

# Buffers for Agriculture

for the Connecticut River Watershed

*Future-thinking farmers look for ways to leave the land in better shape each year. It makes economic sense to keep nutrients and soil where they belong: on the farm, not in the water. Riparian buffers, strips of native vegetation along rivers and streams, aren't new technology. They're a proven, time-tested way of working with the land, not against it.*

Runoff from an unbuffered field can degrade fisheries and threaten public health, recreation, and drinking water in nearby wells and streams. Rainwater can pick up animal wastes, fertilizers, and pesticides, and carry them from farms to streams, just as it takes toxic chemicals from parking lots and lawn fertilizers from back yards.

Manure and fertilizers are as good at growing algae blooms in streams as they are at growing corn. When that algae decays, it steals oxygen from fish. Bare, unshaded, sediment-filled channels are poor habitat for fish and their food. In places like setbacks on the Connecticut River, anything that needs oxygen and can't swim away may die. The temperature in a small stream flowing through open land can rise as much as 1.5 degrees F for each 100-foot exposure to the summer sun.

Erosion inventories along the Upper Connecticut River mainstem show that shorelines without buffers tend to have higher rates of erosion, particularly when grazing livestock are present. The land between the water's edge and the top of the bank must stand up to:

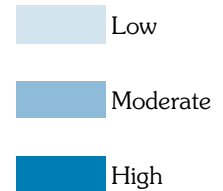
- ice movement
- wave action
- flooding
- boat wakes (on larger rivers)
- fluctuating water levels
- rapid surface runoff
- scouring currents
- from higher ground

The flood and erosion "insurance" provided by a riparian buffer is all the more important now that the weather is taking a turn. Whether global climate warming is natural or human-induced, New England is seeing a definite shift toward heavy storms that deliver several inches of rain in a single day. Sturdy plantings on your streambank are the best protection you can provide for your own property and your neighbors'. While a streamside buffer can't promise to stop erosion — nothing can — it is the river's original stabilizer and provides other benefits, too.

**Buffers are profitable, common sense conservation**

## Effectiveness of Different Vegetation Types for Specific Buffer Benefits

BENEFITS	grass	shrubs	trees
stabilize streambank	Low	Moderate	High
filter sediment and the nutrients, pesticides, & pathogens bound to it	High	Moderate	High
filter nutrients, pesticides, and microbes from surface water	Moderate	Low	Moderate
protect groundwater and drinking water supplies	Low	Moderate	High
improve aquatic habitat	Low	Moderate	High
improve wildlife habitat for field animals	High	Moderate	Low
improve wildlife habitat for forest animals	Low	Moderate	High
provide economically valued products	Moderate	Moderate	High
provide visual interest	Low	Moderate	High
protect against flooding	Low	Moderate	High



(adapted from Agroforestry Notes, AF Note 4 Jan 1997, USDA Forest Service/NRCS)

### **For an Eroding Bank**

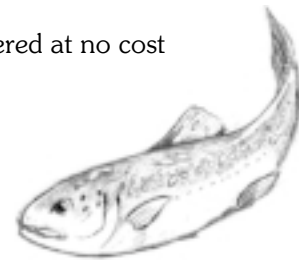
If you have an unstable bank, deal with this first. Consult *The Challenge of Erosion in the Connecticut River Watershed*, published by the Connecticut River Joint Commissions. Remember that a buffer will provide good insurance for your riverbank. Your county Conservation District office has an inventory of erosion sites on the Connecticut River mainstem and plenty of good advice.

## **BENEFITS AND COSTS OF BUFFERS**

Many farmers recognize both short-term *and* long-term economic benefits to buffers.

### **Costs**

- replacement of land taken out of production
- seed and plant material (some must be purchased; some can be gathered at no cost other than own labor)
- labor to plant and maintain until established
- fertilizer & lime
- weed control during plant establishment
- equipment repairs



