bldg 10-18, Colchester, VT 05446 • Phone: (802) 655-0334 Fax (802) 655-0818







# APPENDIX G

## SOURCES OF ASSISTANCE

Environmental Protection Agency  
Region 1  
JFK Building  
Boston, MA 02203  
617-565-9026

USDA Natural Resources  
Conservation Service  
◆ NH county offices:  
Coos County: 788-4651  
Grafton County: 747-2001  
Sullivan County: 863-4297  
Cheshire County: 352-3602  
◆ VT county offices:  
Essex/Caledonia Counties: 748-3885  
Orange/Windsor Counties: 295-1504  
Windham County: 254-5323

USDA Cooperative  
Extension Service  
◆ NH county offices:  
Coos County: 788-4961  
Grafton County: 747-6944  
Sullivan County: 863-9200  
Cheshire County: 352-4550  
◆ VT county offices:  
Essex/Caledonia Counties: 676-3900  
Orange/Windsor Counties: 296-7630  
Windham County: 257-7967

New England Interstate Water  
Pollution Control Commission  
255 Ballardvale St.  
Wilmington, MA 01887  
508-658-0500

### FEDERAL AGENCIES

National Park Service  
Rivers and Trails Conservation  
Assistance Program NH/VT  
King Farm, 5 Thomas Hill  
Woodstock, VT 05091  
802-457-4323

U.S. Fish and Wildlife Service  
Conte Refuge Planning Project  
38 Avenue A  
Turners Falls, MA 01376  
413-863-3070

### NEW HAMPSHIRE STATE AGENCIES

Dept. of Environmental Services  
6 Hazen Dr., P.O. Box 95  
Concord, NH 03302-0095  
603-271-3503  
◆ Rivers Coordinator: 271-1152  
◆ Water Division: 271-3503  
◆ Wetlands Bureau: 271-2147

Fish and Game Department  
2 Hazen Dr.  
Concord, NH 03301  
603-271-3211

Dept. of Resources & Economic  
Development  
172 Pembroke Rd., P.O. Box 1856  
Concord, NH 03302-1856  
603-271-2411  
◆ Natural Heritage Inventory:  
271-3623

Division of Historical Resources  
19 Pillsbury St., P.O. Box 2043  
Concord, NH 03302-2043  
603-271-3558

Department of Agriculture  
25 Capitol St., 2d Floor  
P.O. Box 2042  
Concord, NH 03302-2042  
603-271-3551

Department of Safety  
31 Dock Rd.  
Gilford, NH 03246  
603-293-0091

### VERMONT STATE AGENCIES

Dept. of Agriculture, Food, &  
Markets  
116 State St.  
Montpelier, VT 05620-2901  
802-828-2500

Agency of Natural Resources  
Dept. of Environmental  
Conservation  
103 S. Main St., 1 South  
Waterbury, VT 05671-0401  
802-241-3800  
◆ Water Supply: 241-3400  
◆ Water Quality: 241-3770  
◆ Solid Waste Management: 241-3444

Dept. of Fish & Wildlife  
103 S. Main St., 10 South  
Waterbury, VT 05671-0501  
802-241-3700  
◆ Natural Heritage Inventory  
Program: 241-3700

Dept. of Forests, Parks &  
Recreation  
103 S. Main St., 10 South  
Waterbury, VT 05671-0601  
802-241-3670

Department of Travel & Tourism  
134 State St.  
Montpelier, VT 05602-3403  
802-828-3237

Division for Historic Preservation  
135 State St., 4th Floor, Drawer 33  
Montpelier, VT 05633-1201  
802-828-3226

Housing & Conservation Board  
136 ½ Main St., Drawer 20  
Montpelier, VT 05620-3501  
802-828-3250

Water Resources Board  
58 E. State St. Drawer 20  
Montpelier, VT 05620-3201  
802-828-2871

**REGIONAL PLANNING COMMISSIONS**  
*and Resource Conservation and Development Areas*

Northeast Vermont  
Development Association  
P.O. Box 640  
St. Johnsbury, VT 05819  
802-748-5181

North Country Council  
107 Glessner Rd.  
Bethlehem, NH 03574  
603-444-6303

Upper Valley/Lake Sunapee RPC  
77 Bank St.  
Lebanon, NH 03766-1704  
603-448-1680

