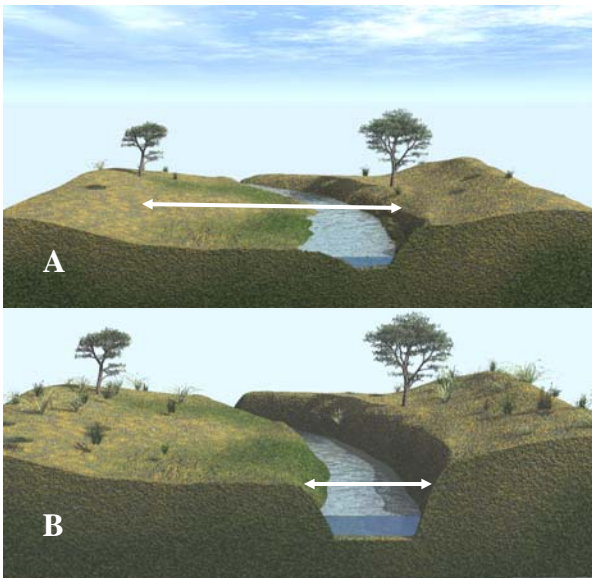


# Conservation of River Corridor Lands

## A Proposal to Establish Landowner and Municipal Incentives and Resources

### *River down-cutting is among the most difficult natural resource issues facing Vermont today*

Vermont has found itself in an unsustainable relationship with its rivers and streams. With five years of river assessment completed, results are telling the recurring story that traditional land use patterns, river management, and flood recovery efforts have led to the straight jacketing, steepening, and a down-cutting of rivers. Since European settlement, repeated channel dredging, snagging, berming and armoring has led to a widespread loss of flood plain function (Figure 1). The increased power of larger floods has become prohibitively expensive for landowners and taxpayers. An average of \$18-20 million are being spent annually in Vermont to keep rivers straightened and static in the landscape, an unsustainable condition that leads to ever-increasing erosion hazards and flood losses. River management has become a vicious cycle where flood recovery and structural constraints have led to increased encroachments and land use investment where rivers formerly meandered and accessed their floodplains. Inevitably, and often decades later, a large flood occurs and the cycle repeats itself.



**Figure 1.** Loss of critical flood prone width when a river undergoes channel down-cutting (A to B).

If this cycle is not broken, land-based enterprises will suffer economically because, in addition to erosion hazards, channelization leads to a loss of sediment storage and a net export of life-giving soil and nutrient from a watershed. Despite the barriers placed in their way, it is the physical imperative of rivers that have

down cut and lost access to their floodplains, to erode their banks until new floodplains are formed. During the early stages of this channel evolution process, floods remain within deepened channels, and have much more power to erode and carry away anything that enters them. Without floodplains and meanders, it is often the lakes and reservoirs that are the first quiet waters in which rivers deposit the eroded soil and nutrient. This process helps to explain the enrichment and algae along the shores and bays of Lake Champlain.

Under natural conditions, periodic flood-related disturbances create and maintain the tremendous habitat diversity within aquatic and riparian ecosystems. Disruption of flood cycles and the widespread physical manipulation of rivers is a major factor in the decline of aquatic ecosystems worldwide. Despite the success in treating wastewater discharges, the challenge remains to develop alternatives to maintaining channelized streams for flood and erosion control, and protect existing functional riparian corridors from degradation and loss. Human channel works, and the energized, sediment transport-dominated conditions they create, degrade habitat by continually removing the structure and complexity in river ecosystems. The physical watershed processes that create and maintain stream, floodplain, and riparian habitat have been altered over a vast majority of the landscape. Very little historic reference to the biological potential of Vermont rivers and streams remains.

The physical manipulation of rivers and their watersheds is often difficult for people to comprehend because it is so extensive, began over 200 years ago, and is only now being documented scientifically. Introducing and affecting cultural change around issues of such temporal and spatial magnitude will require many voices. State leadership and the alignment of all public and private conservation programs will be essential.

