RIVER BANKS & BUFFERS

No. 1

Introduction to Riparian Buffers

for the Connecticut River Watershed

Riparian buffers are the single most effective protection for our water resources in Vermont and New Hampshire. These strips of grass, shrubs, and/or trees along the banks of rivers and streams filter polluted runoff and provide a transition zone between water and human land use. Buffers are also complex ecosystems that provide habitat and improve the stream communities they shelter.

Natural riparian buffers have been lost in many places over the years. Restoring them will be an important step forward for water quality, riverbank stability, wildlife, and aesthetics in the Connecticut River Valley. Landowners, town road agents, local governments, farmers, and conservation organizations can all help restore and protect the riparian buffers which in turn restore and protect the quality of our streams.

HOW BUFFERS GO TO WORK

Sediment Filter

For water quality

Riparian buffers help catch and filter out sediment and debris from surface runoff. Depending upon the width and complexity of the buffer, 50–100% of the sediments and the nutrients attached to them can settle out and be absorbed as buffer plants slow sediment-laden runoff waters. Wider, forested buffers are even more effective than narrow, grassy buffers.

Pollution Filter, Transformer, and Sink

The riparian buffer traps pollutants that could otherwise wash into surface and groundwater. Phosphorus and nitrogen from fertilizer and animal waste can become pollutants if more is applied to the land than plants can use. Because excess phosphorus bonds to soil particles, 80–85% can be captured when sediment is filtered out of surface water runoff by passing through the buffer. Chemical and biological activity in the soil, particularly of streamside forests, can capture and transform nitrogen and other pollutants into less harmful forms. These buffers also act as a sink when nutrients and excess water are taken up by root systems and stored in the biomass of trees.

Stream Flow Regulator

By slowing the velocity of runoff, the riparian buffer allows water to infiltrate the soil and recharge the groundwater supply. Groundwater will reach a stream or river at a much slower rate, and over a longer period of time, than if it had entered the river as surface runoff. This helps control flooding and maintain stream flow during the driest time of the year.

Bank Stabilizer

For bank stability

Riparian buffer vegetation helps to stabilize streambanks and reduce erosion. Roots hold bank soil together, and stems protect banks by deflecting the cutting action of waves, ice, boat wakes, and storm runoff.

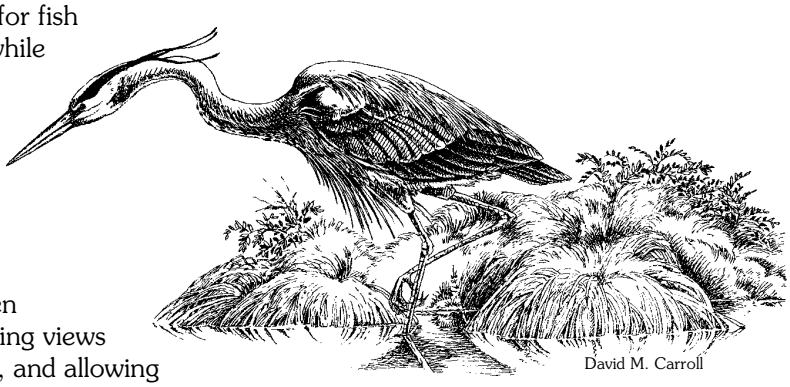
Bed Stabilizer

Riparian buffers can also reduce the amount of streambed scour by absorbing surface water runoff and slowing water velocity. When plant cover is removed, more surface water reaches the stream, causing the water to crest higher during storms or snowmelt. Stronger flow can scour streambeds, and can disturb aquatic life.

Wildlife Habitat
The distinctive habitat offered by riparian buffers is home to a multitude of plant and animal species, including those rarely found outside this narrow band of land influenced by the river. Continuous stretches of riparian buffer also serve as wildlife travel corridors.

For fish and wildlife

Aquatic Habitat
Forested riparian buffers benefit aquatic habitat by improving the quality of nearby waters through shading, filtering, and moderating stream flow. Shade in summer maintains cooler, more even temperatures, especially on small streams. Cooler water holds more oxygen and reduces stress on fish and other aquatic creatures. A few degrees difference in temperature can have a major effect on their survival. Woody debris feeds the aquatic food web. It also can create stepped pools, providing cover for fish and their food supply while reducing erosion by slowing flow.


