Grow Agriculturally Productive Buffers

Every river needs a riparian buffer: a section of forest and grass along a river's banks helps control floods, stabilize riverbanks, maintain water quality, cool waters to create fish habitat, and provide wildlife habitat. Buffers are ecologically productive.

You may hesitate to grow a buffer. Your reason may be financial, philosophical, or otherwise.

One solution is an "agriculturally productive riparian buffer." This buffer cleans the water, holds banks in place, provides wildlife habitat – and grows a profitable food, fuel, or forage crop.

This guide aims to help farmers and landowners learn how:

- Growing crops in buffers can protect our natural resources and provide income.
- To choose crops for your buffer.
- To grow crops in the buffer.

Meeting Your Resource Needs

Planting an agriculturally productive buffer helps you take care of the land and your bottom line.

Any riparian buffer is helpful, but the most effective buffers include a combination of trees, shrubs, and grasses. Agriculturally productive buffers include all three, so they keep drinking water clean, provide wildlife habitat, prevent erosion, and help control flooding. Best of all, perhaps, you don't have to give up prime agricultural land in order to grow a buffer. You can generate income from the buffer by growing fruit and nut trees, berry bushes, hay, and other perennial crops.

You may even be able to secure funding for planting an agriculturally productive buffer. It's expensive to transition from annual crops to perennials, and a paycheck for planting a buffer can help offset the cost of establishing perennial crops. See the "Economics" section for information on groups that are working with farmers to plant agriculturally productive buffers.




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Designing Your Buffer for Conservation and Economic Goals

Agriculturally productive buffers follow the USDA Center for Agroforestry's three-zone buffer design, with perennial crops in Zones 2 and 3 (Figure 1). If you're going to grow agriculturally productive buffers, you will want to understand how each zone works, and what types of crops fit each zone.

