

# **Stream Buffer Maintenance Handbook: For newly established buffers**





# 1 Introduction

Pollution negatively impacts our streams, rivers, and water bodies in many ways. The pollution that enters the environment from industrial activities is called *point source pollution*. This is addressed by a number of governmental regulations and agencies. Pollution that comes from excess fertilizer on lawns, runoff from driveways and parking lots, damaged septic and sanitary systems, or animal wastes are referred to as *non-point source pollution*. Non-point source pollution is something that individuals and families can address at home and work. One way to minimize non-point source pollution from harming our streams is by developing riparian buffers.

A *riparian buffer* is an area of land next to a stream that contains a mixture of trees, shrubs, and other plants that stabilize the stream bank from erosion. A riparian buffer can also help remove some non-point source pollution through absorption.

## ***Benefits of Buffers***

In addition to improving water quality, riparian buffers can provide the following benefits:

- *Increased property values* – Buffers can increase property values by as much as 20% by providing natural enhancements.
- *Reduced erosion* – Plants and their roots reduce runoff and stabilize soil.
- *Air quality improvement* – Trees and shrubs absorb airborne pollutants and return oxygen to the atmosphere for our use.
- *Decreased cooling costs* – Trees can provide summer shade.
- *Noise reduction* – Trees and shrubs can muffle urban noises.
- *Wildlife habitat and viewing* – Wildlife depends upon mixed woodlands for food, habitat and travel corridors.
- *Groundwater recharge* – Buffers absorb excess water increasing groundwater recharge and reducing flood volume.

*Adapted from: Got Buffer? Brochure by Virginia Department of Conservation & Recreation.*

The purpose of this handbook is to provide information to facilities management staff and landscapers from municipalities, institutions and businesses on how to control invasive species and maintain an effective and attractive riparian buffer that has been already established. This manual assumes that a riparian buffer has already been planned or established.

## 2 Maintenance

The first 3-5 years after a riparian buffer is established is the most critical maintenance period. Regularly scheduled maintenance should begin immediately after the buffer is planted to optimize chances of survival. It is also important to carefully inspect the riparian buffer annually and after major storm events for any damage that may have occurred. Repairs should be completed as soon as possible to maintain proper buffer functions.

### 2.1 Maintain Tree Shelters

Seedlings planted in a riparian buffer are often planted inside tree shelters or tree tubes. Tree shelters provide a greenhouse-like environment for seedlings, promoting faster establishment, and protecting seedlings from wildlife damage. Broken stakes should be repaired and leaning shelters should be straightened.

The mat that goes under the seedling and shelter is used to protect the seedling from pests and from competition with other vegetation. Weed mats may be removed once the trees have developed a canopy that will



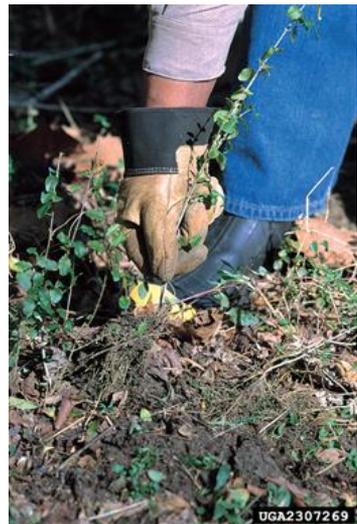
**Figure 1. Tree shelter at Purcell Park in Harrisonburg, VA. (Photo credit: City of Harrisonburg)**

naturally shade out weeds. Mesh netting may have also been placed on top of tree shelters to prevent birds and other wildlife from getting into the shelter, and should be removed as the tree grows to the height of the tree shelter.

The inside of tree shelters should be checked from time to time to make sure there are no invasive plants growing in place of the tree and that the tree is still alive. It is important not to remove the tree shelters too early. Early removal of a tree shelter will make the tree vulnerable to browsing by deer and other wildlife. Tree shelters may be removed when the tree is approximately two inches in diameter.

### 3 Weed Control

Preventing the introduction of weeds into a riparian area is critical for the survival and rapid growth of trees and shrubs. Tree and shrub seedlings are vulnerable to above and below ground competition from invasive plants in the first few years. Seeds of invasive plants can be dispersed into riparian areas by wind, animals, and down stream flow. Once a single plant has become established, it can produce thousands of seeds which can be further dispersed. Removing weeds each season before they go to seed can help address this problem.



