

Landowner Guide to **Buffer** Success

A comprehensive seasonal guide for your forested buffer project

A Forested Buffer Success Story

Before and After

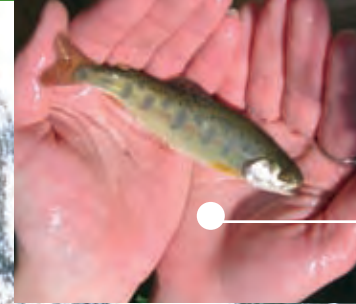
These photos show the recovery possible in 12 years. On the left is the “before shot” from a small bridge, prior to buffer planting in 1995. On the right, is the same view 12 years later. Trout have now spawned here after being unable to for many decades. Forested buffers are an important part of a bigger effort on the whole stream.



Before



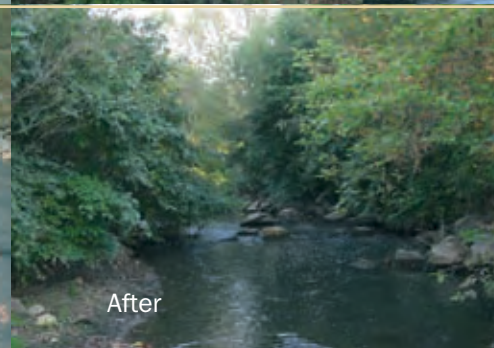
After



A young brown trout born in the stream.



Before



After

The photos on the left show before and after shots 40 yards upstream from the photos above. Success like this requires active care.



An Introduction to the Landowner Guide to **Buffer** Success

Dear Landowner;

You have decided to restore a forested buffer that will provide benefits to you, wildlife, your stream and in countless ways downstream.

The purpose of this guide is to help you succeed in your goal. This guide includes insights from dozens of conservation professionals with hands-on experience with hundreds of sites. Probably the single most important task is to apply herbicide around tree shelters in spring and late summer.

Herbicides boost the survival rate and growth rate to get your trees quickly past their most vulnerable stage. Good work at key tasks in the first three years will give major payoffs in the long run. This guide is written especially for participants in the USDA's Conservation Reserve Enhancement Program (CREP), but the insights are highly relevant to forested buffer restoration via many other efforts.

We suggest hanging this guide on a wall where it can be a convenient reminder for the next few years.

We also hope the attractive photos inspire and remind you of the end goal of this work. Many resources and many efforts, public and private, ours and yours, are going into buffer restoration efforts. We wish you much success and believe this guide can help.

Yours in Conservation,

USDA Farm Service Agency, USDA Natural Resources Conservation Service, PA Department of Environmental Protection, PA Game Commission, Chesapeake Bay Foundation, Western Pennsylvania Conservancy, Center for Rural Pennsylvania, Ducks Unlimited, PA Association of Conservation Districts, PA Department of Agriculture, PA Department of Conservation and Natural Resources, PA Fish and Boat Commission, Partners for Fish and Wildlife, and the State Conservation Commission.

We suggest hanging this guide on a wall where it can be a convenient reminder for the next few years. We also hope the attractive photos inspire and remind you of the end goal of this work.



**CHESAPEAKE BAY
FOUNDATION**
Saving a National Treasure



In this guide you'll find:

- *Activities by season that are key to success*
- *Tips to save time and improve outcomes*
- *Blank areas for making notes for future use (how many ounces of product for your sprayer, etc.)*
- *Attractive photos with informative captions*
- *A summary of how trees help streams*
- *Complete details and additional references*

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February—March

Check Your Tree Shelters



Leaning shelters allow rodents easy entry and could allow herbicide to reach and harm trees. Downed shelters will kill trees. A few seconds can correct leaning or downed shelters.

Avoid damage from nets. Fast growing trees can add 12-18" or more in spring. Remove nets on any tree likely to reach nets this season. Clip off any twisted trees below the twist to reduce long-term damage.



Steps for Success

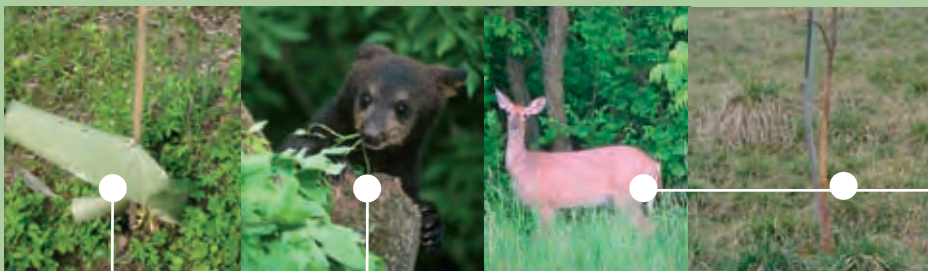
Late Winter

Keys to Success in February & March

Check tree shelters and stakes

1. Fix any downed, damaged, or leaning shelters
2. Re-drive any loose stakes, replace any broken or rotten stakes
3. Remove nets from trees that will reach nets this season
4. Remove any wasp nests
5. Mark any missing or obviously dead trees. Replant when appropriate.
6. At the proper time, remove shelter if needed (see the following pages)

Tips: Do tree shelter checks after the year's frost heaving is ended, but before the spring rush of other work, and before the wasps become active. Carry some extra shelter ties or wire, a few stakes, and a hammer to re-drive loose or replacement stakes.