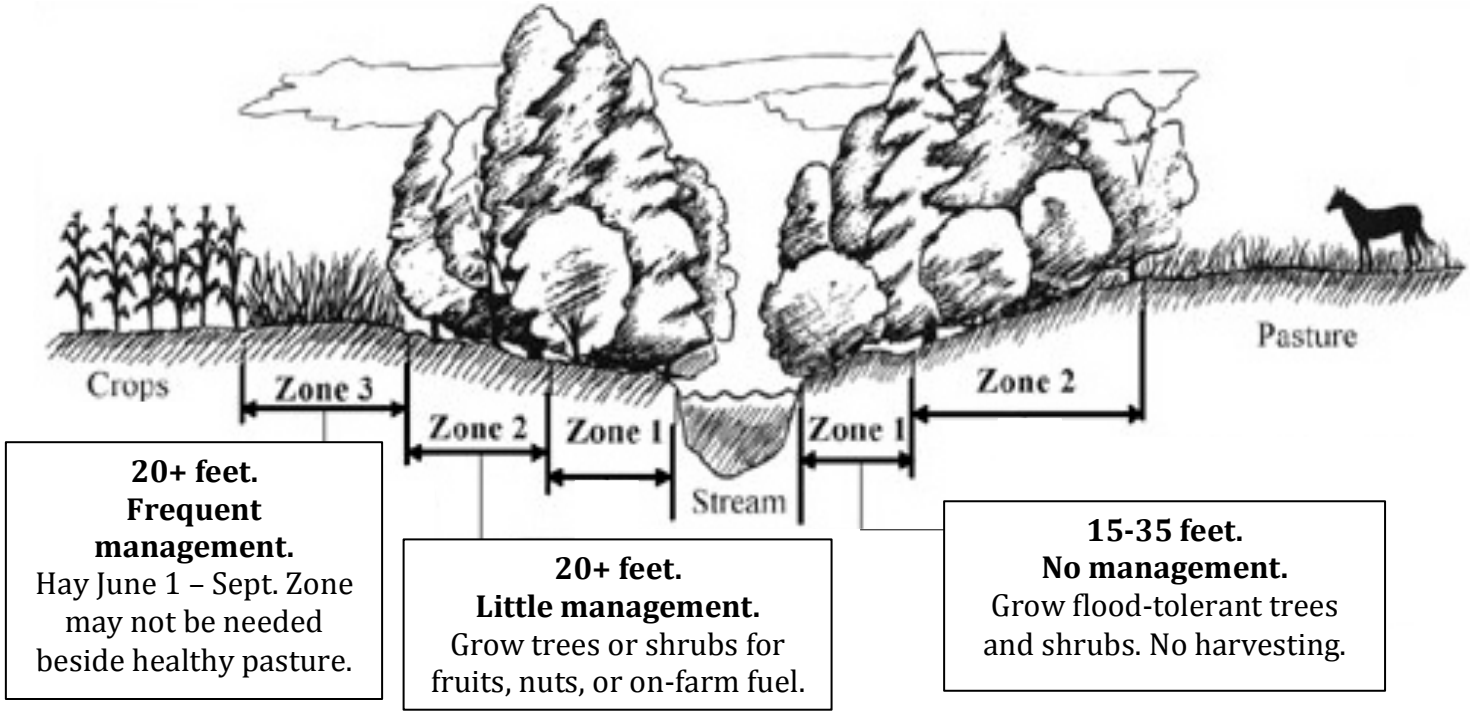

Figure 1. Agriculturally productive buffers grow perennial crops in Zones 2 and 3 of the buffer. Adapted from the Association for Temperate Agroforestry.

Zone 1

Native trees' deep roots stabilize the bank, and they re-grow quickly when they are covered by sediment, bent over by a flood or ice, or damaged in a storm. The trees in Zone 1 soak up floodwater and send it back into the atmosphere. Their thick trunks catch large debris from floods, and keep it out of farm fields. Finally, they provide wildlife habitat and keep waters cool for fish populations. Plant a diversity of native, flood-tolerant trees and shrubs, based on the site's soils and natural vegetation. Look to nearby, intact forests for suggestions.

Zone 2

Fast-growing trees and shrubs hold the stream bank in place with large, deep roots. They absorb nutrients with fine, shallow roots, and their trunks can catch flood debris. This zone can also produce viable crops, including nuts, fruits, and fuels. You can interplant with native vegetation, or grow in clusters or rows. Plant flood-tolerant crops with fruits or nuts that grow above typical flood height.

Zone 3

Hay forms a hardy network of above- and below-ground growth that traps sediment and slows down runoff. When a heavy rain falls on a cultivated field, water doesn't filter down into the soil – it "runs off" over land, downhill, and into the nearest stream or river. The hay crop is a physical barrier to the water's movement, and it slows down runoff. Slower moving water can filter into the soil. The soil can

absorb and retain the water, or just delay it temporarily. Either way, floods are less powerful: if only part of the water from a storm event is ever reaches the river, or if some of that water is delayed, the amount of water that has to go downstream at any one time decreases. Less water and less power means that a flood will be less destructive. The grasses and legumes in Zone 3 absorb excess nutrients that run off of farm fields. Instead of polluting our rivers and our drinking water, these chemicals fertilize a perennial, harvestable crop. Plant whatever perennial hay mix you grow on the rest of your property (for ease of planning and logistics). If you do not already grow hay, select a sod-building mixture of cool season perennial grasses and legumes. The hay mix should be flood tolerant, with dense, stiff above ground growth.

Choosing Crops

A native buffer meets all of our ecological needs perfectly – it readily filters water, absorbs extra nutrients, and provides wildlife habitat. When you plant crops in the buffer, select ones that still perform these ecological functions. Consider how each crop grows and plant species that can thrive in Vermont floodplains.

A range of food and fuel crops can make sense in Vermont's floodplains (Figure 2). Most Vermont buffers would naturally be forested, so this guide emphasizes fruit, fuel, and nut trees in Zone 2. Perennial grasses make ecological sense in Zone 3. Growing guides for most crops are available through Extension of the National Agroforestry Center. Buffers can also provide floral products and materials for creating baskets, dyes, furniture, cordage, and more.

