

# General Guidelines for Volunteer Based Riparian Buffer Plantings

## Riparian Buffers:

Forested stream sides, or riparian buffers, are important to the overall health of watersheds and to the people and wildlife that live there. The quality of the waters flowing through any watershed, no matter how large or small, is directly related to the condition of its riparian buffers. Riparian buffers can reduce soil erosion, filter pollutants, suppress noise, improve air quality, moderate air and water temperature, reduce peak flows and downstream flooding, reduce water treatment cost, and provide wildlife habitat. In short, riparian buffers help protect and improve the quality of life within a given watershed as well as downstream.

Establishing riparian buffers is a simple way to make a positive contribution to the quality of life in any watershed. There are generally two ways in which a riparian buffer may be established, **Passively** or **Actively**.

## Passively Established Buffers:

The information contained in these General Guidelines is for **Actively** established riparian buffers. However, in many cases a riparian buffer may be established **Passively** by simply creating a no-mow zone along a waterway through fencing, signage, or otherwise ensuring that the area is no longer mowed. Vegetation in the area now protected from mowing will naturally colonize the site over time and eventually establish a buffer of successional forest. While this **Passive** approach is less costly and less labor intensive to install, it may not necessarily generate an aesthetically pleasing buffer in the short term, or may not be composed of the desired diversity and species of trees and shrubs. However, it is a perfectly acceptable way of establishing a riparian buffer. The TDOF Riparian Buffer Program can provide technical assistance to landowners for the establishment of **Passive Buffers**, and may also be able to provide financial assistance. Please contact the Program for more information.

## Actively Established Buffers:

To help foster efforts to **Actively** establish riparian buffers, the Tennessee Division of Forestry has established a Riparian Buffer Program specifically to restore degraded riparian buffers and improve water quality in 8 urban watersheds in Davidson and Rutherford counties: Richland Creek; Browns Creek; Mill Creek Upper; Mill Creek Lower; Hurricane Creek; Stones River Middle; Stones River Upper; and Whites Creek. Native trees, in most cases bare root seedlings, are available through this program at no cost to homeowners, business owners, and organizations to help in the establishment of Riparian Buffers on streams in these watersheds.

For more information about the Tennessee Division of Forestry Riparian Buffer Program, visit:  
<http://www.tn.gov/agriculture/forestry/rbp.shtml>

For more information on Riparian Buffers in general, please visit:  
<http://www.tva.com/river/landandshore/stabilization/index.htm>

Following are some general guidelines and resources for use in establishing riparian buffers with volunteers. Please see the Helpful Resources Link on the TDOF Riparian Buffer web-site for additional resources to help you get started.

### **Site Selection:**

Generally speaking, the condition of riparian buffers along waterways will fall into one of several categories, from no buffer at all to a well-established shrub and overhead canopy buffer. When selecting potential sites to establish buffers a priority should be given to those sites that lack both a shrub layer along the waterway and an overhead canopy above the waterway. Waterways like this receive little to no benefit of storm water runoff filtration and no benefit of shading to help regulate water temperatures. The riparian buffer along these types of waterways will typically be represented by a mowed lawn right up to the water's edge, and are most often seen in private yards, commercial properties, urban public lands, and in some cases on agricultural lands.

Waterways with either a grass/shrub buffer or an overhead canopy, but not both, should be a second priority for site selection. The riparian buffer along these waterways will be either mowed up to or near the water's edge or have a narrow shrub buffer with little to no overhead canopy, or may have an established overhead canopy above the waterway but no shrub buffer along the waterway. These conditions are often seen in urban public land settings, golf courses, residential common spaces, residential private yards, and pastures that are grazed or row cropped.

And finally, waterways with both a shrub buffer along the waterway and an overhead canopy above the water would be a third priority if the existing buffer is less than 30 to 60 feet in width.

By focusing riparian buffer efforts on those sites with the least existing buffers, the greatest overall benefit to waterways in need can be addressed.