Southwest RPC  
20 Central Square, 2d Floor  
Keene, NH 03431  
603-357-0537

Two Rivers/Ottawaquechee RPC  
King Farm, 5 Thomas Hill  
Woodstock, VT 05091  
802-457-3188

Southern Windsor County RPC  
Box 320 Ascuney Prof. Bldg., Route 5  
Ascuney, VT 05030  
802-674-9201

Windham Regional Commission  
139 Main St., #505  
Brattleboro, VT 05301  
802-257-4547

George D. Aiken Resource  
Conservation & Development Area  
P.O. Box 411  
Randolph, VT 05060  
802-728-9526

North Country Resource  
Conservation & Development Area  
103 Main St., Suite 1  
Meredith, NH 03253  
603-279-6546

**PRIVATE ORGANIZATIONS AND LAND TRUSTS**

River Watch Network  
New England Office  
RR 1, Box 209  
Hartland, VT 05048  
802-436-2544

Connecticut River Watershed  
Council  
1 Ferry St.  
Easthampton, MA 01027  
413-529-9500

NH Rivers Council  
54 Portsmouth St.  
Concord, NH 03301  
603-228-6472

Vermont River Conservancy  
RR 5, Box 920  
Montpelier, VT 05602  
802-229-9282

The Nature Conservancy- NH  
2 ½ Beacon St., Suite 6  
Concord, NH 03301  
603-224-5853

The Nature Conservancy-VT  
27 State St.  
Montpelier, VT 05602  
802-229-4425

Vermont Natural Resources  
Council  
9 Bailey Ave.  
Montpelier, VT 05602  
802-223-2328

Audubon Society of NH  
3 Silk Farm Rd.  
Concord, NH 03301  
603-224-9909

Society for Protection of NH  
Forests  
54 Portsmouth St.  
Concord, NH 03301  
603-224-9945

Upper Valley Land Trust  
19 Buck Rd.  
Hanover, NH 03755  
603-643-6626

Vermont Land Trust  
8 Bailey Ave.  
Montpelier, VT 05602  
802-223-5234

Passumpsic Valley Land Trust  
P.O. Box 124  
St. Johnsbury, VT 05819  
802-748-8089

Windmill Hill Pinnacle Association  
RR 3 Box 248  
Putney, VT 05346

Inherit New Hampshire  
266 N. Main St.  
Concord, NH 03301  
603-224-2281

Vermont Institute of Natural  
Science  
Church Hill Rd.  
Woodstock, VT 05091  
802-457-2779

Montshire Museum  
P.O. Box 770  
Norwich, VT 05055  
802-649-2200

Bonnyvale Environmental Center  
Old Guilford Road  
Brattleboro, VT 05301  
802-257-5785

NH Farm Bureau  
295 Sheep Davis Rd.  
Concord, NH 03301  
603-224-1934

VT Farm Bureau  
RR 4, Box 2287  
Montpelier, VT 05602  
802-223-3636



## APPENDIX H

### CONSERVATION EASEMENTS

*Land trusts offer a voluntary mechanism for protecting individual parcels of land forever. Using a legal document known as a conservation easement, land trusts can ensure continued stewardship and productive use without relying on public regulation or public ownership.*

*Land subject to conservation easements remains in private ownership and can be sold, given or transferred at any time. A conservation easement assures the landowner that the resource values of his or her property will be protected forever, no matter who the future owners are.*

#### **What is a conservation easement?**

A conservation easement is a legally enforceable agreement between a landowner and a private conservation organization (such as a land trust) or governmental agency that specifies forever, the types and locations of activities permitted on a particular parcel of land. A conservation easement is a deed “running with the land,” and all future landowners are bound to the provisions of the easement deed.

Landowners place conservation easements on their properties voluntarily, working with land trusts to craft provisions that will protect the natural features of the property and meet the landowner’s objectives. For instance, a landowner may choose to conserve some, but not all, of her land; or a landowner may wish to specify timber or habitat management standards to continue his investment in good stewardship.

Conservation easements are usually donated to land trust, but in certain cases, land trusts may purchase conservation easements. This is sometimes called “selling development rights.”

