

Growing Healthy Streamside Forests

Stroud™ Water Research Center offers the following guidance for riparian buffer planning, planting, and maintenance. We have tested these techniques primarily in southeastern Pa. If your site is outside this region, please consider variations of temperature, invasive species, pests, and soils. If you enroll in the CREP program, a professional will work with you on a buffer plan.

Tree Health Depends on Tree Care



Photo: Will Parson/Chesapeake Bay Program

Thank you for choosing to grow a riparian forest buffer. Growing healthy streamside forests is one of the most effective actions we can take for healthier land, water, and wildlife. Let's get started!

1 CONFIRM GOALS AND SITE PLAN

Identify roles and responsibilities, particularly who will do or pay for specific tree care tasks.

Prepare a simple plan with budget, row layout, locations of wet vs. drier soils, and types of shelters and stakes. Include site preparation plans and tree care tasks to implement for at least three years.

If possible, set your buffer boundaries 100' out from the top of the streambank on each side of the stream; Stroud Water Research Center found 100' buffers to be adequately effective for protecting stream health. At minimum, buffers should measure 35' wide on each side of the stream.

Fifteen-foot-by-15' spacing provides for about 200 stems per acre, a common planting density if shrubs are included. You may choose a different density, but we recommend at least 125 trees per acre.

Decide if the first row will be near the stream edge (recommended) or farther back.

Decide whether to use herbicide circles or stone mulch or both around shelters for rodent protection. The Stroud Center installs gravel on bare ground or short grass and does not use weed fabric.

Decide how mowing will be done and who will do it. Tall vegetation competes with trees and provides cover for rodents that kill trees through chewing and nesting.

Plan and install site improvements (e.g., livestock fencing, crossings) prior to planting. Include gates for access if fencing will enclose the buffer.

If using a contractor to install the buffer, ask your local Natural Resources Conservation Service or conservation district office for a list of local contractors. Avoid contractors who are unfamiliar with restoration-scale projects.

2 SELECT TREE AND SHRUB SPECIES, THEN ORDER MATERIALS

Select *native* trees and shrubs that are adapted to riparian zones in your region and that are available from local wholesale nurseries.

Consider selecting a higher proportion of pioneer riparian trees and shrubs that grow quickly. Slower growing species like oaks should be

included, but if they dominate the planting, it will take longer to establish the buffer.

Shrubs are ecologically important and should comprise at least 25% of your plants. In deer-prone areas, plant tree-form shrubs in 5' tree shelters. You can protect multi-stem shrubs with wire enclosures. Five-foot tree shelters have advantages but must be cut open when growth fills the shelter.

Decide if you will plant shrubs in groups or disperse them individually in the same row as the trees. Shrub selection and placement should in part depend on the method of deer protection.

Decide on a spring or fall planting. Order plants, stakes, and shelters as early as possible, preferably during the prior season.

3 PREPARE THE SITE, THEN PLANT

Spot spray or remove invasive plants and plan for future invasive plant control.

If the site has acceptable groundcover (e.g., pasture), mow the site just prior to placing flags. If ground is bare, establish appropriate groundcover (avoid aggressive grasses) before planting.

Flag each planting spot, allowing room for mowing in long passes and room for turns. Space the rows based on the size of mowing deck, if known. Place flags in a grid pattern for rows in each direction or in an offset pattern for a less formal look. Align flags to follow stream meandering for efficient mowing and pleasant, curving sight lines.

If using herbicide around shelters, spray 3'-to-4'-diameter circles around each flag at least two weeks prior to planting. Use an aquatics-approved, broad-spectrum herbicide. Alternatively, and if planting in the spring, you can spray the herbicide circles after the trees are sheltered.

If using stone mulch for rodent prevention, see our guidelines in the next section.

Follow recommended planting procedures (see stroudcenter.org/restoration for a video demonstration), which will differ for bare root, small container, or potted plants. Many references for planting techniques are available online.