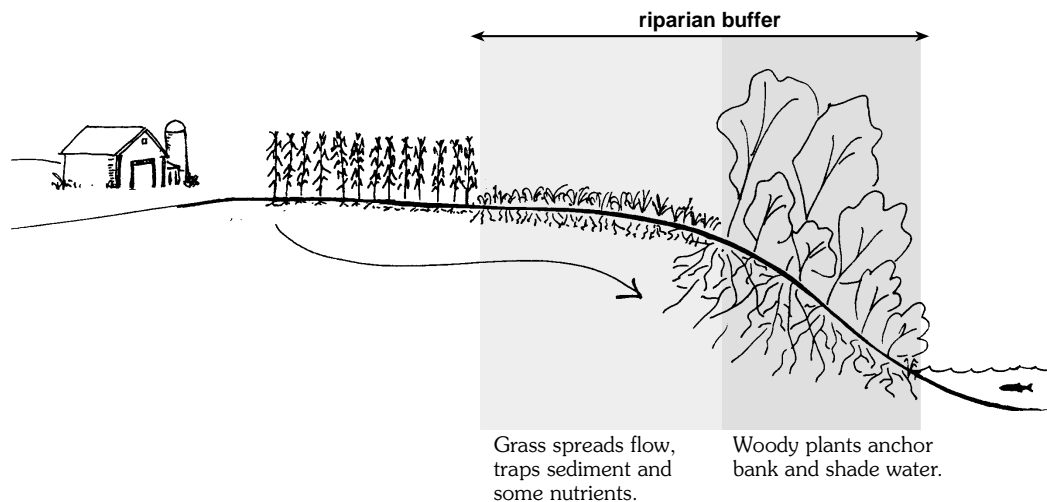
### **Benefits**

- **Keep the nutrients at home for use by crops**, not by water weeds. Buffer strips can sponge 50-80% of nutrients/pesticides and 60% or more of pathogens from surface runoff and shallow groundwater passing through the root zone.
- **Keep soil on site**. Buffers can trap 75-90% of sediment before it leaves the farm. When you see runoff moving through the permanent cover and coming clear, you know it's catching most of what was headed for the stream. Because phosphorus tends to cling to sediment, buffers can trap that, too.
- **Keep equipment safe** from rollover on steep ditches or riverbanks.
- **Take unprofitable land out of production** and possibly get paid for it.
- **Reduce labor, fertilizer, and seed costs in buffer** once established. Native buffer vegetation needs little attention, compared to annual crops.
- **Help minimize erosion** and avoid costs of bank stabilization and loss of land.
- **Reduce crop losses from flooding**, which can erode valuable cropland and deposit debris in fields.
- **Improve integrated pest management success** by providing cover for predatory insects and insect-eating birds.
- **Ensure safe drinking water** for you and your neighbors.
- **Improve fish and wildlife habitat**.
- **Build good will in the community** — showcase a commitment to protecting the land for future farmers.
- **Help avoid regulation by being pro-active**: when combined with conservation tillage and nutrient and pest management, buffers reduce serious water pollution and related environmental problems from farms.
- **Decrease property taxes** through the stewardship category of current use if you have a management plan for the buffer.
- **Qualify for incentive payments**.
- **Boost the bottom line with cash crops from the buffer** itself (lumber, hay, nuts, fruits & berries, fiber, horticultural, pharmaceuticals).

# A BARE-BONES BUFFER

## What You Plant:

- willow and other live woody stakes of shrubs along water's edge for stability
- 35-50' buffer of dense, stiff grasses



## How You Manage It:

- no till seeding—don't disturb soil—not managed as part of adjacent cropland rotation
- minimal fertilization
- a couple of cuttings of grass strip to remove captured nutrients
- restrict livestock access to the streambank
- keep heavy equipment away from the streambank

## What You Get:

PLUSES	MINUSES
traps 3/4 of sediment from runoff	is less effective as more runoff events occur
traps 1/4 of nitrates and phosphorus from runoff	allows majority of nitrates and other pollutants to pass through
can be more efficient at removing phosphorus from shallow groundwater than forested buffers	may have relatively short useful life span
promotes sheet flow better than forested buffer alone	may have to periodically remove sediment, reestablish vegetation, and remove channels which develop
slightly improves drinking water at nearby wells	does not greatly improve flow to groundwater and wells
slows runoff slightly	does not reduce flooding
will help improve water quality for fish	does not provide much temperature control
benefits grassland birds and small shoreland wildlife	will not provide much habitat for plants or for other wildlife
provides some streambank stabilization	does not provide substantial streambank stabilization
protects against tractor rollover	provides little noise or odor control