Conserved land remains in private ownership, used for farming, forestry and other activities that are consistent with the purposes of the conservation easement deed. The land trust accepts the responsibility of monitoring the property - forever - to ensure compliance with the terms of the conservation easement.

#### **Does a conservation easement allow public access to the property?**

Landowners who grant conservation easements make their own choice about whether to open their property to the public. A conservation easement does not allow access to the general public unless the landowner has specifically provided for access in the easement agreement.

Public access is more often granted when the property has a history of public use and is perceived to be a recreational resource. Some landowners provide public access rights to a limited area, such as allowing fishing in designated areas or hiking along a clearly defined corridor. Landowners may choose to permit public access for specific purposes (scientific research, education, or hunting, for example). Some landowners restrict public access to particular types of activities, such as walking, skiing, biking, or horseback riding.

Conservation easements do permit regular access by the land trust for the purpose of monitoring the use and activities on the property to ensure that the terms and conditions of the conservation easement are upheld.

#### **Who can grant an easement?**

Any owner of property with conservation values may grant a conservation easements. If the property belongs to more than one person, all owners must consent to granting an easement. If the property is mortgaged, the owner must obtain an agreement from the lender to subordinate its interests so that the easement cannot be extinguished in the event of foreclosure.

### **How restrictive is a conservation easement?**

A conservation easement generally permits existing land use practices to continue and may allow a limited amount of future development. Each easement is designed to prohibit development and other activities to the degree necessary to protect the significant natural values of that particular property.

Agricultural and forestry activities are permitted and encouraged on most easement-protected land. This includes: building structures such as culverts, bridges, barns, sheds, fences and dams when necessary for farming and forestry. Habitat management and improvement, such as creating ponds and wetlands or establishing plant species to benefit wildlife, is also usually permitted.

Depending on the characteristics of the property and the landowners' wishes, future residential or commercial construction may be prohibited entirely or limited to sites where the impact will not impair the natural values of the property. Additional limitations may include prohibition of mining, excavation, or installation of billboards, and the establishment of protective buffers around ponds or waterways.

### **How much land must be included?**

Any amount. A conservation easement may apply to only a small part or all of an owner's land, depending upon what the owner wants to protect and on whether the restrictions are acceptable to the land trust.

### **Are there financial benefits to donating a conservation easement?**

*Income Taxes:* The donation of a conservation easement constitutes a charitable gift which may be deductible for federal income tax purposes if the property meets conservation standards established by the federal government. The value of the gift, determined by an appraisal, is equal to the difference between the fair market value of the property before and after the easement is donated.

*Estate Taxes:* A conservation easement can be a useful estate planning tool, enabling heirs to keep land they would otherwise have to sell. State and federal inheritance taxes on real estate are often so high that the heirs are forced to sell some or all of the land just to pay the taxes. Because an easement reduces the value of the property, the inheritance taxes are also reduced.

*Gift Taxes:* When a landowner gives land to a family member, the gift is subject to gift taxes if its value exceeds the maximum tax-free amount. Lowering the value of the land through a conservation easement may allow the landowner to give more land free of tax, or may help reduce the amount of tax owed.

*Property Taxes:* Most property subject to a conservation easement is eligible for preferential tax treatment under current use taxation. Landowners whose property is already enrolled in a current use program will generally not see a further reduction in their property taxes.

### **How are conservation easements enforced?**

The recipient organization (usually a land trust) is responsible for monitoring compliance in perpetuity. Representatives of that organization will visit the property periodically to determine that no violations have occurred. The organization will use written records and photographs to document the condition of the property.

A property owner should make sure that the recipient organization has the time and resources to carry out its monitoring responsibility. Most land trusts maintain endowments for this purpose, and many ask the landowner to make a contribution to the endowment at the time an easement is accepted.

*Prepared with the assistance of the Upper Valley Land Trust, which was founded in 1985 with a mission of helping people conserve land. UVLT has worked with farmers and forest owners, local conservationists, and elected officials to conserve nearly 12,000 acres of land since then: productive farmland, working forest, remote wild places, stream and river corridors, scenic vistas, wetlands, hiking trails, and picnic and camping spots. The Upper Valley Land Trust works in 40 Upper Valley towns on both sides of the Connecticut River. For more information about how you can conserve your land, or a special place in your community, call or write: UVLT, 19 Buck Rd, Hanover, New Hampshire 03755 (603) 643-6626.*



# APPENDIX I

## REFERENCES AND MAPS

Connecticut River Water Quality Assessment, NH Dept. of Environmental Services and VT Dept. of Environmental Conservation, 1994. Prepared for the CRJC with support from the Environmental Protection Agency, this bi-state assessment of the watershed is written for a non-technical audience and describes general and specific water quality issues on the Connecticut River mainstem and its tributaries. The report includes an extensive technical appendix and presents the states' strategies for correcting water pollution in the basin.