### *Government programs and non-profit organizations are recognizing the issue*

During the 1990s Vermont experienced four devastating floods. Over \$60 million was spent to cover the loss of homes, farm property, and transportation infrastructure. In response to these losses the legislature passed Act 137, which required the Agency of Natural Resources to explain why extensive community participation in the National Flood Insurance Program was not working to limit flood losses in Vermont.

The report, prepared by the VT DEC River Management Program, documents the predominance of erosion-related losses in Vermont and provides an accounting of traditional river management and land use practices that have led to an increase in flood and fluvial erosion hazards.

The State is giving attention to the issue through its Clean and Clear Action Plan. It would be easy and perhaps even popular to focus Clean and Clear capital funds on traditional dredge, berm, and armor practices in the name of water quality. Over the years, limited conservation dollars have been unwisely spent chasing erosion and buying band-aid solutions. Instead, policy makers have grasped the connection between the over use of these practices, increasing erosion hazards, and water quality degradation. The State is beginning to develop programs focused on avoiding conflicts between human investments and river dynamics through incentives-based river corridor protection programs.

The Agency of Natural Resources River Management Program has developed a Stream Geomorphic Assessment Protocol and has worked with its partners and consultants to assess the physical condition and sensitivity of Vermont's rivers. The development of a scientific approach for defining river corridors and specific plans for managing rivers toward their geomorphic equilibrium conditions<sup>1</sup> has engendered the interest and support of public agencies, municipalities, private non-profits, and watershed organizations.

No single agency or organization has, in place, all the programs and authority necessary to establish a truly comprehensive river restoration and protection program. A partnership is forming to combine resources and practices in Vermont, but many challenges exist. Because riparian ecosystems can take decades (or even generations) to fully recover, there is danger that essential financial commitments may be difficult to sustain during times of limited resources or a weak economy.

### ***Formulating a plan to improve the protection and restoration of river corridors in Vermont***

It starts with education. People should be encouraged to think and act as though they are part of a watershed community. Conservationists need to promote the idea that natural systems like rivers provide a host of ecological services, as vital to public health and welfare as safe roads, adequate housing, or viable agriculture.

<sup>1</sup> *Fluvial Geomorphic Equilibrium*: The condition in which a persistent stream and floodplain morphology is created by the dynamic fluvial processes associated with the inputs of water, sediment, and woody debris from the watershed; derived within a consistent climate; and influenced by topographic and geologic boundary conditions. When achieved at a watershed scale, equilibrium conditions are associated with minimal erosion, watershed storage of organic material and nutrients, and aquatic and riparian habitat diversity.

An accounting must be made of just how depleted those ecosystem services have become; and restoration and protection of these services should be central to any watershed plan.

The Agency of Natural Resources is working to develop such a program with its local, state, and federal partners. River assessments have shown significant losses in the flood and sediment attenuation and organic and nutrient retention where rivers no longer meander or have access to their floodplains. The profound degradation of these ecological services has resulted in an increase in fluvial erosion hazards (i.e., flood damage), an upward trend in sediment, soil, and nutrient export from Vermont watersheds, and a downward spiral of the social, economic, and ecological sustainability of riparian ecosystems.

To begin restoring these services, channelizing rivers and the maintenance of channelized conditions must be avoided wherever possible. To reduce the dependence on structural controls there must be a change in land use expectations within river corridors and floodplains. Alternatives for resolving the conflicts between human investments and the dynamics of rivers must be developed. The State is attempting to do this by 1) scientifically defining the river corridors necessary to accommodate fluvial geomorphic equilibrium; 2) establishing incentive-based programs to support sustainable land use expectations within those corridors; and 3) working with regional and community planners, watershed organizations, land trusts, and agricultural agencies to align, strengthen, and promote river corridor lands conservation incentives.