David M. Carroll

Recreation and Aesthetics
Forested buffers are especially valuable in providing a green screen along waterways, blocking views of nearby development, and allowing privacy for riverfront landowners. Buffers can also provide such recreational opportunities as hiking trails and camping.

THE BETTER BUFFER

For every buffer there is a reason. Whether it is pollution filtration, erosion control, wildlife habitat, or visual screening, the size and vegetation of the buffer should match the land use and topography of the site.

Topography
A buffer is more important for water quality in areas that collect runoff and deliver it to streams, and less critical on land that tips away from the water. Steeper slopes call for a wider riparian buffer below them to allow more opportunity for the buffer to capture pollutants from faster moving runoff. This is also true at both ends of a flood chute, or the path a river takes across a meander at high water.

Hydrology and Soil
The ability of the soil to remove pollutants and nutrients from surface and ground water also depends upon the type of soil, its depth, and relation to the water table. On a wetter soil, a wider buffer is needed to get the same effect.

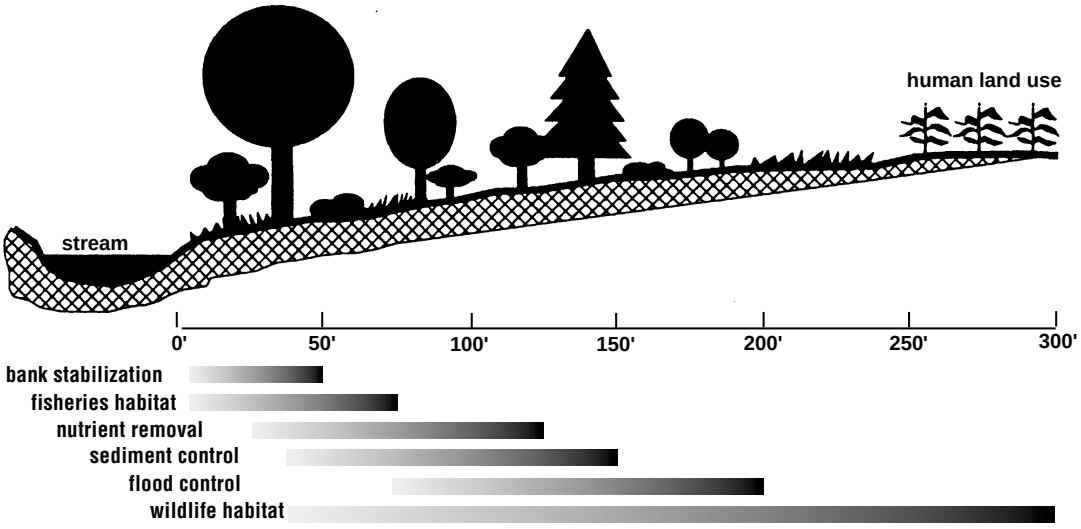
Vegetation
The purpose(s) of the buffer will influence the kind of vegetation to plant or encourage. In urban and residential areas, trees and shrubs do a better job at capturing pollutants from parking lots and lawn runoff and providing visual screening and wildlife habitat.

Between cropland and waterways, a buffer of shrubs and grasses can provide many of the benefits of a forested buffer without shading crops, and trees can be used on the north side of fields.

Trees have several advantages over other plants in improving water quality and offering habitat. Trees are not easily smothered by sediment and have greater root mass to resist erosion. Above ground, they provide better cover for birds and other wildlife using waterways as migratory routes. Trees can especially benefit aquatic habitat on smaller streams. Native vegetation is preferable to non-native plants.

BUFFER WIDTH

How big should a buffer be? One size doesn't fit all. It depends on what you want the buffer to do. There isn't one generic buffer which will keep the water clean, stabilize the bank, protect fish and wildlife, and satisfy human demands on the land. The minimum acceptable width is one that provides acceptable levels of all needed benefits at an acceptable cost. **The basic bare-bones buffer is 50' from the top of the bank. You get more with every foot.**



To Stabilize Eroding Banks

On smaller streams, good erosion control may require only covering the bank with shrubs and trees, and a 35' managed grass buffer. If there is active bank erosion, or on larger streams, going beyond the bank at least 50' is necessary. Severe bank erosion on larger streams requires engineering to stabilize and protect the bank - but this engineering can be done with plants. For better stabilization, put more of the buffer in shrubs and trees.