### **Availability of Seedling and Trees, and Planting Timeframe:**

Native trees should be used in the establishment of riparian buffers. Bare root seedlings are preferred over container or B&B trees because of their low cost, their ease of transportation, handling, and planting, and their ability to survive without regular watering (when planted properly and at the right time of the year). Container and B&B stock, planted approximately 10 feet apart, may be used to establish a visual edge and screen along the side of the buffer away from the waterway.

Bare Root Seedlings are generally used to establish riparian buffers. Bare root seedlings are available from the TDOF Nursery for planting while they are dormant, January through March.

Container and/or B&B trees are available from commercial nurseries and retail garden centers, and should be planted November through March while they are dormant. However, without a firm commitment from the landowner to regular watering during the growing season, container and B&B trees should not be used to establish riparian buffers.

For information and resources on landscaping with native plants, please visit the Tennessee Exotic Pest Plant Council's web-site at: [http://tneppc.org/pages/landscaping#native\\_plants](http://tneppc.org/pages/landscaping#native_plants) .

### **Species Suitable for Riparian Buffers:**

One of the best ways to determine what species should be planted on your buffer is to take inventory of what native tree and shrub species are already growing on or near the site. It is advisable to seek the assistance of someone familiar with specific trees and their habits, such as an urban forester or TDOF Area Forester, to help ensure the success of your planting. Following are just a few of the native tree and shrub species that might be appropriate for establishing a riparian buffer in middle Tennessee: (overstory trees) black willow, cherrybark oak, nuttall oak, red maple, shumard oak, swamp white oak, sweetgum, sycamore, tulip poplar; (understory trees and shrubs) elderberry, silky dogwood.

Please see the Helpful Resources Link on the TDOF Riparian Buffer web-site for additional resources on native tree species.

### **Site Preparation:**

Prior to planting, the site should be cleared of limbs, logs, trash, and other debris; bush hogged or mowed to reduce competing vegetation and to make the digging of holes easier (if necessary and not if significant tree and shrub saplings are already colonizing the site); and the limits of the planting area should be marked with white survey flags or white flagging tape.

(\*Note on the use of herbicides: under some riparian buffer programs, planting sites are sprayed with a broad spectrum herbicide, such as glyphosate, after the site is prepared by mowing or bush hogging. In such cases herbicides are general applied twice, with the second application be applied after visible regrowth of vegetation following the first spraying. However, after such spraying the site should be overseeded with an appropriate native, non-invasive ground cover to prevent soil erosion, such as Virginia wild-rye with a mix of native wildflowers. While this approach will initially reduce the amount of competing vegetation and some unsightly weeds, it does come at increased financial costs and physical labor, and does introduce a significant chemical load onto the site and potentially into the adjunct waterway. Under the TDOF Riparian Buffer Program, we have elected to not use chemical treatment of planting sites. Qualitative analysis of planting sites to date indicate no significant negative impacts on

the plantings by uncontrolled competing vegetation. The only downside observed to date is that some sites will be dominated by tall and unsightly annual weeds until the planted trees gain enough height to begin to shade out competing weeds. The sight of such unsightly weeds can be mitigated to some extent where necessary by planting a line of larger native 1" caliper container or B&B trees at an approximate 10 foot spacing with container or B&B native shrubs planted between the trees to establish an effective visual screen until the seedlings planted in the buffer gain enough height to begin to shade out competing and unsightly weeds.)

TN One-Call should be contacted at 811 ([www.tnonecall.com](http://www.tnonecall.com)) at least two weeks in advance of planting to verify the presence or absence of underground utilities.

If underground utilities are located, the utility owner should be contacted to determine any limits on plant material allowed and their proximity to the underground utility. For information on species suitable for planting near underground sewer lines, visit:

[http://www.murfreesborotn.gov/uploadedFiles/government/water\\_and\\_sewer/stormwater/Residents/sewersafetrees.pdf](http://www.murfreesborotn.gov/uploadedFiles/government/water_and_sewer/stormwater/Residents/sewersafetrees.pdf)

If overhead utilities are present, the utility owner should be contacted to confirm the extent of any utility easements and any limitations of plant materials allowed within the easement area. Even if a utility easement is not present, do not plant trees that are capable of reaching heights of 30 feet or more under or near power lines. Small maturing native trees and shrubs are more appropriate for these sites. For more information on species suitable for planting under or near overhead utilities, please visit: [http://www.tva.gov/power/rightofway/trees\\_shrubs.htm](http://www.tva.gov/power/rightofway/trees_shrubs.htm) and <http://www.nashvilletreefoundation.org/powerline.html> .