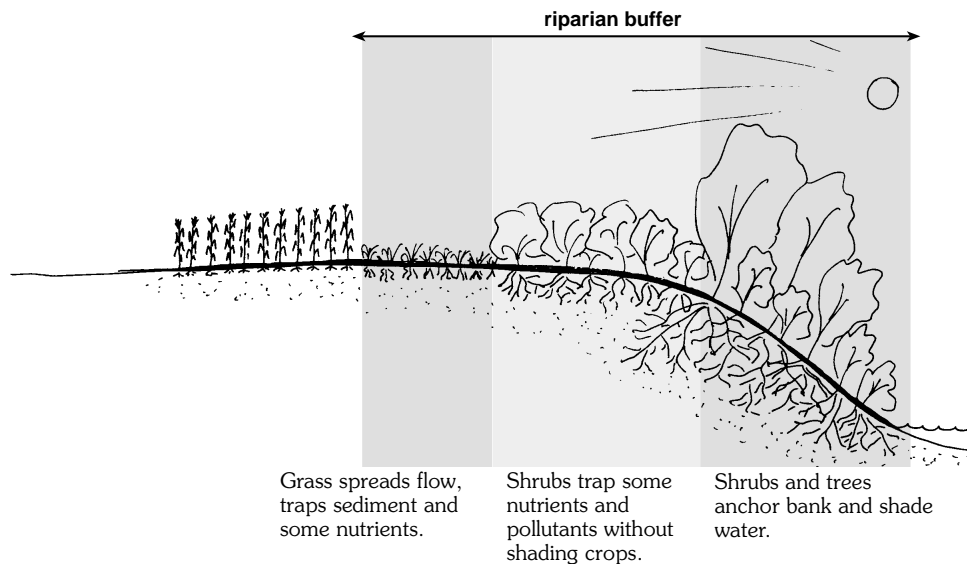
# A BETTER BUFFER

## What You Plant:

- ◆ willow and other live woody stakes of shrubs and trees along water's edge
- ◆ 35-75' zone of native shrubs, depending on slope, intensity of land use, N/S orientation
- ◆ 25' buffer of dense, stiff grasses

## How You Manage It:

- ◆ no till seeding—don't disturb soil—not managed as part of adjacent cropland rotation
- ◆ minimal fertilization
- ◆ leave streambank vegetation undisturbed, except for leaning trees which threaten to pull root ball into the water
- ◆ a couple of cuttings of grass strip to remove captured nutrients
- ◆ control channelized runoff—convert it to sheet flow; consult specialist for sites exhibiting severe erosion
- ◆ restrict livestock access to streambank; allow managed grazing of grass filter strip
- ◆ keep heavy equipment away from the streambank



## What You Get:

### PLUSES

- traps 3/4 of sediment and some pollutants from shallow flow
- shrubs trap more nutrients and pollutants than grass alone
- does not shade crops
- provides enhanced streambank stability
- provides some cover & shade, improves water quality for fish
- provides some cover, nest sites, food, and migration stopover habitat
- leaf litter of shrubs slows runoff, improves runoff infiltration
- roots improve porosity of soil to promote infiltration of runoff
- provides some visual screening, noise and odor control

### MINUSES

- shrubs do not trap nitrogen in shallow ground water as well as trees do
- will not provide much shade and temperature control to streams larger than 25' wide
- does not give as much stability as deep rooted trees
- will not provide habitat for variety of plants or for other wildlife
- can attract nuisance birds and predators to "edge" habitat
- will not provide significant flood protection

# THE BEST BUFFER

## What You Plant:

- ★ willow and other live woody shrub and tree stakes along water's edge
- ★ native trees and shrubs in 50-75'+ zone, depending on slope, intensity of land use, N/S orientation
- ★ 25' buffer of dense, stiff grasses.

## How You Manage It:

- ★ no till seeding—don't disturb soil—not managed as part of adjacent cropland rotation
- ★ minimal fertilization
- ★ leave streambank vegetation undisturbed, except for leaning trees that threaten to pull root ball into the water (leave root systems intact)
- ★ actively manage rest of woody vegetation to remove captured nutrients
- ★ cut grass strip to remove captured nutrients
- ★ control channelized runoff—convert to sheet flow
- ★ restrict livestock access to streambank; allow managed grazing of grass filter strip
- ★ keep heavy equipment away from the streambank

## What You Get:

### PLUSES

traps 95% of sediment, 75-80% of nitrogen, 80% of phosphorus

overhanging branches provide best temperature control, best water quality, habitat for fish

tree roots remove nitrogen from groundwater

leaf litter slows runoff, improves infiltration

provides best protection for drinking water

provides best protection against flooding

roots improve porosity of soil to promote infiltration of runoff

trees provide best sink for excess nutrients

provides cover, nest sites, food, and migration stopover habitat for greatest variety of birds and other wildlife