### ***What are the risks if the next steps are not taken?***

Vermont has experienced times when sectors of its land-based economy became unsustainable and eventually collapsed (e.g., forest clearing and sheep grazing). Hard times during the early part of the 20<sup>th</sup> century marked a period of unparalleled natural resource degradation, the legacy of which many rivers are still recovering from today. From a river conservation standpoint, the coincidence of unsustainable economic, social, and environmental conditions has been a hard-learned lesson.

Over the past several decades, another cycle or trend of unsustainable land use has begun in sectors of Vermont's economy. Vermont has a very limited land

base from which to conduct sustainable agricultural enterprise or promote housing or economic development in support of community goals. Without strengthened and effective land use planning and a new set of landowner and municipal incentives toward sustainability, the limited land base may rapidly be locked up by short-term economic development interests

There are social, economic, and environmental risks if broad based, sustained efforts are not made to protect river corridors. First is the likelihood that economic forces and government deficits at the national and international levels may further endanger the land-based economies in Vermont. At current land prices, compared with other northeastern states, development pressures will increase in the valley bottoms, which are among the easiest places to build. The second growing concern is related to climate change and the documented increase in severe storms and flooding in the Northeast. The need for flood plains to serve as flood plains instead of building sites will only be greater if this trend continues.

Should both these trends continue together, there will be a growing premium on the few lands remaining open (and undeveloped) to perform the ecosystem services associated with river equilibrium conditions. Vermont may be forced to continue the vicious cycle described above to recover from the damages that will be incurred particularly in the agricultural sector. There is often significant farm damage when flood-swollen rivers change course as a result of the cumulative impacts of encroachment, channelization and the loss of flood plain upstream.

If the next steps toward river corridor protection are not made, Vermont will find itself in a situation similar to other states, where rivers are essentially managed as urban systems using complex and expensive structural controls that are in constant need of maintenance and which severely reduce the ecosystem services rivers can provide to fish, wildlife, and human communities.

### ***The State's proper role in promoting, facilitating and supporting the conservation of river corridors***

First and foremost, any efforts to restore and protect stream equilibrium conditions, must recognize the public and private land use investments that exist within river corridors and the livelihoods which may depend on those uses. State and federal initiatives should either mitigate, find replacement value, or compensate for the short-term costs associated with the long-term societal benefits of river corridor lands conservation.

Changing land use expectations may take generations to accomplish. Policies and programs established to accomplish river corridor conservation must be sustained in the long term and find meaningful ways to measure progress.

The following actions and program initiatives are proposed as a Vermont state government enterprise to conserve river corridor lands:

#### *1) River Corridor Conservation:*

State government in Vermont should develop, promote and above all practice a "Riparian Ethic." State agencies should revise and strengthen their policies and programs, and partner with regional and federal agencies to promote a sustainable relationship with river ecosystems. The State should reach out to organizations and municipalities doing important and significant work on farms, forests, roads, and other community assets. The promotion of a riparian ethic should reach the public and landowners primarily through education, example, incentive, and local land use planning.

State-sponsored stream geomorphic assessments should describe a stream's reference and departure from equilibrium conditions and identify key "attenuation assets" within a watershed. Attenuation assets consist of river accessible, vegetated floodplains and wetlands that store flood flows, capture sediments, and store rather than mobilize and transport organic material and nutrients from the watershed. Key attenuation assets are particularly important in reducing flood and fluvial erosion hazards as well as providing for water quality and habitat improvement.

State and federal programs in Vermont should be structured to support conservation of key attenuation assets. Perpetual easements, which include the purchase of channel and riparian vegetation management rights within river corridors, may be an important conservation tool. Collaboration between agencies and non-profits to acquire and manage these rights at key locations in a watershed, and actively or passively manage rivers toward more sustainable equilibrium conditions, would provide important demonstrations of how society can work with and support landowners while deriving ecological services from river corridors. Vermont's Clean and Clear Action programs for river management, wetland restoration, and agricultural conservation (i.e., CREP) programs should continue to make funding available in support of river corridor conservation projects.