Wasp nests can plug shelters, preventing tree emergence. Nests also attract bears and other hungry mammals, leading to tube damage like this.

Deer can browse and rub trees. Protecting young trees for a few years is critical if reforestation is to provide key benefits for many years to come.

Work Records for tree shelter checks:

Years Checks are needed	Date Done:	Notes:
1*		
2*		
3*		
4*		
5*		

* Please note that a few slow-growing trees, like oaks, may still be in shelters in years four, five, or later and may require continued shelter checks.

February—March

Check Your Tree Shelters

Brief Summary On Tree Shelter Removal:

If your tree shelters have a vertical perforated line (designed to split as the tree grows), they can be left in place unless specifically causing damage. On sites planted through 2007, only Tubex™ brand shelters had this feature. If your shelters lack a vertical perforated line, remove shelters from trees that are 1.5 to 2 inches in diameter at top of shelter. On sites with real worries about voles and buck rub, perhaps wait longer, but monitor closely to avoid damage/disease caused by shelters.

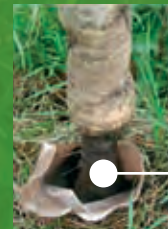
If removing shelters, leave any wooden stakes in place to deter buck rub and to mark tree locations. Remove all non-biodegradable stakes before entrapped by trunk for tree health and human safety.

Steps for Success

Late Winter

Shelters provide huge boost to survival and growth by allowing easy application of herbicide to keep voles from damaging trees, but most types will need to be removed manually.

Tubex™ shelters installed on CREP sites through 2007 were either green or white. Both colors have the vertical perforated line that should allow most of these shelters to come off by themselves. Numerous contractors used green Tubex™. Williams Forestry used white Tubex™ on many sites. All other types of shelters will need to be removed manually. Don't confuse white Tubex™ shelters (which can be left on trees) with other white shelters that lack perforated lines and will need to be removed.



Damage from a shelter left on too long. Serious disease and death can occur even before trees fill and touch shelters.

Shelters help deter voles and buck rub. If you must remove the tube, balance the overall risks.



Tight shelters can cause water and debris to become trapped. Disease and rot can follow.



Details on

Tree Shelter Removal:

Q: Why must most types of tree shelters be removed at 1.5 to 2 inches tree diameter?

A: As trees grow, shelters can injure or kill trees. Even before trees reach shelter diameter at the top of the shelter, trapped water and debris can cause disease and rot. Actual girdling of trunks can also occur. The trunk's wide flare at ground level is the first likely point of damage. Despite many claims by manufacturers, most types of tubes do not degrade or split adequately to prevent this damage.

Q: What else should I consider?

A: Consider the risks of removing shelters for your specific site (from voles, buck rub, herbicide, mowers). Balance this with the risk of leaving the shelters in place a bit longer. For example, if your site has lots of voles (common), the benefit of being able to easily spray herbicide around trees may outweigh the risk of leaving tubes in place a bit longer. Regular checks will give you key information to help make decisions. Agency staff in Maryland are testing the idea of cutting the shelter's full length, but leaving it in place a bit longer. Results are not clear at present.

Q: Where can I get more information?

A: The detailed text at the end of this document (p.24) has more information. You can also ask the conservation professional that assisted you with project design.

Buffers and Livestock:

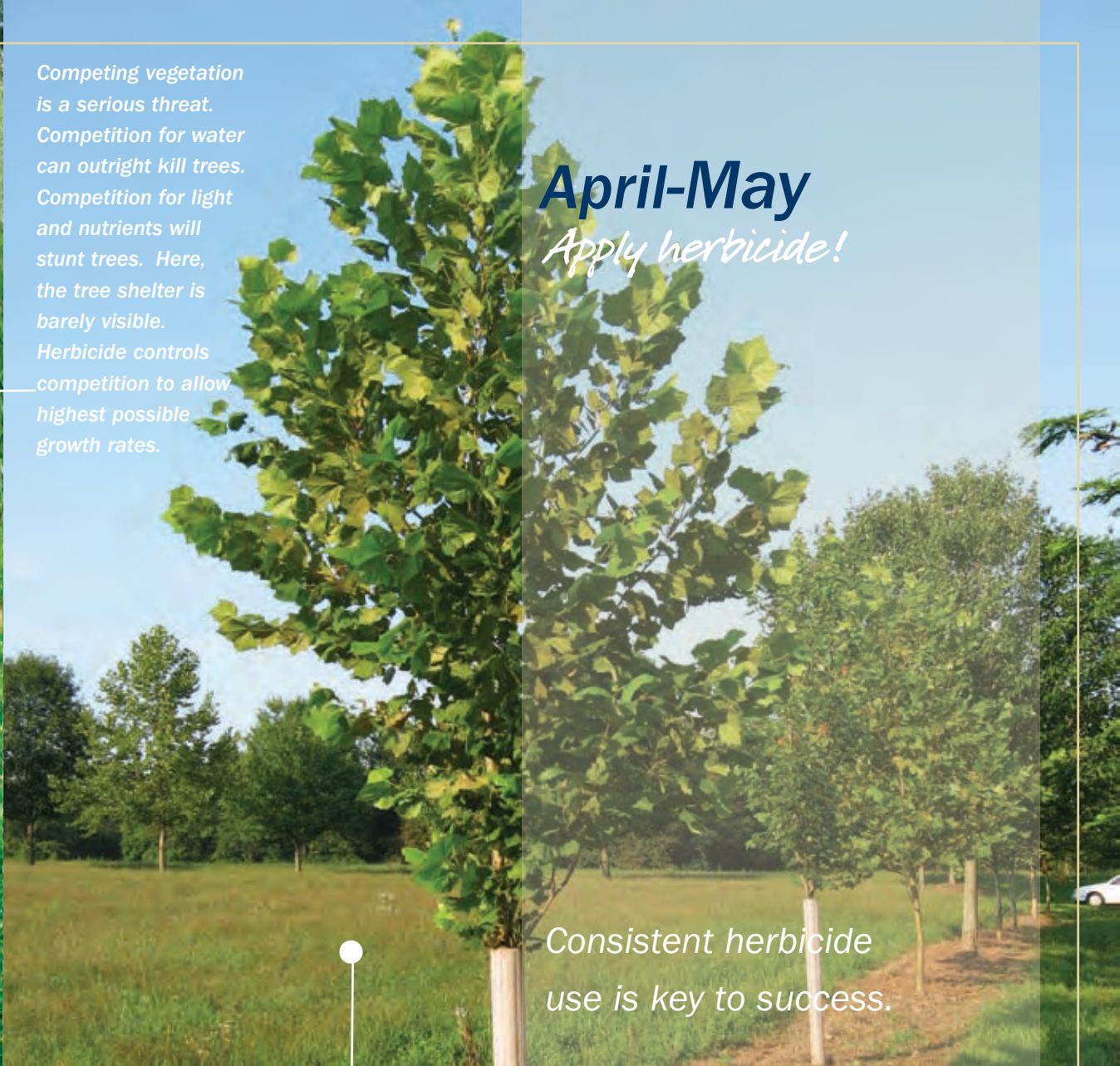




Competing vegetation is a serious threat. Competition for water can outright kill trees. Competition for light and nutrients will stunt trees. Here, the tree shelter is barely visible. Herbicide controls competition to allow highest possible growth rates.



While spraying in continuous strips is best, spot spraying can also be effective. These rings should be larger to prevent unsprayed plants from overtaking the area later in the season.



April-May
Apply herbicide!

Consistent herbicide use is key to success.

Consistent herbicide use is key to success. Probably no other step is so vital to project success. Spraying continuous strips is best.

Steps for Success
Spring



Herbicide use combined with mowing produces robust growth. Be sure not to spray herbicide on trunks after shelters are removed since injury or death will result. Mowing is allowed in the first 2-3 years after planting. Mowing on this site should stop unless there is a severe problem with voles.

Keys to Success in April-May

Herbicide Application Around Tree Shelters

Apply broad-spectrum herbicide (such as Roundup Pro™) around sheltered seedlings to protect them from rodents and to reduce competing vegetation. **Regular herbicide use is probably the single most critical step for overall success.** Adding a pre-emergent herbicide is advisable during this spring application.

1. Ideally, spray 6-foot wide strips centered on shelters (particularly if mowing is part of plan) but 4-6 foot diameter spots are OK.

2. Always follow label instructions. Most herbicides are highly toxic to desirable trees, shrubs, and stream life.

3. In general, apply herbicide in April in southern Pennsylvania, and in May in northern Pennsylvania. If unsure, consult your CREP staff.

4. For more information, see detailed text on page 25. Check the next pages for more spring buffer success activities.

Tips: Adding a pre-emergent herbicide to your spray mix will extend the benefits of your spraying by suppressing regrowth. See page 25 for details. While out in the buffer, also remove any nets as needed. Watch for any noxious or invasive plants. Early detection and treatment is key.

Work Records:

Years Spray is Needed:*	Date Done:	Products, rates, amounts used, and other notes for future reference:
1*		
2*		
3*		
4		
5		

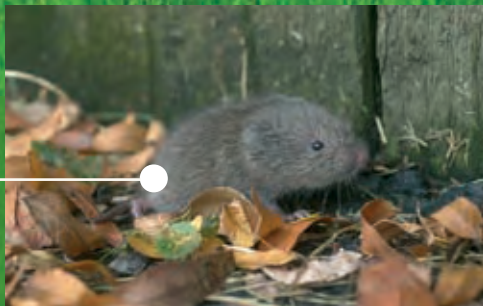
* Spray is critical in years 1-3. In years 4 and 5, there may still be a few trees in shelters that would benefit.

April-May Use Herbicide to Reduce Vole Damage

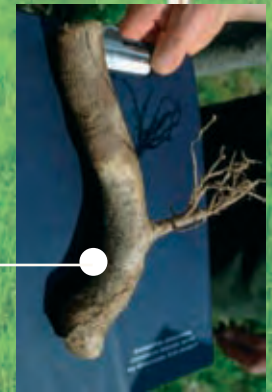


Nurseries and orchards rely on “clean culture” via herbicides to control vole damage by eliminating their food and cover. To date, voles are a lead cause of reforestation project failures.

Voles are small, mouse-like mammals that have been known to give birth to over 70 young in a year. Population surges are common.