### **Local Ordinances**

In some cases, there may be local landscaping or storm water ordinances that could affect such buffers. Local planning offices and storm water programs can be helpful in determining if such regulations might govern a potential riparian buffer, and should be consulted in advance of buffer planning.

### **Stream Access and Views:**

In some cases, access to or a view of a creek or stream may be desirable within a riparian buffer. The size of such access area relative to the overall buffer should be kept as small as possible. These areas can provide access to the waterway for fishing, wading, launching a canoe, or for simply sitting and/or picnicking near the stream. The general area of the access or view should be carefully considered and then outlined on the ground in some manner. It may be helpful for one person go to the area from which a stream view will be seen to guide a second person in delineating that view on the streamside itself. If a sitting/picnic access area is desired, after the area is delineated you may wish to place the desired number of lawn chairs or a picnic table in the area to be sure that it is size appropriately.

Low growing vegetation and trees should be left in place along the stream bank adjacent to the access area to prevent erosion, while a small maintained area of mowed grasses or a native non-invasive ground cover should be used within the access area to prevent soil erosion. Low growing native shrubs should be used throughout the access area if access is not needed but rather a view is desired. Whether for access or a view, an overhead canopy from adjacent trees should be allowed to shade the area, both for the comfort of people using the site and for the benefit of the stream and its fish and wildlife.

## **Estimating Number of Seedlings and Trees Needed**

### Bare Root Seedlings:

A seedling planting density of 6 feet x 6 feet is recommended for establishing riparian buffers, which is 1,210 seedlings per acre. One acre covers 43,560 square feet. This high planting density of seedlings will help establish a dense and effective buffer, and allow for some potential mortality among seedlings.

To determine how many seedlings are needed, multiply the average depth of the buffer by its length; then divide that number by 43,560 (square feet); then multiply that number by 1210 (seedlings per acre). This will give you the total number of seedlings needed for your buffer.

Example seedling number calculations are as follows:

Planting a buffer 30 feet wide x 100 feet long = 3,000 sq. feet divided by 43,560 sq. feet per acre=0.07 acres x 1210 seedlings per acre =85 seedlings

Planting a buffer 50 feet wide x 100 feet long = 5,000 sq. feet divided by 43,560 sq. feet per acre =0.12 acres x 1,210 seedlings per acre = 145 seedlings

Seedlings are generally available in multiples of 100, so you may need to round up to the nearest 100.

### Container or B&B Trees:

Container or B&B trees ( ½" to 1" caliper) and container or B&B shrubs are often used along the outer edge of a buffer (away from the waterway) to establish a visual screen between the public and the buffer itself, especially for sites that are excessively weedy and are adjacent to public parks, private businesses and residences. In these cases, container or B&B trees are planted along the outer edge of the buffer at a spacing of approximately 10 feet, with one or more container or B&B shrubs spaced between each tree.

To determine the number of such trees needed, divide the total length of the buffer edge to be screened by 10, and that number will be the approximate number of trees needed. Approximately the same number, or more, of shrubs may be planted one or more between each tree.

For example, a buffer of 1000 feet in length would require approximately 100 container or B&B trees, and approximately 100 shrubs to establish a visual screen.

### **Sources of Native Seedlings and Trees:**

Tennessee Division of Forestry Seedling Order Form:

<http://www.tn.gov/agriculture/publications/forestry/seedlingcatalog.pdf>

Pick-TN-Products-Flowers, Plants, and Trees:

[http://www.picktnproducts.org/Flowers\\_trees/index.html](http://www.picktnproducts.org/Flowers_trees/index.html)

<http://www.agriculture.state.tn.us/Marketing.asp?qstring=HNP#mid>

### **Handling and Planting Bare Root Seedlings:**

Keep seedlings in their shipping bag(s), and keep them cool and out of direct sun until they are ready to be planted.