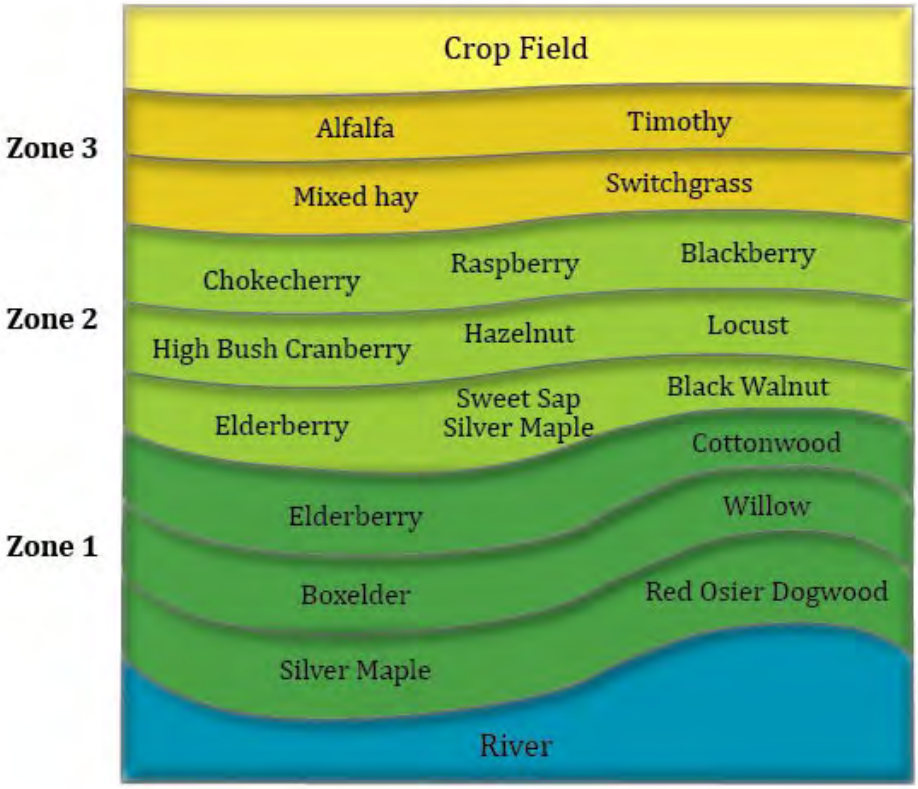

Figure 2. Examples of crops that can grow in Vermont's buffers.

Agriculture + Forestry = Agroforestry

Growing crops in riparian buffers is one of many types of "agroforestry" – agriculture that grows trees in combination with a mix of perennials, annual crops or livestock. Other examples of agroforestry include pasturing animals in orchards (silvopasture), growing fruit or nut crops as windbreaks, and growing alleys of trees and annual crops. Learn more about agroforestry from the National Agroforestry Center at nac.unl.edu.

Crunching the (Establishment) Numbers

Transitioning your riverfront from annuals to perennials is no small task. These tips may help.

Finding Root Stock

Nurseries around Vermont and New England sell rootstock of fruit and nut trees, berry bushes, and other perennials. Options include:

- Intervale Conservation Nursery
- St. Lawrence Nursery
- Elmore Roots Fruit Tree Nursery

Finding Funding and Support

Many Vermont conservation groups are putting money and energy into agriculturally productive buffers. Several groups help fund planting trees in Zone 1 (no harvest), and let you plant the rest of the buffer with perennial crops. Others are exploring more complete funding. Consider partnering with these groups to fund your agriculturally productive buffer:

- Vermont River Conservancy
- Trees for Streams
- Vermont Land Trust
- Your local watershed group

Using Volunteers to Help with Buffer Plantings

Volunteers are excited to help care for the land and the water, and their labor can dramatically reduce the cost of planting an agriculturally productive buffer. Potential volunteers are all around you: local watershed groups, high school clubs, and beyond. Conservation groups may also be able to help find volunteers to plant your buffer. These groups may be able to help recruit volunteers:

- Intervale Conservation Nursery
- Trout Unlimited
- Trees for Streams

River Corridor Stewardship

Rivers and farms are integrally connected, and many Vermont conservation organizations want to promote ecologically and economically viable river corridors. Sustainable agriculture is an important part of that vision, and farmers like you are part of the solution to caring for our rivers.

Some Vermont conservationists are exploring ways to simultaneously restore and conserve our rivers for the long term *and* meet our state's food needs. They think that agriculturally productive buffers are one strategy that can make sense for stewarding our rivers and our agricultural land. They invite you to think critically about this idea, and join in the conversation.

Growing Crops in the Buffer

Farming in buffers will look and feel different than a typical farm field or forest. Because the crops are close to the river, your farming practices have to take the river into account. Many of these guidelines are requirements for all Vermont farmers, noted as State Regulations. If you work with a conservation organization, they may require these or similar practices, depending on your agreement or contract.