Voles can damage and kill trees until they reach 4-5” diameter. Herbicide use is key to getting trees quickly past this vulnerable stage via vigorous growth.



Voles can tunnel beneath tree shelters, even those installed to depths of 3” or more. Gnawing on roots and stems is often fatal, and always stunts growth. Here, over 90% of roots have been eaten by voles.

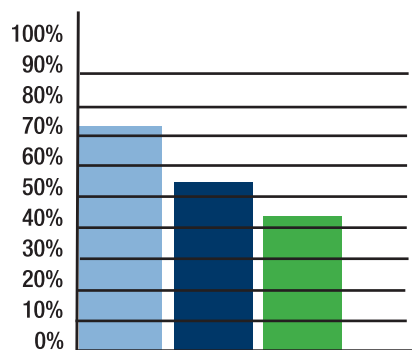
Severe vole problems may require use of a rodenticide containing zinc phosphide which is economical and effective. Consult your project advisor. Measures in fall are even more important. See pages 17, 25, and 27 for more information. The above landscape-view photo shows a site with the barest minimum protection. Herbicide kill spots should be wider. Continuous strip application would be better.

Steps for Success Spring

Keys to Success in April-May Herbicide Application Around Shelters

The graphs below show the key benefits of herbicide use around sheltered plants. Note that mere survival is not the goal – the goal is reforestation. In the second graph, only those plants protected by both shelters and herbicide were gaining size. Declines in height in the second graph were due largely to voles killing the main leader, followed by resprouting of shorter side leaders. Robust growth is the goal and routine herbicide use is probably the single most cost-effective step to aid this.

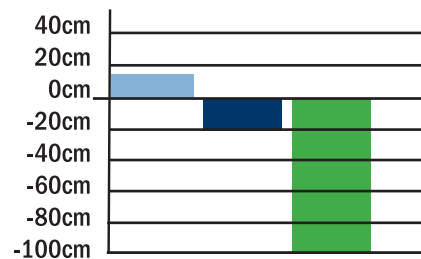
Tree SURVIVAL after two years:
Herbicide Helps



Percent Survival after Two Years
(Source: CBF research at Hopeland Farm)

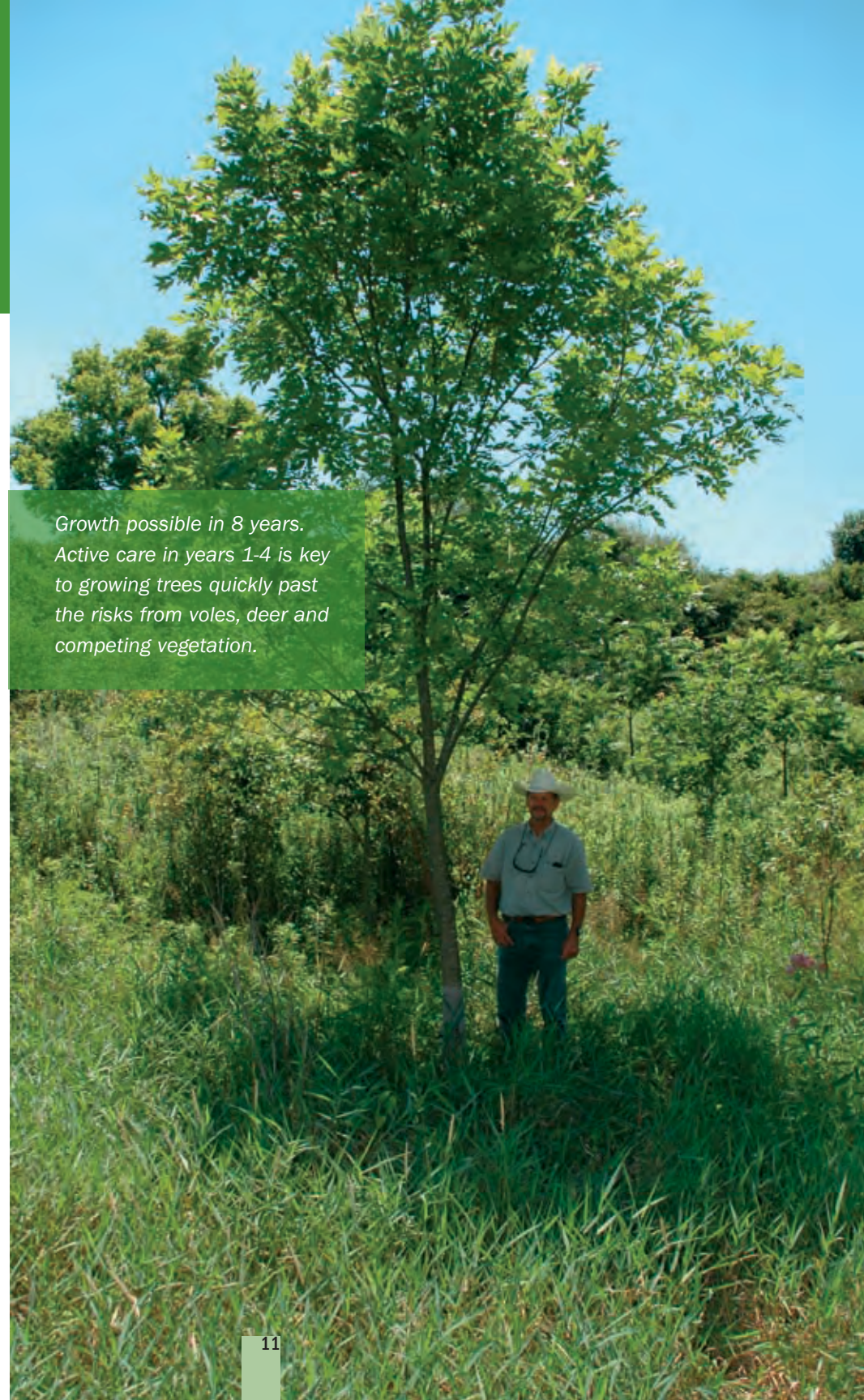
- Herbicide + Shelter
- Shelter Only
- Neither Herbicide nor Shelter