## 2) Watershed and River Corridor Planning:

The State should support and participate in watershed and river corridor planning to expedite federal, state, and local conservation practices consistent with state conservation goals. State-sponsored planning should be structured to 1) achieve clearly defined water resource goals and objectives; 2) assess river departure from equilibrium conditions and the status of ecological services within river corridors; and 3) define priority river management and land use practices that would be supportive of and consistent with plan implementation.

State watershed and river corridor plans need to make the correlation between diffuse pollution sources and fluvial erosion hazards, and specify the actions necessary to achieve water quality and stream equilibrium goals. The plans should advise federal programs, direct and prioritize State agency actions, and define those planning activities and resource conservation practices at the local level that would be eligible for state and federal incentives. Specifically, the State and its partners should cost-share conservation practices consistent with sustainable river and floodplain management within corridors, and create disincentives for new river and floodplain encroachments.

## 3) Municipal Incentives and Resources:

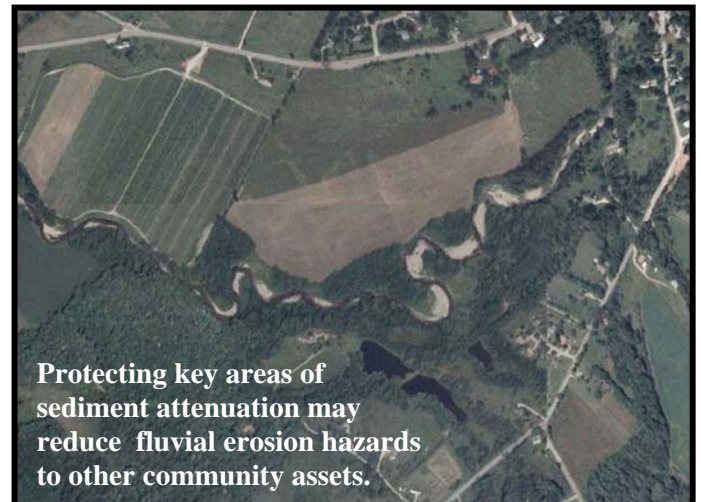
The State should implement, on a statewide basis, a system of incentives and enhanced resource base to establish a comprehensive partnership between the state and local governments, thereby enabling the achievement of shared goals of water quality protection and restoration, flood and fluvial erosion hazard mitigation, and socio-economic health and sustainability.

In Vermont, municipal government has historically functioned as the primary arbiter of local land use decisions. As local land use and economic development is increasingly associated with statewide water quality, natural resource conservation, and public safety objectives, local governments are, in many cases, overwhelmed by the myriad responsibilities and obligations placed on them for the purpose of achieving these objectives. Vermont's municipalities should continue to be the primary governmental level at which local land use decisions are rendered. But without a system of meaningful incentives and enhanced resources, towns, villages, and cities can never be truly effective partners, nor functionally share with the state the pursuit and achievement of mutual objectives.

Exposure to devastating flood events is increasing due to intensifying land development in susceptible areas and potentially by global climate change. Current state and federal policies and programs, such as FEMA Public Assistance and Individual Assistance Programs, and the USDA Emergency Watershed Protection Program, provide a disaster response safety net that rewards all eligible individuals and governmental entities regardless of how recklessly public and private investment, and growth management decisions have been made at the local level. The State should work with its federal partners to establish meaningful policies, programs, or incentives to support, encourage, or reward municipalities that are proactive in mitigating existing and avoiding increasing flood or fluvial erosion exposure, and to establish sustainable community relationships with river systems.

The State of Vermont should establish and promote a Municipal Incentives and Resources Program to:

- *Establish comprehensive and coordinated state and federal programs to support local water quality, economic development, and hazard mitigation planning;*
- *Strengthen state technical and administrative support for community land use planning and development review, and hazard plan implementation; and*
- *Create economic incentives for watershed and river corridor protection initiatives by local government.*



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