**Figure 2. Some weeds have spines. Wear gloves when hand pulling weeds. (Photo credit: J.H. Miller - USDA Forest Service, Bugwood.org)**

#### 3.1 Hand pulling

Hand pulling is an option for managing newly infested or lightly infested areas. The practicality of this method depends on the type of weeds and the size of the weed population.

Pulling weeds does cause some soil disturbance, thus creating the potential for soil erosion or for a place for other invasive seeds to set.

If hand pulling is done, it should be done before seeds set. The time of year seeds set varies depending on the plant (some seeds mature all season, some mature late in the summer, etc.). Hand pulling may also be easiest when invasive plants are relatively young and have not yet developed deep taproots or extensive root systems.

### 3.2 Spray Application

Spraying herbicides to kill weeds is a short-term maintenance technique (2-3 years) that is generally considered less expensive and more flexible than mowing and will result in a quicker establishment of the buffer.

However, improper use of herbicides can cause harm to nearby plants and the environment. Pesticide Applicator Training and certification is required for all commercial applicators. More information about training and certification can be obtained from the Virginia Department of Agriculture & Consumer Services (VDACS).

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*Apply spray herbicides  
when the air is calm  
and no wind exists.*

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Backpack sprayers are useful for small areas where precision is needed. With backpack sprayers, a post-emergent herbicide, such as glyphosate, that is also labeled for use around water can be applied close to the base of tree shelters without harming the trees inside. Pre-emergent herbicides can be applied to areas during the fall or early spring to help control weeds in the next growing season.

If seedlings were planted without tree shelters, shielded spray wands should be used due to the close proximity of woody vegetation and potential damage to trees that can take place.

Herbicides can damage trees and shrubs so equipment calibration and safety measures are important. Precautions should be taken to keep woody seedlings safe from spray drift. Factors that should be taken into account include: wind direction and speed, herbicide formulation and mix, soil properties, relative humidity, air temperature, and spray droplet size. For more specific information on the most suitable herbicides to use, call or visit your local Cooperative Extension office.

**Table 1. Dos and Don'ts of Herbicide Spray Application.**

|   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• <b><u>DO</u></b> always read and follow the label. Any use of herbicides and pesticides that are inconsistent with the label is prohibited by law and there are state and federal penalties for violations.</li> <li>• <b><u>DO</u></b> calibrate your equipment.</li> <li>• <b><u>DO</u></b> mix only the amount of herbicide that you will use at one time.</li> <li>• <b><u>DO</u></b> take precautions to prevent spray drift.</li> <li>• <b><u>DO</u></b> apply when the air is calm and no wind exists.</li> </ul> | <ul style="list-style-type: none"> <li>• <b><u>DON'T</u></b> allow spray drift to enter streams or waterbodies.</li> <li>• <b><u>DON'T</u></b> allow herbicide to get on good plants, for they will be damaged by overspray.</li> <li>• <b><u>DON'T</u></b> clean the tank over concrete. Unused chemicals may flow into a storm drain and into waterways causing harm to fish and wildlife. Instead, clean over a dirt area.</li> </ul> |
|---|--|

### 3.3 Brush Application

A weed or unwanted plant may be cut and then the remaining portion of the plant can be saturated with an herbicide to deliver chemicals into the plant root. A paint brush can be helpful in applying the herbicide to the cut plant.

### 3.4 Mowing

Ideally, it is best to let riparian buffer areas grow naturally with little interference. However, grasses are often slow growing above ground during the first 1-2 years after establishment because much of their energy is put into producing a root system. During this time, invasive weeds can rapidly become established and compete with young grasses.

Managing weeds through hand pulling and spraying should be sufficient to maintaining a healthy riparian buffer. However, should a riparian buffer become overwhelmed with weeds during the early years of establishment

mowing may be necessary. If mowing is necessary, it should happen before weeds get taller than 18" and should only take place after the completion of the nesting season (after August 15<sup>th</sup>).

### 3.5 Replanting and Reseeding

Replanting and reseeding are important maintenance practices during the first few years following establishment. Inspections should be made twice annually to identify areas in need of replanting and reseeding. Replanting and reseeding can be done in the spring or fall.

Woody plants should be replanted within an area if more than 3-4 nearby tree seedlings have died. Spot planting can be done quickly with just a bucket full of water, tree seedlings, and a shovel.