Tree GROWTH after two years:
Herbicide Is Key To Growth



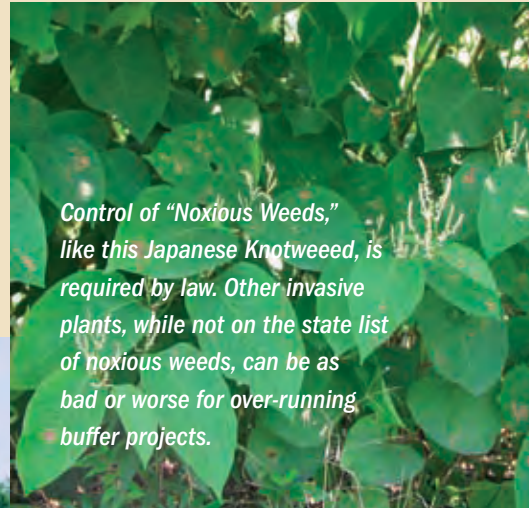
Growth (centimeters) after Two Years
(negatives mean loss of height)
(Source: CBF research at Hopeland Farm)

*Growth possible in 8 years.
Active care in years 1-4 is key
to growing trees quickly past
the risks from voles, deer and
competing vegetation.*





Control problem weeds before they set seed.



Control of "Noxious Weeds," like this Japanese Knotweed, is required by law. Other invasive plants, while not on the state list of noxious weeds, can be as bad or worse for over-running buffer projects.

June-August Managing Vegetation



Mowing is allowed in CREP buffers for the first 2-3 years after planting. Mowing decreases competing vegetation, suppresses rodent populations, and can help control noxious and invasive weeds.



A young buffer well on its way due to proper management of competing vegetation.



Early detection and treatment of noxious and invasive plants can avoid major infestations and treatment costs.

Steps for Success Summer



Keys to Success in June-August

Managing Vegetation that was Not Sprayed in Spring with Broad-Spectrum Spray

1. Early detection and treatment of noxious and invasive plants can avoid major infestations and treatment costs. Best control strategies vary by species. Consult detailed text (p.26), references and/or professional for more information.
2. Mowing is allowed in CREP buffers during the first 2-3 years. Mowing is a useful tool in controlling weeds and voles, but delays natural tree regeneration for those years. Discuss appropriateness of mowing with CREP staff. Wide-spread mowing after year three is not permitted unless vole concerns are severe.

Tip: When spot spraying for noxious or invasive weeds, consider a selective herbicide such as 2,4-D that kills broadleaf plants, but not grasses. Using a broad spectrum herbicide (like Roundup Pro™) will kill broadleaf plants and grasses. This leaves bare soil where weeds will flourish in the future since there is no grass to suppress them.

Tips: If mowing will be a part of your management, spray 6' wide continuous herbicide strips in spring (instead of spots) centered on shelters. This will allow mowing of all live vegetation without bumping shelters and breaking stakes. Mow unwanted plants before they set seed. A late season mowing will reduce vole cover going into winter.

Work Records:

Date:	Notes on activities, products, rate, etc.



State-listed noxious weeds such as this Canada thistle must be controlled under state law.

State-listed Noxious Weeds Control required by law

Canada Thistle (*Cirsium arvense*)

Multiflora Rose (*Rosa multiflora*)

Johnson Grass (*Sorghum halepense*)

Mile-a-minute (*Polygonum perfoliatum*)

Kudzu-vine (*Pueraria lobata*)

Bull or Spear Thistle (*Cirsium vulgare*)

Musk or Nodding Thistle (*Carduus nutans*)

Shattercane (*Sorghum bicolor*)

Jimsonweed (*Datura stramonium*)

Purple Loosestrife, including all cultivars (*Lythrum salicaria*)

Giant Hogweed (*Heracleum mantegazzianum*)

Goatsrue (*Galega officinalis*)

Marijuana (*Cannabis sativa*)

Other Invasive Plants – control highly recommended

Common Reed (*Phragmites australis*)

Japanese Knotweed (*Polygonum cuspidatum*)

