

River Corridor Protection as a Restoration Tool

A Note to Restoration Ecologists, Planners and Engineers

Problem

A restoration policy focused solely on the re-creation of natural forms within isolated reaches of a river, like its predecessor regimens of river management, may be doomed to failure.

We have created a great deal of interest in river restoration in recent decades because:

- the nations rivers, finally unclogged from pollution, are found to be in poor physical shape;
- habitat restoration for threatened and endangered species has become a high priority;
- the conflicts between river dynamics and human investments are resulting in large “emergency” flood recovery expenditures; and
- a greater understanding of fluvial systems, has allowed people to resolve conflicts with practices designed to meet environmental objectives.

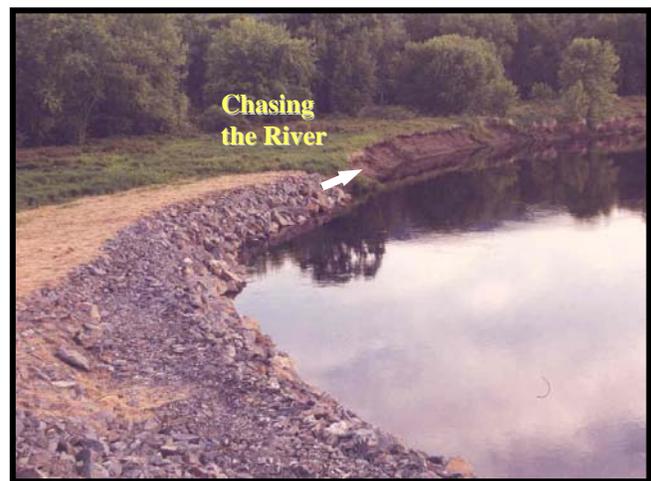
But, this current era of river management may end when people increasingly see their isolated restoration projects fail during flood events for which they were designed to withstand.

As we examine the data from watershed scale geomorphic assessments, we see that the degraded sites where people want or need to resolve conflicts rarely result from stressors borne solely within the reach. The erosion, the physical habitat degradation, and the threat to public and private investments are more likely the result of multiple stressors related to changes in flow, sediment supply, or channel and floodplain modifications outside the affected reach.

The network or systemic nature of channel adjustments creates a seemingly insurmountable challenge to the restoration ecologist. How to help stream engineers resolve immediate conflicts with fluvial systems in a environmentally sound manner, when watershed processes are either totally-out-of-balance or in such major transition that there is little hope of predicting a static channel form that will be compatible with the outcome of such large scale adjustments?

Unfortunately, many stream restoration practitioners have resorted to the “just build the dikes higher” approach to designing their projects. Basic plan—put a whole lot of fish friendly rocks into the channel for structure and then configure them in a way to ensure that what ever sediment comes into the reach—leaves the reach. Increase both the energy grade and bound-

ary resistance at dimensions that can transport the calculated sediment load and discharge, anchor in some root wads, and there you have it, a bomb proof project that fish will love. But, the problem is that instead of chasing the erosion with rip-rap, you end up chasing the erosion with cross vanes and root-wads. Bottom line—in alluvial systems, every response or sediment storage reach within a watershed can not be turned into a sediment transport reach. Eventually (temporally and spatially) the sediment load will be exceeded, and the erosion, conflicts, and degradation that follow may undo and exceed the gains that were made through upstream restoration.



This is not an argument against all restoration projects or efforts to resolve conflicts with environmentally sound practices. It is to engage in a discussion among restoration ecologists and their planning and engineering counterparts, that projects should consider fluvial processes that extend far upstream and downstream of the reach in which they may be working. It is a plea that we begin explaining to the public that channel works will either:

- be unfeasible, at present, due to major watershed adjustments currently underway (e.g. alteration of hydrology due to urbanization);
- represent a manipulation of the sediment regime of the river that will need to be mitigated by off-site (typically downstream) practices that allow for and attenuate the sediment load that will be transferred—thereby reducing the conflicts with other landowners; or
- be designed in a manner where the channel is not expected to be static and where fluvial processes may continue to evolve within the reach while larger scale adjustments either play out or become resolved.

In every approach listed, there may be a need to reduce or remove constraints to the lateral adjustment of the stream channel. This is especially true in Vermont where streams are not only under adjustment from current and large-scale historic land use/land cover changes but have been channelized over extended portions of the watershed response (or deposition) zones. Restoration projects that attempt to resolve conflicts by “fixing” the location of the channel under such watershed adjustment conditions may end up being less than satisfactory to landowners that felt assured their near stream investments would be safe. This can lead to a second round of more traditional channel works that perpetuate the conflicts.

Anyone who has spent time attempting geomorphic-based restoration, who has come to understand the concepts of dynamic equilibrium in streams, begins to see and experience that for every mile restored, there may be three miles of unstable stream channel that will be managed forever as streams in disequilibrium, due to new river corridor encroachments that will require protection through channelization. More often than not, the channelized reach tempts or invites more investments and encroachments which ultimately require the maintenance and extension of structural measures to protect them. Channel works, while they work, eliminate or drastically reduce sediment storage, resulting in greater sediment loads and transport, and adding stress to unstable reaches downstream.



In the face of such a daunting large-scale problem, it is very tempting to say to-hell-with-it! Our society, our bureaucracy rewards the restoration ecologist not as to whether projects are successful in the long term, but rather, how many projects are completed in the short term, e.g., if we’re fighting and gaining dominion over erosion then we’re the heroes, especially so if we’re restoring fish and wildlife habitat.