Reseeding grasses may be a bit more involved depending on the density and quality of grass and establishment. If there is poor establishment with heavy weed pressure, an herbicide like glyphosate can be used on

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#### Tips if planning to mow:

- Mowing once or twice during the season is usually enough.
  - Mow after completion of nesting season (after August 15<sup>th</sup>) and before late season seeds mature.
  - Mow high – 8 to 12 inches above ground to minimize cutting slow-growing native plants.
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weeds, followed by reseeding. (Note that if glyphosate is broadcast sprayed, it will likely kill everything and the area will need to be replanted and/or reseeded.) If there is some establishment without heavy weed pressure, the site can be directly reseeded. If the areas that need reseeding are small and relatively weed free, hand-spreading the seed and raking it into the ground is acceptable. Whatever is done, reseeding must be done rapidly because invasive weeds can move in very quickly.

Reasons that trees and grasses failed to establish should also be investigated to help address future concerns. Some common reasons may be drought, poor planting, or voles. If you are unsure of the cause of failure, you should consult with experts within your organization or call your local Cooperative Extension office for assistance.

## 4 Increasing stream buffers with No Mow Zones

No mow zones are areas around a stream that are allowed to grow undisturbed and include areas that were purposely planted as well as areas that were not purposefully planted. Although designing and planting a riparian buffer is preferable, no mow zones that are not purposefully planted can still help to improve water quality.



**Figure 3. No Mow Zone at Westover Park in Harrisonburg, VA (Photo credit: City of Harrisonburg)**

No mow zones vary in size depending on space available and the preferences of the property owner. In areas not purposefully planted, plants will likely take to the undisturbed stream bank and a no mow zone will develop into a stream buffer. However, this buffer may contain unwanted and weedy plants if they are not removed.

## 5 Educational Signage

It is recommended that where possible, educational signage be installed to explain to the public what a riparian buffer or no mow zone is and what their benefits are. These signs may also serve as boundaries for maintenance crews, reminding them where not to mow.

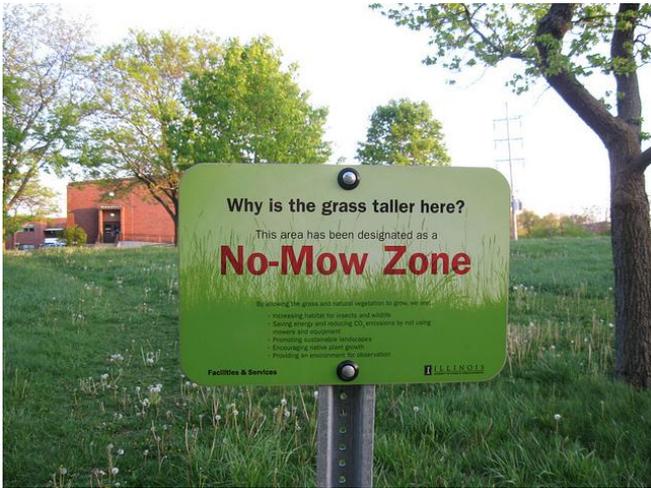


Figure 4. No Mow Zone signage at the University of Illinois.  
(Photo credit: Edward Walters)

## 6 Examples of Poorly Maintained and Better Maintained Riparian Buffers



Figure 5. Example of poorly maintained stream bank. Notice that mowing is occurring up to the stream. Without anything to help stabilize the stream bank, it is eroding. This area could benefit from a no mow zone. (Photo credit: City of Harrisonburg)



Figure 6. Riparian buffer at Eastern Mennonite University, Harrisonburg, VA. (Photo credit: City of Harrisonburg)



**Figure 7. Although there is some ground cover on the left stream bank, the right stream bank suffers erosion and has little vegetation to stabilize it. Notice the vertical 4 ft. drop of the streambank. This photo was taken in 2005 at Purcell Park prior to the stream restoration project in 2009-2010. (Photo credit: City of Harrisonburg)**



**Figure 8. This photo is of the same location as Figure 7 and was taken while the stream restoration project was underway. Notice the right bank was sloped back and planted with trees and groundcover is being established. (Photo credit: City of Harrisonburg)**



**Figure 9. Example of poorly maintained stream bank before Liberty Park was established in Harrisonburg, VA. (Photo credit: City of Harrisonburg)**



**Figure 10. Example of stream bank improvement. This is a photo of the same location as shown in Figure 9 several years following a restoration project. The retaining wall was removed and the bank sloped back and planted. (Photo credit: City of Harrisonburg)**



**Figure 11. A small stream buffer separating a stream from the adjacent municipal storage lot. Although not perfect, it's a start. (Photo credit: City of Harrisonburg)**

## 7 Common Invasive Species to Harrisonburg and Rockingham County

Below are a few common invasive species to Harrisonburg and Rockingham County and information on how to remove them. More photos and information about these and other invasive species can be found online at the Virginia Cooperative Extension “Weed Identification Guide” at [www.ppws.vt.edu/weedindex.htm](http://www.ppws.vt.edu/weedindex.htm).