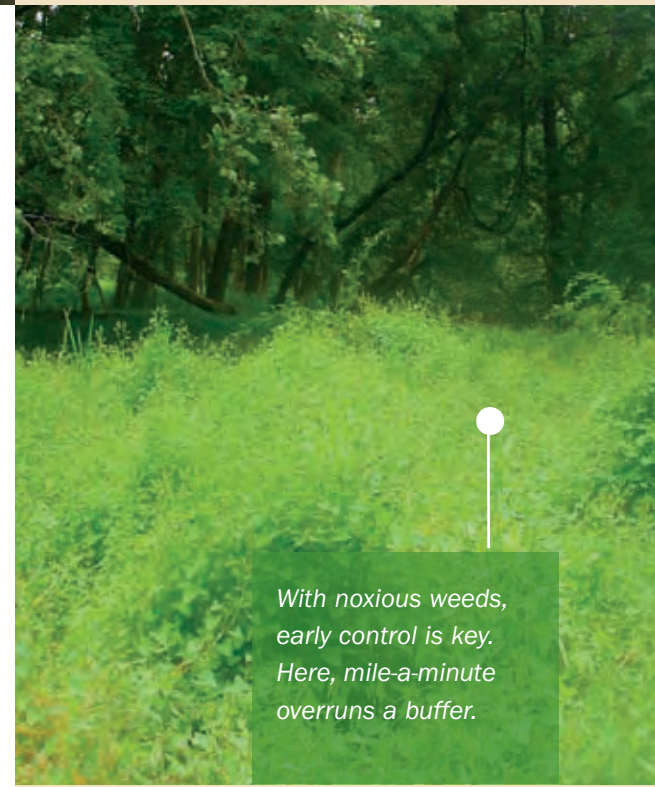
Reed Canary Grass (*Phalaris arundinacea*)

Japanese Honeysuckle (*Lonicera japonica*)

Japanese Hops (*Humulus japonicus*)

Oriental Bittersweet (*Celastrus orbiculatus*)

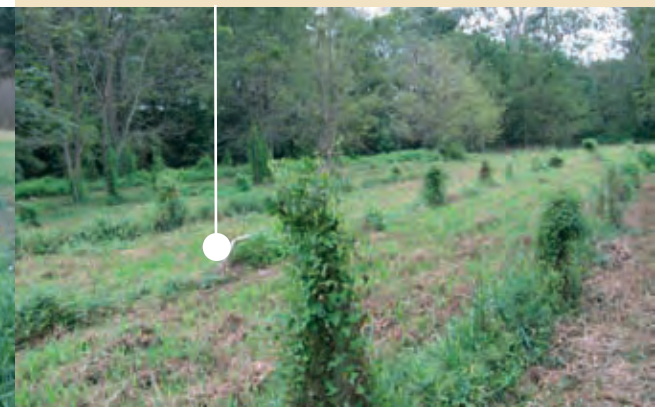
Tree-of-Heaven (*Ailanthus altissima*)



With noxious weeds, early control is key. Here, mile-a-minute overruns a buffer.

Mowing is allowed in the first 2-3 years and can be a useful tool in controlling weeds.

Best control strategies vary by species. Mile-a-minute beginning to overtake a buffer.





Japanese Knotweed, an invasive plant, is common along waterways.

Identification of Common Noxious and Invasive Plants in Riparian Areas



Canada Thistle



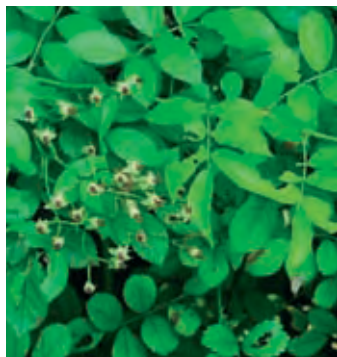
Japanese Knotweed



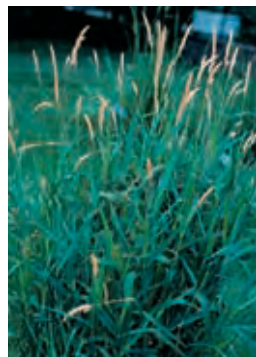
Mile-A-Minute



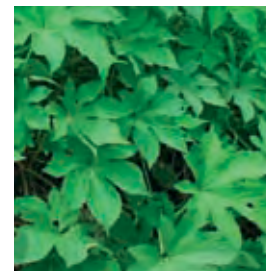
Tree-of-Heaven



Multiflora Rose



Reed Canary Grass



Japanese Hops



Common Reed



Oriental Bittersweet

For further help in identifying and controlling noxious and invasive plants, you can refer to Alliance for the Chesapeake Bay's **Pennsylvania Field Guide: Common Invasive Plants in Riparian Areas**, on line at <http://www.acb-online.org/pubs/projects/deliverables-145-1-2004.pdf> or purchase by calling **717-737-8622**.

Photos provided by Deborah Rudy, Alliance for the Chesapeake Bay, and from The University of Nebraska-Lincoln



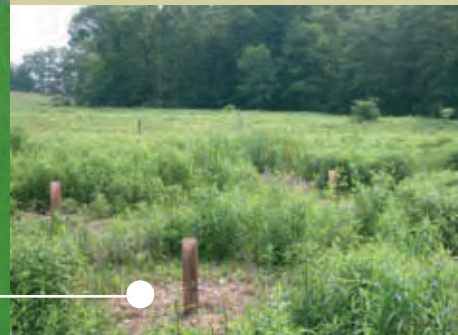
August-October

*Make Another
Herbicide Application
Around Tree Shelters*

Vole damage on tree roots. These trees were three years old and 6-12' tall. Vole control efforts in fall are key since much damage occurs during winter. Use herbicide in early fall to help keep voles away from trees. Late fall is an ideal time to reduce severe vole populations – see text on page 17.