Planting with volunteers requires good planning, training, and oversight during the event.

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INSTALL SHELTERS

We strongly recommend tree shelters. They enhance growth and protect against deer, rodents, mowers, herbicide, and buck rub. Grasses and weeds are difficult to control without shelters. Stroud Center research has shown that many leading brands of shelters are effective. Only 5' shelters protect against deer. Four-foot shelters are suitable if no deer pressure exists. All shelters should have a perforation that splits as the tree outgrows the shelter.

Stakes can be synthetic, white oak (other oak species will rot), or pressure-treated oak, but choose wisely for long-term performance. For 5' shelters, standard wood stakes are 1" by 1" by 5' long. Consider flexible synthetic stakes on flood-prone sites where overland currents are strong during flooding.

In flood-prone areas, stake on the upstream side of the shelter. Elsewhere, stake on the side facing prevailing winds.

Install bird nets on shelters to prevent bird and tree mortality (unless tree is within 8" of the top of the shelter). Pull net over the shelter to form a half-dollar-sized hole for the tree to grow through in case the nets are neglected. Do not leave a tassel at the top of the net: it entangles the tree.

Bury shelter about 1" deep in the soil at planting time and reset to maintain this approximate depth through year four. Do not bury the shelter too deeply, as this may damage surface roots.

Shrubs may require different kinds of deer and vegetation protection, such as wire cages or fencing, but use 5' tree shelters for tree-form species of shrubs. Cut open tall shelters housing multi-stem shrubs after two to three years to allow multi-stem shrubs to spread out.

Install stone mulch, if used. Apply 20 to 25 pounds (two heaping shovels full) of 2A-modified gravel to form a 12-15"-diameter ring around and against the base of each shelter as a rodent barrier. See our stone mulch fact sheet at stroudcenter.org/restoration for more guidance. Stroud Center trials since 2013 show stone mulch is as effective as herbicide against rodents and provides longer lasting protection.

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MAINTAIN SO TREES SURVIVE

Don't plant a buffer without a detailed maintenance plan showing who will do what and when.

Mow the alleys between tree rows at least two or three times during the growing season for the first three years, making sure grass is



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low going into winter, when risk from rodents is high.

If using herbicides instead of stone mulch, spray approved broad-spectrum herbicide once in the spring and again in late summer or fall to clear a 3'-to-4'-diameter area around each shelter.

Add approved pre-emergent herbicides in the tank mix *only* if exact or lower rate is precisely applied to prevent tree mortality or stunting from the pre-emergent.

Routinely straighten leaning shelters and replace broken stakes.

Replace missing nets and remove nets from shelters where tree is within 6" of the top.

Watch for winter frost heaving of tubes and rebury if a gap develops under the tube.

Lift and weed shelters containing unwanted growth. Remove vining plants that strangle trees.

Be aware that, where common, bears may damage tree shelters as they seek insects nesting inside the shelter. Replace any damaged shelters.

Monitor mortality and replant dead trees, ideally in the second or third year after planting (watch for seedlings that appear dead but are fully viable and will re-sprout later in the season).

Straighten badly leaning trees with stakes and ties as early as possible.

IMPORTANT: If deer are present, leave shelters on trees until trees are 4" in diameter at the top of the shelter. Deer aggressively scrape their antlers on smaller trees, often killing the trees.

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A WORD ON WEEDS

In southeastern Pa., invasive plants growing inside tree shelters are a challenge. The Stroud Center applies a granular, pre-emergence herbicide called Snapshot *inside* shelters (3/4 teaspoon per shelter) to prevent weed seeds from germinating. This is done in late February and again in mid-May each year until trees are out of shelters (one to three years).

Visit stroudcenter.org/restoration/resources for more tips on preventing weed seed germination in shelters.

Questions?

Email us at buffers@stroudcenter.org to speak with one of our watershed restoration professionals.