### Japanese Hop

*Humulus japonicas*



(Photo Credit: City of Harrisonburg)

This annual or trailing vine has 5-lobed leaves and stems with prickles. The flowers of the vine bloom in the mid-summer.

The plants should be pulled before they set seed. When removing this plant, attempt to remove as much of the rootstock as possible. If the plant is growing as an annual, spot apply an herbicide any time during the year prior to flowering. If it is growing as a perennial, apply an herbicide when rootstock is most rapidly accumulating carbohydrates (July-September).

## Canada Thistle

*Cirsium arvense*



(Photo Credit: City of Harrisonburg)

This plant is a 2-5 foot perennial plant. Stems of this plant are hairy and the leaves are long with crinkle edges. There are also spines along the outside of the leaf. Between July and September, this plant has purple flowers.

The best time for hand removing Canada thistle is after seed head production, but before flowering. Snip off the plant at soil level with a lawn mower, shears, or string trimmer. The stress of being cut encourages the roots to send up new growth soon after, so you will need to cut repeatedly for several seasons before the roots are weakened and re-growth is stopped. If the infestation is small, the entire plant may be removed using a narrow spade. Be sure to remove broken pieces of roots to prevent the weed from growing again. An herbicide may also be applied to the foliage in the spring after the buds appear or before re-growth in the fall.

## Ragweed

*Ambrosia artemisiifolia*



(Photo Credit: Ohio State Weed Lab Archive – The Ohio State University, Bugwood.org)



(Photo credit: Ted Bodner – Southern Weed Science Society, Bugwood.org)

Ragweed is tall with long hairs on the stem. Leaves are lobed and are hairy on the top of the leaves. Flowers are yellow when they bloom. The best way to prevent its spread is to keep idle land covered with grasses or other plants. If ragweed is established, the plant may be hand pulled or cut low near the roots, or if there is heavy infestation a chemical herbicide like glyphosate may also be used. Control of ragweed should be done before August 1 to prevent pollination and seed formation, and the next generation of plants.

## Siberian Elm

*Ulmus pumila*



(Photo credit: Patrick Breen – Oregon State University, Bugwood.org and Steve Dewey - Utah State University, Bugwood.org)

This plant has serrate leaves and hair on the leaf stems. The leaves feel rough and the tree can grow 50 to 70 feet.

During the growing season, Siberian Elm seedlings can be hand pulled and small trees removed by a grub hoe or weed wrench. If dealing with a large tree, girdling it is the preferred management technique where practical. Strip the bark in a band roughly 3-4 inches wide all the way around the tree. This process will take 1-2 years for the tree to die completely, but ensures that the tree will never re-sprout again. Alternatively, the tree may be cut down followed by a few route applications of herbicide such as gyphosate.

## Tree of Heaven

*Ailanthus altissima*



(Photo credit: Chris Evans – River to River CWMA, Bugwood.org)



(Photo credit: Matthew Yancey – Virginia Cooperative Extension)

Tree of Heaven can grow up to 80 feet. Leaves are compound and there is an odor in the twigs and leaves. The tree blooms with yellow flowers in June.

The most effective way to control Tree of Heaven is to pull seedlings by hand before the tap root develops. If you already have a tree, wait until late spring or early summer to cut the tree trunk as close to the ground as possible. Apply an herbicide to the cut area. During the following spring, examine the stump for signs of new growth. If new growth is seen, spray all the leaves and stems with the same herbicide solution.

## Wild Mustard

*Brassica kaber*, aka. *Sinapis arvensis*



(Photo credit: Virginia Tech Weed Identification Guide)



(Photo credit: Karen A. Rawlins – University of Georgia, Bugwood.org)

Wild mustard has yellow flowers when it blooms. Seed pods are located on the stem and the leaves are irregularly lobed. This plant can grow between 8 to 36 inches.

If you have a small area of infestation, wild mustard can be removed by hand. If a large infestation occurs, a chemical control with herbicides may be used.

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**Cover photo: Urban riparian buffer at Liberty Park in Downtown Harrisonburg, VA. (Photo credit: City of Harrisonburg)**





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