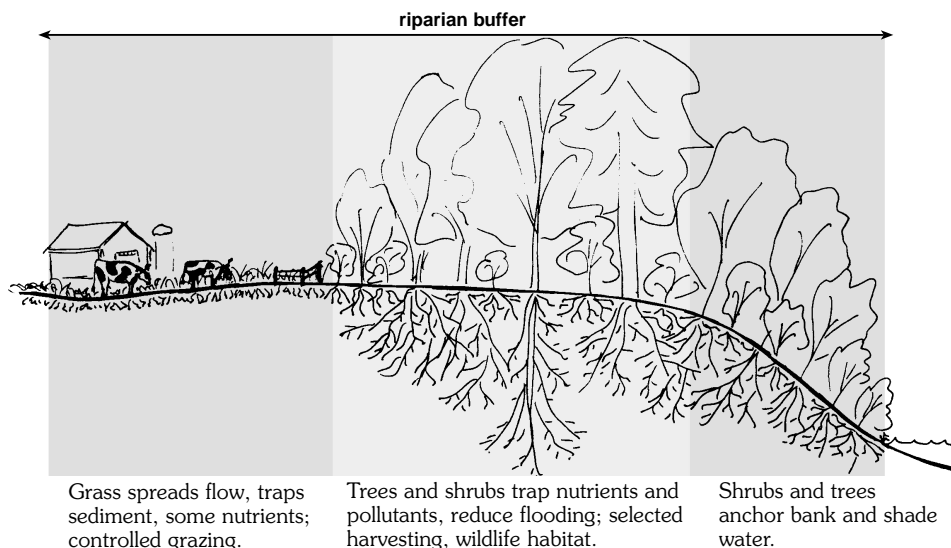
provides space for recreational activities

provides income through cash crops and incentives

provides effective visual screening, noise, dust, and odor control

### MINUSES

may shade crops (to avoid this, plant trees N & E of cropland, use shrubs on S & W)



## LIVESTOCK

For buffer success, restrict animal access to protect against trampling and keep manure on land where it is more valuable. Use a movable electric fence on flood plains, and let it down in winter to allow wildlife and ice to move freely. Complete exclusion of livestock may be enough to reverse even heavy damage to a natural riparian buffer. In the grass portion of a buffer, use grazing management involving seasonal and herd size restrictions, with tubs or restricted access watering. A forested buffer downslope from a high-use area is also an important part of the waste management system.

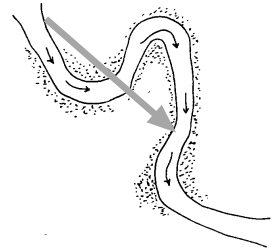
### Facts about Cows in a Stream

- 🐄 one cow produces approximately 5.4 billion fecal coliforms per day
- 🐄 two cows allowed unrestricted access to a stream for 24 hours could contaminate as much water as the city of Keene, NH, uses in one day
- 🐄 persistent exposure to wet conditions can lead to soft hooves and lame cows

## FLOOD PLAIN MEADOWS & FLOOD CHUTES

On the Connecticut River mainstem and larger tributaries, a buffer can help with the special problems of fields located on river bends. Here, the riverbank can be the highest point except for the flood chute, or the short-cut the river takes during high water.

The most important places for thick buffers are at both ends of the flood chute, because the runoff draining that field is likely to pass through these points. Use a combination of trees, shrubs, and stiff-stemmed grasses. Let deep rooted shrubs stand in for trees if shading is a concern. At the upstream end of the flood chute, a thick buffer of sturdy trees and shrubs helps keeps debris and ice out of the meadow. Plan on re-planting trees if they are lost to ice or other factors in the first five years. Reed canary grass can help stabilize this area quickly before woody plants become established, but use it wisely as it can take over, especially in wetlands.



## KNOW STATE AND LOCAL REGULATIONS

**NEW HAMPSHIRE:** The Basal Area Law (RSA 227-J:9) requires that within 150' of 4th order streams and great ponds, 50% of the pre-harvest basal area must be maintained, and also within 50' of other perennial streams, rivers, and brooks. Fourth order streams in the Connecticut River watershed of NH include the lower portions of the Ashuelot, Ammonoosuc, Cold, Gale, Israel, Mascoma, Mohawk, Sugar, Little Sugar, and Upper Ammonoosuc rivers, and Mink, Partridge, and Stocker brooks, and the Connecticut River itself.

**VERMONT:** *The Manual of Acceptable Management Practices* specifies that except for stream crossings, a protective strip shall be left along streams in which only light thinning or selection harvesting can occur, so that breaks made in the canopy are minimal and a continuous cover is maintained. Log transport machinery must remain 25' away from the stream. Including this 25' margin, the width of the protective strip shall be 50' for land sloping 1-10%, adding 20' for each additional 10% increase in grade.

### 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



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