Spot spraying requires large spots to be effective, 4-6' in diameter. Combined with mowing (allowed in first 2-3 years), continuous strips provide fuller control of competing vegetation and voles, but delay any natural tree establishment for a few years.



Regular use of herbicides around shelters is key for highest possible survival and growth rates and faster canopy closure. Shade is a great deterrent to many of the worst noxious weeds and invasive plants since they prefer high light conditions. Here is a 12-year old buffer.

Steps for Success

Fall

Right: Sprayed spots should be 4-6' in diameter. This site needs its next herbicide application.



Left: Spring peepers spend early lives in water as tadpoles. Below: Mayflies spend most of their lives as nymphs in streams.

Follow all herbicide label instructions. The surfactant in Roundup Original™ is highly toxic to aquatic life! Formulations like Rodeo™ can reduce this risk.

Keys to Success in August-October

Make Another Application of Herbicide Around Shelters

Apply a broad-spectrum herbicide (like Roundup Pro™ or other glyphosate product) around sheltered seedlings. This application is like the one done in spring, but the pre-emergent can be omitted. Spraying can be done from mid-August through early October, depending on your region and site-specific conditions. This application will control competing vegetation and will create bare soil conditions around tree seedlings. This spraying is a key defense against voles during winter when a lack of other food often leads to damage on trees.

Fall is also the right time to consider additional steps to avoid vole damage over winter. A late fall mowing removes cover for voles and increases predation. Mowing is allowed in CREP projects during the first 2-3 years. Wide spread mowing beyond year 3 for control of voles or noxious weeds requires special permission. If not needed for vole control, omitting mowing may increase natural tree regeneration – particularly in northern PA where that potential is higher. Extreme vole problems may justify the use of an economical rodenticide containing zinc phosphide, applied by a professional. Consult your CREP project staff to discuss mowing or rodenticides. More information is available at right.

Tips: This spray is especially critical on sites where substantial regrowth in treated areas has occurred since spring. Competing vegetation can be an issue in late summer/early fall. Addressing regrowth of any grass is key, since voles prefer grass over broadleaf plants for food and cover. While working, pay attention to tree health, whether there are invasives regrowing and other details. Also mark any dead trees for replacement later.

Right: These trails are tell-tale signs of vole activity. Herbicide, mowing, and rodenticide are all helpful tools to prevent vole damage to trees.



Additional information on voles:
Penn State University site (good overview, no photos):
<http://pubs.cas.psu.edu/freepubs/pdfs/uh094.pdf>

Cornell University site (good overview and photos):
<http://nysipm.cornell.edu/factsheets/treefruit/pests/vole/vole.asp>

University of Maryland site (also tells how to assess vole levels) <http://www.agnr.umd.edu/MCE/Publications/Publication.cfm?ID=146&cat=8>

Right: Voles tunnel through snow and may gnaw on trees up to the height that snow accumulates.





Some links to riparian forest buffer information:

www.chesapeakebay.net/forestbuff.htm - EPA's Chesapeake Bay Program's info on buffers

www.chesapeakebay.net/pubs/subcommittee/nsc/forest/handbook.htm - EPA's Chesapeake Bay Program's extensive riparian area handbook that is quite valuable

www.chesapeakebay.net - the general website for EPA's Chesapeake Bay Program

www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/streamreleaf.htm - PA DEP site with basic buffer info and Pennsylvania specifics

www.riparianbuffers.umd.edu/home.html - University of Maryland site – regional perspective, lots of links to other resources – a good place to start

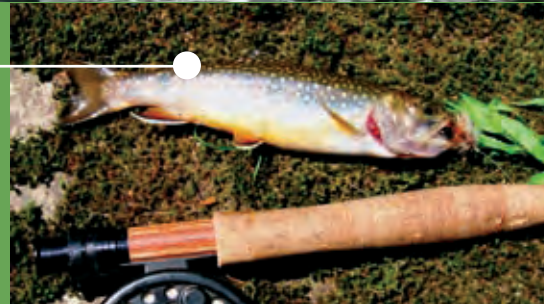
www.crjc.org/riparianbuffers.htm - riparian buffer fact sheets from Vermont/New Hampshire; still valuable information

or do a search on “riparian forest buffer”

Forested buffers are a stream's best friend.

Trees multiply stream habitat. The life of streams is tied to the bottom, literally. Most small organisms cling to rocks, roots and gravel to avoid being swept away. Trees vastly increase the amount and quality of bottom habitat. Compared to a bare soil bank in a meadow stream, a bank with fine tree roots commonly supports 1000 times more organisms in the same amount of space. Forested streams also have more bottom area. They are typically two to three times wider than a meadow stream of equal flow. With full sun, grasses encroach on the stream and channels narrow dramatically. Trees give streams more area, more habitat, more life.

Trout grow on trees.
Trout eat stream insects that specialize in eating leaves of native trees that fall into streams. In very real ways trout grow on trees.



Forested buffers:

Read on to learn how forests work magic for Streams



Trees Help Streams

Some ways that trees help streams are obvious: they shade streams and hold the banks in place. Other ways are less obvious but even more important.