One to three hours prior to planting, remove seedlings from their shipping bag(s) and place in buckets of water to hydrate the roots. Keep out of direct sun.

With a shovel, remove all turf from where a seedling is to be planted to a width of 2 feet. Discard the excavated turf.

Dig a hole with a shovel approximately 2 feet wide and deep enough to accommodate all roots of the seedling. If a planting hole cannot be dug deeply enough to accommodate all roots in a vertical position, you may dig a horizontal trench out from the planting hole deep enough to bury long roots. Place the excavated soil dug from the hole in a bucket to be used to backfill the hole.

Remove a seedling from the bucket of water, separate and spread the roots, and place the seedling into the planting hole.

Be sure that the seedling is placed in the hole so that all roots will be underground. The seedling root flare (a slightly swollen area just above where the roots begin, also indicated by a change in bark color) should be level with or just below the soil surface when the hole is filled. Be sure the seedling is straight up in the hole, and is not leaning.

While holding the seedling straight up in the hole, backfill using soil collected in the bucket when the hole was dug. Be sure that there are no exposed roots, and discard any rocks, bricks, or other such debris. Gently firm the soil around the seedling, but do not compact the soil. Make sure that the seedling is straight up in the hole.

Seedlings should be spaced in a random pattern approximately 6 feet apart.

For more information on planting seedlings, visit: <http://tn.gov/twra/pdfs/treeplanting.pdf>

### **Handling and Planting of Container or B&B Trees and Shrubs:**

Keep container and B&B trees and shrubs well watered until ready to plant.

Dig a hole twice the width of the container or root ball with sloping or flared sides wider at the top than at the bottom.

Remove the container from the tree before placing it in the hole, or for B&B trees place the tree in the hole and then remove any wires or string holding the burlap in place and fold the burlap down the sides of the tree toward the bottom of the hole.

Position the tree so the root flare is at or just above ground level, and be sure that all roots will be buried when the hole is backfilled.

Backfill the hole with the same soil that came out of the hole, do not add soil amendments.

Apply 3 to 4 inches of mulch around the tree, but not against the trunk of the tree itself.

Do not apply tree wraps or stakes, unless the tree will not stand upright on its own. If stakes are needed, please remove after the first growing season.

Water thoroughly after planting, and during dry periods the following growing season.

### **Volunteers:**

Generally, you can expect volunteers to plant approximately 6 bare root trees per hour. In order to ensure adequate supervision of the planting, there should be 1 supervisor for each 10 to 15 volunteers. Optimum volunteer crew size is 10 to 30 volunteers with 1 to 3 supervisors, depending on the number of volunteers. Optimum planting time for volunteers is about 3 hours. The following will help in determining approximately how many bare root seedlings a volunteer crew will plant in an hour:

A volunteer crew of 10 could be expected to plant approximately 60 seedlings per hour or 180 seedlings in 3 hours.

A volunteer crew of 15 could be expected to plant approximately 90 seedlings per hour or 270 seedlings in 3 hours.

A volunteer crew of 30 could be expected to plant approximately 180 seedlings per hour or 540 seedlings in 3 hours.

The above estimates are for bare root seedlings based on each volunteer working alone. If volunteers are working in teams of 2, then the total number of seedlings planted will be reduced by 50%. If larger stock trees are used, reduce the number of trees planted per volunteer by about 50%. Soil conditions will also affect the number of seedlings planted, as soft loose soil free of roots, rocks, and other debris will be easier to dig in, while hard compacted soil with roots, rocks, and other debris will be harder to

dig in. It may be helpful to dig a few test holes prior to recruiting volunteers to determine how difficult or easy the digging will be, and to then recruit volunteers accordingly.

### **Materials and Supplies:**

Certain supplies and materials, or in some cases all supplies and materials, may be provided by the organizer of the buffer planting, while in other cases volunteers can be asked to bring some supplies and materials themselves. Generally, it is preferred for the buffer organizer and its partners to provide as many of these items as is possible. Local beautification, watershed, or municipal storm water programs can often provide assistance with some of these items.