Solution

If the problem defined above rings true, then restoration ecologists and engineers may need to forego some accolades today; develop larger scale, river process-based strategies; and create new incentives for both landowners and themselves. The latter will require the abilities of those who can articulate both the short and long term socio-economic and environmental benefits of restoration that includes conflict avoidance with fluvial systems.

Before elaborating on these points, there is a concern that must be laid out and made plain. While pursuing larger scale, conflict avoidance strategies, we must **not** drop the ball on:

- restoring river reaches that are unstable due to localized stressors;
- implementing restoration practices which may pose little risk of being incompatible with equilibrium conditions at any scale and provide some immediate relief to a landowner; and
- resolving enduring or intractable conflicts using natural channel design techniques which may create a static channel but in a form that provides water quality and habitat benefits. The trick is in defining the words “enduring” and “intractable” and a test is whether a project will result in an unacceptable level of risk to others.

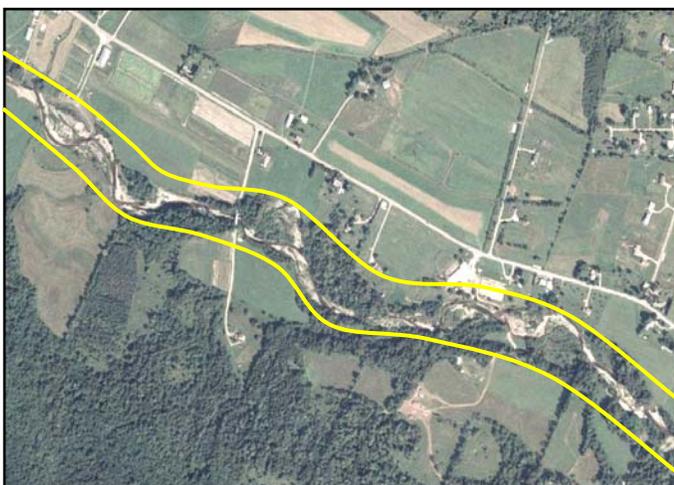
To understand whether projects meet these criteria and help its partners understand whether resolving a conflict or restoring a reach will move a river toward or away from equilibrium conditions, the Vermont River Management Program is preparing a “*River Corridor Protection and Restoration Planning Guide*.” In pursuing larger scale, river process-based strategies, Vermont must continue to allocate resources in support of watershed and reach-scale fluvial geomorphic assessments. Data must be analyzed so that River Corridor Plans explain the:

- equilibrium conditions, channel adjustments, and sensitivity throughout the stream network;
- stressors which are causing sediment storage and transport process-related changes;
- strategic actions or combinations of actions that would be compatible with restoring equilibrium conditions at the reach and watershed scales; and
- programs and incentives necessary to engage and work with affected landowners and communities.

The success of this program—to assess, plan, implement, and monitor—will rest on the resolve of all resource agencies to work in a coordinated fashion and provide a consistent message to the public.

If we are to move beyond the “one step forward, two steps backward” approach to river management then we must start considering the concept of “restoration potential” and take advantage of relatively inexpensive opportunities to protect unconfined river corridors when they arise and while they still exist. If we focus all of our energy on traditional restoration and don’t at the same time **just protect** river corridors, avoid further degradation that comes from encroachment, and create opportunities for future restoration; the current and impending high rate of land use conversion in Vermont, will quickly bring us to a place and time where we’ve lost the chance for true restoration forever! In this scenario, we’ll create an unending and escalating cycle of flood disaster and recovery that will create more and more hazards, degrade water quality, and result in an expensive program to resolve conflicts using fish rocks and lunker boxes at the foot of rip-rap armored embankments.

Hydrologic changes and channelization, designed to increase water and sediment transport, have so pervasively altered fluvial processes, that river corridor plans should identify counterbalancing measures. The protection of “key attenuation assets” would be one such measure. Attenuation areas are riparian floodplains, wetlands, and vegetation, connected to geomorphically sensitive streams, that store flood flows and sediments and reduce the transport of organic material and nutrients from the watershed. Key attenuation assets are particularly important in reducing flood and fluvial erosion hazards and provide for water quality and habitat improvement.



Defining and protecting the meander belt width corridor that will accommodate equilibrium conditions may be the most important objective in any river restoration project.

State and federal programs in Vermont are being structured to support river corridor conservation. Perpetual easements, which include the purchase of channel and riparian vegetation management rights within river corridors, are being developed as a conservation tool. Collaboration between agencies and non-profits to acquire 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.

Many lands conservation programs, funding authorities and land trusts have not traditionally focused nor pursued river corridor lands conservation projects. Considerable effort is required to demonstrate that river corridor protection aligns with and supports protection of agricultural soils, forest resources, recreational opportunities, and rare, threatened and significant fish and wildlife habitat.

Another challenge, and one that must be overcome immediately, is the perception that only restoration work that involves yellow machines is going to get the job done, or that river corridor protection work is not consistent with a proactive restoration program. As our society becomes ever concerned with immediate results, we must double the effort to explain and develop public support for both active and passive river and watershed restoration techniques.

The key to all of this is the way our programs measure progress. At present our annual reports only include such indicators as “miles restored.” If at the same time, agency programs tracked “restoration opportunities lost” we would start to see how inconsequential restoration alone will be. Perhaps in addition we should be looking at “miles of restoration potential gained,” and we should articulate from the very heights of our public podiums just how long it will take to disentangle ourselves from investments that unnecessarily constrain and degrade our rivers.

As restoration ecologists, planners, and engineers, we must start thinking about the importance of river corridor protection as a tool in our restoration tool bag. To do otherwise, will most certainly diminish our chances of ever achieving true restoration of fluvial processes and achieving an economically and ecologically sustainable relationship with our rivers.