Along the Northern Connecticut River: An Inventory of Significant Instream Features, Connecticut River Joint Commissions, 1994. This inventory contains the available information relating to in-stream features of the Connecticut River mainstem for both sides of the river. It covers water quality features, such as location of water quality and streamflow gauging stations water withdrawals, and wastewater treatment facilities; river flow and riverbank features, such as dams, impoundments, and significant streambank erosion sites; and recreational features, such as whitewater segments, boat launch sites and campgrounds. Information is presented by local river subcommittee region both in tables and on GIS-based maps. An extensive annotated bibliography covers both technical publications and those focusing on Connecticut River history and travel. The inventory is also provided on a computer disk in the front of the notebook for easy reference. Designed to be user-friendly, it can be run on a personal computer using MS-DOS. The appendix includes instructions on how to operate the disk.

*LIVING WITH THE RIVER SERIES of publications by the Connecticut River Joint Commissions:*

A Homeowner's Guide to Nonpoint Source Water Pollution in the Connecticut River Valley, 1994. This booklet offers useful hints for homeowners on managing runoff, caring for septic systems, conserving water, and dealing with yard waste, bugs, and chemicals. It also offers alternatives for toxic household products and a directory of sources of help.

The Watershed Guide to Cleaner Rivers, Lakes, and Streams, Brian Kent, 1995. Liberally illustrated, this guide describes the causes of nonpoint pollution, suggests ways to reduce and prevent it from reaching waterways, and provides basic ideas that citizens can use to help improve water quality in the valley. The report covers a number of best management practices for construction sites, developed areas, backyards, septic systems, gravel and sandpits, marinas, farms, golf courses, woodlots, and storage of hazardous materials, and includes a useful directory.

A Citizen's Guide to River Monitoring in the Connecticut River Valley, Geoff Dates, River Watch Network, 1995. This user-friendly guide is intended to help people establish long-term, community-based, and scientifically credible river monitoring programs in the valley.

The Challenge of Erosion in the Connecticut River Watershed, 1996. A series of informational fact sheets on riverbanks and buffers summarize the findings of a year-long multi-agency investigation into riverbank erosion. Written for the riverfront landowner or interested citizen, they cover river dynamics and the many causes of erosion, riparian buffers, streambank stabilization techniques, field assessment of problem sites, and a guide to permitting requirements on each side of the river.

Cultural Landscape of the Connecticut River in New Hampshire and Vermont, Richard Ewald, draft report 1995, final report in publ. An illustrated report to the National Park Service from the CRJC, covering pre-history and early settlement, transportation, agriculture, industry, conservation, culture and government, architecture and settlement patterns, and tourism and recreation. Includes maps identifying selected sites of interest in each subject.

Connecticut River Valley: Opening New Markets for Agriculture, Conference Proceedings and Recommendations, 1994. This report reviews a valley-wide conference sponsored by the CRJC, and presents dozens of recommendations dealing with financing, market regulations, government support, processing and distribution, agri-tourism, cooperatives and contract marketing, and community supported agriculture. Farmland trends taken from supporting research papers are also summarized.

Connecticut Valley Inventory, Vols. I and II, NH Connecticut River Valley Resource Commission (of the CRJC), 1989. Written in non-technical language, these two volumes are a source of basic information about the river and the NH side. Volume I covers corridor character, protected parcels, surface water quality, public access, boating suitability, fisheries, and endangered species. Volume II covers flood hazard areas and impoundments, aquifers, historic and archeological resources, and wildlife.

Findings to Support Classification of Segments of the Connecticut River, Connecticut River Valley Resource Commission, 1991. These findings, prepared with the help of citizens along the length of the river, nominated 34 specific segments of the river in several categories for classification and instream protection through the New Hampshire Rivers Management and Protection Program.



Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, NH Dept. of Environmental Services, 1994. This useful reference explains nonpoint source pollution and concisely covers the best management practices, current laws and regulations, and reasons for concern for the top ten land use activities which can cause pollution. Individual actions are highlighted, as well as current watershed protection and planning.

Connecticut River Erosion Inventory, Grafton County Conservation District in cooperation with the Soil Conservation Service, 1992. This study inventoried and classified erosion sites on the 89 miles of the river in Grafton County, NH. The three volumes include photographs and location and adjacent land use assessments.

A Guide to the Connecticut River Primitive Campsites, Upper Valley Land Trust, 1996. Map and description of a system of 17 campsites along the river.

Living with the River: a Landowner's Guide to Erosion Control on the Connecticut River, a public information pamphlet based on the results of the Grafton County erosion survey, available from the county Conservation District.

Native Vegetation for Lakeshores, Streambanks, and Wetland Buffers, VT Dept. of Environmental Conservation, 1994. This guide describes buffer strips and contains general considerations, native plant descriptions and maps of hardiness zones in VT for buffer strip enhancement.

Natural Resources: An Inventory Guide for New Hampshire Communities, Upper Valley Land Trust and UNH Cooperative Extension Service, 1992. This manual is intended to help volunteer groups prepare, evaluate, and use the results of a local natural resource inventory. The text covers mapping options, and discusses a number of features a community might want to include in its inventory.

New Hampshire Natural Heritage Inventory, NH Dept. of Resources and Economic Development, 1995. Listing of plant and animal species and plant communities of special concern in each NH town along the Connecticut River, their rarity rank on a global and state level, listing under the federal Endangered Species Act, date last observed, and USGS quadrangle map.

New Hampshire Resource Protection Project, New England Interstate Pollution Control Commission and Environmental Protection Agency, 1995. This project is a cooperative endeavor among federal, state and local government agencies along with private conservation and business interests. Its goal is to identify high priority natural resource areas in NH and assist in those regions' protection planning efforts. Using GIS technology, the study analyzed data on wildlife habitat, drinking water supplies, forestry, agriculture, recreation, and pollution threats.

Silvio Conte National Fish and Wildlife Refuge Final Action Plan and Environmental Impact Statement, U.S. Fish and Wildlife Service, 1995. This extensive report details the findings of the Service in addressing Congress's direction to establish a wildlife refuge in the Connecticut River Valley, and describes the environmental and economic consequences of five alternative plans of action. In addition to description of the plant, fish, and wildlife resources of the watershed, the report identifies sources of funding assistance, technical support, public concerns and comments, and various management options for land, water, and public education. The report also describes "special focus areas" identified by the Service.

Watershed Protection Techniques, Vol. I No. 3, Fall 1994. pp 100-111

## MAPS

(NOTE: GIS = Geographic Information Systems, indicates computerized database as source of map)

Series of GIS maps produced for the CRJC and the local river subcommittees by MicroDATA, with the support of VT Agency of Natural Resources, 1994. These same maps are presented in Along the Northern Connecticut River: An Inventory of Significant Instream Features at a scale of 1:63,360.

Upper Valley Region - Recreation. Displays surface waters, roads, railroad routes, public boat launch sites, campgrounds, waterfalls and cascades, and whitewater segments in Piermont/Bradford - Lebanon/Hartford. Scale 1:31,680

Upper Valley Region- Water Quality. Displays NH Rivers Program segment designations, VT wastewater management zones, water quality sampling stations, gauge stations, point discharges, water withdrawals, hydro electric water use, municipal water supplies, surface waters, roads, and railroad routes for Piermont/Bradford through Lebanon/Hartford. Scale 1:31,680

Upper Valley Region- River Flow and Shorelines. Displays dam sites, impoundment zones, and shoreline erosion distinguished as severe or moderate/unclassified, surface waters, roads, and railroad routes for the towns of Piermont/Bradford through Lebanon/Hartford. Scale 1:31,680

GIS maps produced for the CRJC and local river subcommittees in 1994 by the U.S. Fish and Wildlife Service Connecticut River Coordinator's Office:

Communities Map showing the general location of unidentified biological communities of concern and their rarity within the watershed, in all watershed towns in the Upper Valley region. Accompanied by descriptive listing of these communities and their rarity rank on a state, watershed, and global scale, location unidentified. Scale 1:100,000

Plants Map showing the general location of unidentified plant species of concern and their rarity within the watershed, in all the watershed towns in the Upper Valley region. Accompanied by descriptive listing of these species and their rarity rank on a state, watershed, and global scale, location unidentified. Scale 1:100,000

Wildlife Map showing the general location of unidentified wildlife species of concern and their rarity within the watershed, in all the watershed towns in the Upper Valley region. Accompanied by descriptive listing of these species and their rarity rank on a state, watershed, and global scale, location unidentified. Scale 1:100,000

Bald Eagles in the Connecticut River Watershed Map shows bald eagle use areas in the four-state watershed.

Waterfowl in the Connecticut River Watershed Map shows waterfowl use areas in the four-state watershed.

Atlantic Salmon in the Connecticut River Watershed Map shows the anticipated future fishery, current and future stocking and resting areas, and current and future migratory pathways for salmon in the four-state watershed.

◆  
Northern Connecticut River, Canada to Massachusetts - 150 Foot Buffer Zone, MicroDATA, 1994. GIS map produced for the CRJC showing all NH and VT riverfront towns. Displays restricted boat speed zone within 150 feet of shore, and areas greater than 150' from shoreline, surface waters, roads, and railroad routes. Scale 1:100,000

◆  
Highlights of the New Hampshire Natural Resource Protection Project, New England Interstate Water Pollution Control Commission and the Environmental Protection Agency, 1996. GIS maps prepared for each of the five CRJC local river subcommittees show agricultural lands, unfragmented natural lands and shorelines, high value freshwater wetlands, drinking water supplies and pollution threats, bald eagle wintering sites, conservation and public lands, and some natural heritage inventory sites. Scale varies.

◆  
Connecticut River Rapids Macrosite, The Nature Conservancy, 1994. Draft GIS map prepared for the U.S. Fish and Wildlife Service and Connecticut River Rapids Macrosite Committee, showing state and federally listed and candidate species, some protected lands, and potential pollution sources in the watershed region from the mouth of the Ompompanoosuc River to Weathersfield Bow. Scale 1:100,000.

◆  
Connecticut River Basin Sampling Stations, NH Dept. of Environmental Services, 1994. Series of three GIS maps covering the entire watershed in NH and VT shows surface waters, sub-watershed boundaries, NPDES outfalls, and water quality sampling stations for the Connecticut River Watch Program, and NH Dept. of Environmental Services, and the VT Dept. of Environmental Conservation. Scale 1:150,000.



# A PPENDIX J

## UPPER VALLEY LOCAL RIVER SUBCOMMITTEE MEMBERS

### *past and present*

- Suellen Balestra, Lebanon, NH
- ◆ Lynn Bohi, Hartford, VT
- Joan Brewer, Lebanon, NH
- David Cole, Lyme, NH
- Michael Collins, Bradford, VT
- Tim Cook, Lyme, NH
- Hal Covert, Piermont, NH
- Jean Dyke, Orford, NH
- Bill Flynn, Norwich, VT
- Morgan Goodrich, Norwich, VT
- Karen Henry, Lyme, NH
- Earl Hodgdon, Hartford, VT
- David Jescavage, Lebanon, NH
- Ken Kinder, Hartford, VT
- ◆ Bob MacNeil, Lebanon, NH
- ◆ Melissa Malloy, Thetford, VT
- Chuck Manns, Lebanon, NH
- Miranda Martin, Thetford, VT
- ◆ Jean McIntyre, Lyme, NH
- Phil Odenice, Hanover, NH
- Arlene Palmer, Thetford, VT
- Nancy Prosser, Hanover, NH
- Ellen Putnam, Piermont, NH
- Freemont Ritchie, Piermont, NH
- Carl Schmidt, Orford, NH
- Sue Sliwinski, Hanover, NH
- Donald Stocking, Fairlee, VT
- Steve Stocking, Fairlee, VT
- ◆ Freda Swan, Lyme, NH
- Pat Tullar, Orford, NH
- Walker Weed, Hanover, NH
- Albert Young, Piermont, NH
- ◆ *elected officer of the Upper Valley River Subcommittee*