The sponsoring organization should provide, at a minimum, the following for each buffer project:

The appropriate number of bare root seedlings and 5 gallon buckets for soaking seedlings prior to planting. Seedlings should be placed in 5 gallon buckets onsite (50 to 100 seedlings per bucket of water) 1 to 3 hours prior to volunteers arriving to ensure that the seedlings are well hydrated before planting.

Mulch if planting container or B&B trees or shrubs. Many municipalities provide free mulch from chipped and ground yard waste and tree trimmings, which can generally be loaded into a pickup truck or trailer and brought to the site. Or, a pickup or trailer load of mulch can be bought, or mulch can be bought by the bag.

Each volunteer or team of volunteers should either bring with them or be provided the following:

1 five gallon bucket for each volunteer, or for each team of 2 volunteers (for holding excavated soil)

1 shovel for each volunteer, or for each team of 2 volunteers.

1 pair of gloves for each volunteer

Water for the volunteers

### **Watering and Tree Maintenance:**

Seedlings planted correctly at the right time of the year do not require watering. However, watering of seedlings at the time of planting and during prolonged dry hot weather of the following summer can be helpful to ensure a higher survival rate.

All container and B&B trees should be thoroughly watered immediately after planting to settle the soil around the roots and to remove air pockets, and should be watered during periods of drought after planting for the first year.

For more information on tree care, please visit:

<https://utextension.tennessee.edu/publications/Documents/Sp574.pdf>

### **Tree Mortality:**

A certain limited amount of tree mortality is to be expected when planting bare root or container/B&B trees, especially when planting large quantities. However, by planting trees properly and at the right time of the year, and by providing adequate water and maintenance as needed, mortality should be low. If some of the planted trees appear to have died, they should be left in place and care continued long enough to see if they will resprout from the root or from buds the following growing season. This will often be the case for both bare root seedlings and container/B&B trees that appear to have died. If the trees do not resprout the following growing season, then they should be removed. Replacement may or may not be necessary on buffer plantings, as long the losses are minimal.

### **Buffer Maintenance:**

With the exception of within an access area, the riparian buffer should not be mowed after planting.

**Extreme caution should be taken to ensure that the outer edge of the buffer is well marked in a clearly visible manner, and that mowing crews are aware that they should not continue to mow within the buffer.** Natural, native vegetation will begin to populate the area along with the planted trees. Invasive species of weeds, shrubs, and trees, however, should be carefully removed by cutting and pulling. Common invasive species include Japanese honeysuckle, shrub honeysuckle, and privet. Any vines or shrubs that might overtake the buffer planting should be removed. For more information on invasive species, please visit the Tennessee Exotic Pest Plant Council's web-site at: [http://tneppc.org/invasive\\_plants](http://tneppc.org/invasive_plants) . In some cases, a local non-profit or business may be recruited to provide some oversight and minimal maintenance of the buffer. Otherwise, annual volunteer days should be organized to address these and any other maintenance needs

### **Neighbor Notification:**

In some cases, especially on larger projects on public lands within or adjacent to residential area, it is advisable to contact neighbors through direct mailing, signage on the site, or by going door to door with handouts, to ensure that neighbors understand what is being done and why. This is also a good opportunity to gain neighbor buy in and support by inviting them to participate in the planting.

### **Publicity:**

Especially for riparian buffers established on public property, efforts should be made to make the public aware of the newly planted buffer, its importance, and the partners involved. Riparian buffers established on public properties often provide opportunities to educate the public about the importance of buffers and to encourage them to establish such buffers of their property.

**Photo Documentation and Site Monitoring:**

One or more permanent photo points should be identified and marked on site and/or recorded on maps of the site. Before and after photos should be taken to document the project, and an annual photo taken each year thereafter during an annual site visit to document buffer progress through time. Additionally, records should be kept of the number and species of trees planted.

Annual site visits are important to ensure that buffer signs are up and that the buffer has not been damaged. Particular attention should be focused on any mowing that is being done adjacent to the site. Opportunities to visit with the mowing crew and/or site manager should be sought to help ensure that the site is not inadvertently mowed or otherwise damaged. Any maintenance needs should be identified and follow-up maintenance scheduled accordingly.