To Filter Sediment and Attached Contaminants from Runoff

For slopes gentler than 15%, most sediment settling occurs within a 35' wide buffer of grass. Greater width is needed on steeper slopes, for shrubs and trees, or where sediment loads are particularly high.

To Filter Dissolved Nutrients and Pesticides from Runoff

A width up to 100' or more may be necessary on steeper slopes and less permeable soils to allow runoff to soak in sufficiently, and for vegetation and microbes to work on nutrients and pesticides. Most pollutants are removed within 100', although in clay soils, this may not happen within 500'.

To Protect Fisheries

Buffer width depends on the fish community. For cold water fisheries, the stream channel should be shaded completely. Unless there are problems with algae blooms, warm water fisheries do not require as wide a buffer or as much shade, but they still benefit from water cleaned by a buffer's filtering action. Studies show that at least up to 100', the wider the buffer, the healthier the aquatic food web.

To Protect Wildlife Habitat

Buffer width depends upon desired species: 300' is a generally accepted minimum. Much larger streamside forest buffer widths are needed for wildlife habitat purposes than for water quality purposes. The larger the buffer zone, the more valuable it is. Larger animals and interior forest species generally require more room. Some use so much habitat that it

would be nearly impossible to protect the size buffers they require. A narrow width may be acceptable for a travel corridor to connect larger areas of habitat. Continuity is important — even small patches of trees are better than none at all when it comes to migrating birds.

To Protect Against Flood Damage

Smaller streams may require only a narrow width of trees or shrubs; a larger stream or river may require a buffer that covers a substantial portion of its flood plain. This is why it is not a good idea to build a permanent structure where a river can get at it.

To Grow Valuable Products

Buffer width depends upon the desired crop and its management. Don't forget to consider tax incentives and cost-share programs when looking at the economic return from a riparian buffer.

DECIDING ON THE RIGHT WIDTH FOR YOUR PROPERTY

From the top of the streambank, turn back and take 15 long paces. This should carry you 50' from the bank. This area should be covered with native vegetation. Another 15 paces brings you about 100' from the bank. The ability of a buffer to remove pollutants is uncertain if it is narrower than this. A 100' buffer will generally remove 60% or more of pollutants, depending on local conditions. It will also provide food, cover and breeding habitat for many kinds of wildlife but only fulfill a few needs for others, such as travel cover.

Remember, a bigger buffer is needed to do the job if:

- the riverside land is sloped and runoff is directed here
- the land above is sloped (the steeper the slope, the wider a buffer should be)
- land use is intensive (crops, construction, development)
- soils are erodible
- the land is floodplain
- the stream naturally meanders
- the land drains a large area (ratio of drainage area to buffer area is more than 60:1; based on the soil loss factor in the Connecticut River Valley)
- more privacy is desired

Fact sheets in the series *Riparian Buffers for the Connecticut River Watershed*

No. 1 Introduction to Riparian Buffers
No. 2 Backyard Buffers
No. 3 Forestland Buffers
No. 4 Buffers for Habitat
No. 5 Buffers for Agricultural Land
No. 6 Urban Buffers
No. 7 Guidance for Communities
No. 8 Planting Riparian Buffers (& plant list)
No. 9 Field Assessment
No. 10 Sources of Assistance

See also the companion series for land owners:
The Challenge of Erosion in the Connecticut River Valley, Connecticut River Joint Commissions, 1998.

Part of the ***Living with the River*** series. May be reprinted without permission.
Riparian Buffers for the Connecticut River Watershed was prepared by the Connecticut River Joint Commissions of NH & VT with support from the Silvio O. Conte National Fish & Wildlife Refuge Challenge Cost Share Program, PG&E National Energy Group, NH Dept. of Environmental Services, and EPA. Technical assistance was provided by UNH Cooperative Extension Service, USDA Natural Resources Conservation Service, VT Dept. of Environmental Conservation, Connecticut River Conservation District Coalition, Upper Valley Land Trust, Environmental Protection Agency, Appalachian Mountain Club, NH Dept. of Environmental Services, US Fish & Wildlife Service, PG&E National Energy Group, CRJC river commissioners and local river subcommittee members. September 2000

CONNECTICUT RIVER JOINT COMMISSIONS INC

PO Box 1182 • Charlestown NH 03603 • 603-826-4800 • WWW.CRJC.ORG