Designing and Managing Your Buffer

- **Let the river meander.**
- **Follow the USDA's three-zone buffer design.**
- **Allow your buffer's boundaries to "float," or move when the river changes.**
- **Do not protect plantings from the river's natural movement with rip rap or other methods.**
- **The unmanaged strip along the waterway must be at least 10' wide (25' for Medium and Large Farm Operations) (State Regulation).**
- **Leave banks in their natural state (State Regulation).**
- **Limit trampling and equipment damage on banks (State Regulation).**
- **Do not develop roads within the buffer.**
- **If trees or shrubs are already growing along your river, leave them in place, and plant crops in openings.**

Growing Crops in the Buffer

- **Grow a diversity of perennial crops.**
- **If you amend soils, do so based on soil tests (State Regulation).**
- **Do not apply manure within the buffer (State Regulation).**
- **Limit application of chemicals to crops.**
- **Limit equipment use for planting, maintenance, and harvest.**

Dealing with Risk in Floodplains

Floodplains offer rich soils and flat land – but they also put farmers at risk to flooding. Major storms, like Irene and Sandy, are becoming more frequent and more intense, so farmers are adapting. Growing a riparian buffer is one way to adapt, because buffers absorb floodwaters and hold soil in place.

- Allow the river to meander and flood. Do not protect crops from flooding or secure the riverbanks using rip rap, channelization, or other means.
- Let buffers "float" – when the river moves, the buffer moves, too. Areas that are outside of the buffer initially may eventually be located within the buffer.
- Know that the crops you plant in the buffer may be lost to flooding.
- Plant crops in the most stable parts of your buffer. Do not plant where the river is actively eroding.
- Choose crops that are adapted to flooding: deep rooted, sprouting perennial crops
- Plan to invest some energy and money into maintaining the buffer: Mow or mulch plantings to give them a good start. Replant lost trees. Protect plantings from browse. Inspect the buffer annually and after storms.

Thinking Critically About the Economics

Should every buffer be agriculturally productive?
Absolutely not. This type of buffer management is an option when the river is stable and you want to keep the land in agricultural production. Other buffers are too risky to plant in crops.

Are buffer crops really economically viable? At what scale?
We're still learning. Farmers in other parts of the country are growing crops in their buffers at backyard and commercial scales. We'll know more about yields, costs, and markets for buffer crops in Vermont as more pioneering farmers plant in their buffers (see last question). We encourage you to talk with us, other farmers who are growing crops in their buffers, and with your Extension agent or NOFA-VT technical assistance advisor. Together, we can provide resources about what crops make sense along your floodplains as well as the economics of these crops.

Can agriculturally productive buffers qualify for conservation funding?
Sometimes. Energy is building around the idea of agriculturally productive buffers, and several local groups are funding buffers that include crops (see next question). Federal programs (including NRCS) do not typically pay for planting crops in buffers, or allow for harvest in riparian areas.

Is anyone planting agriculturally productive buffers in Vermont? Who's funding these plantings?
Yes. Several farmers have planted agriculturally productive buffers, and nonprofits are helping fund their work. The Friends of the Mad River helped plant elderberry for a commercial grower near Waitsfield. Trees for Streams helped plant Zone 1 of a buffer at a tree nursery near Johnson. Because they paid for planting the native buffer, the farmer could afford to plant crop trees in Zone 2, including hazelnuts (nuts), black locust (timber), plums (fruit), apples (fruit), and more. The White River Partnership helped farmers plant homestead-scale fruits and berries in Royalton. The Vermont River Conservancy is helping farmers plant locust (fence posts), high bush cranberries (fruit), and late-cut hay (forage) in Cambridgeport.

Resources for Learning More

- **Establishing and Managing Riparian Forest Buffers** (University of Missouri Center for Agroforestry) provides a comprehensive guide to planning agriculturally productive buffers.
- **Riparian Forest Buffer Design, Establishment, and Maintenance** (Maryland Cooperative Extension, 1998) explains the three-zone concept and covers planning and planting options.

This handout is a product of Liz Brownlee's graduate project at the University of Vermont. Her work was generously funded by the Green Mountain Coffee Roasters and the Lake Champlain Sea Grant, and builds on the good work of many organizations.

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