Forested vs Grass Buffers

Summary of Research by Stroud Water Research Center (located in Chester Co., PA)

Study Variable:	Forest Buffer	Grass Buffer	Comments:
water temperature	+	-	forested areas cooler in summer, warmer in winter, both beneficial
streambed habitat quality	+	-	more usable streambed habitat, both amount and quality
removal of nitrogen pollution	+	-	forested areas removed 200% to 800% more nitrogen pollution
removal of phosphorus pollution	+/-	+/-	forested area tended to remove more phosphorus, but further study is needed
removal of pesticides	+/-	+/-	equal removal in forested areas was a surprise since sunlight is key
stream velocity	+	-	lower in forested areas, providing more contact time for clean up
stream width	+	-	forested streams 2-3x wider, providing 200-300% more habitat
large woody objects for habitat	+	-	large woody objects provide key habitat and benefits

- +
 -
 - +/-
- means significantly better results than the other buffer option
 means significantly less helpful than the other buffer option
 means no significant difference

Trees help streams clean themselves

In a recent study, Stroud Water Research Center (with a staff of 30+ stream researchers) showed that forested conditions increase a stream's ability to cleanse itself. They studied 16 streams in eastern PA, comparing forested sections to grass buffered sections as the same streams flowed from woodlots to healthy meadows with no livestock and back again. Forested streams can remove 200% to 800% more nitrogen pollution than non-forested streams. The full results appear in the table on the left.

Added Benefits from Streamside Forests:

Beyond providing clean water, streamside trees also provide a long list of other benefits.

- Allowing rainfall to soak into the soil, turning floodwater into well water
- Reducing flooding and flood damage, guarding roads, bridges, houses, land
- Providing quality recreation and related income to local communities
- Providing key habitat for both aquatic and terrestrial wildlife
- Providing air quality benefits, especially when near animal production facilities

Complete Details:
*A Seasonal Summary
of Activities*

**Doing good things by
planting *buffers***

Many landowners view
buffers as a valued boost
to fisheries.



Trees provide critical benefits to streams,
providing benefits for both water quality
and for quality of life. Restoring streamside
forests provides a big boost to efforts to
improve Pennsylvania's streams.

Details for Late Winter Activities

(February-March):

Checking tree shelters and stakes

Timing: Best done when site is easily traveled, after most frost-heaving is finished, before spring flush of tree growth occurs and while wasps are less active. Most landowners will want to do this in February or March before the busy spring season.

Leaning or downed tree shelters: This happens mostly from either broken ties or broken, rotted or frost-heaved stakes. Frost action in the soil (especially in wetter soils) commonly lifts many stakes. A few taps from a 2 lb hammer can prevent toppling, pinning and killing trees. Rodents enter downed shelters and quickly damage any tree inside. Frost-heaved shelters (with a gap between soil and shelter) also allow rodents to enter easily (much less a worry if routine herbicide applications are done). You can place a small board over the tube, avoiding tree as needed, and give it a few taps to drive the tube back into the soil. Be careful not to snap the ties while hammering, which can bind on the stake and break. In wetter soils, stakes can rot off before the trees are able to support the weight of the shelter. Rotten or otherwise damaged stakes must be replaced.

Nets: Nets help prevent bird entrapment in tubes, but can ruin many trees. Rotting birds typically kill trees, so keeping them out keeps both birds and trees healthy.

Nets should be removed from trees that will reach the nets that year. For fast growing trees, this can be done when trees are 18" or more from the tops of the shelters. If not removed in time, nets typically cause growth deformities in tree tips. These deformities will reduce growth rate and may reduce future timber value. If you miss a net, clip off any deformed tips below the deformity. Later removal of one shoot may be desirable if a double leader results.

Wasps: Large wasp nests can prevent trees from emerging past the nest or may lead to rotting conditions. Damage to tubes by mammals may be related to wasp nests, which bears and other animals eat. At the very least, it is recommended to remove large wasp nests. Doing so in spring before wasps are active will reduce risk of stings.

Ties: Shelters are fastened to stakes with ties. Over time they can become brittle and break. Replacing as needed with UV resistant ties (or suitable wire) will keep shelters upright and functioning. To reduce the risk of frost-heave lifting shelters, leave a little slack in the ties so that a rising stake is less likely to pull the shelter up by the tie.

Note: Streamside forests provide valuable habitat for many types of wildlife. Bears, birds, voles, wasps, and deer are all valuable parts of a healthy environment. For a brief time in the early years, effort to limit their use and damage of young trees is key. Otherwise, the intended wildlife benefits of a successful reforestation will not occur.

Replanting: Mark dead or missing trees for replanting. Be sure to fix the cause of losses before replanting. Consult your CREP staff regarding potential cost-share before replanting.

A successful buffer after eight years of growth



Details for Late Winter Activities

(February-March):

Balancing risks in removing or leaving shelters on trees:

If your tree shelters lack a vertical perforated line (designed to allow shelter to split as tree grows) it is necessary to remove shelters by cutting them top to bottom (use care to avoid damaging the tree) and pulling them off. Remove when trees reach 1 ½ to 2 inches in diameter at top of tube.

If your tree shelters have a vertical perforated line (through 2007, only Tubex™ shelters had this feature) they can be left in place unless specifically causing damage.

Agency staff in Maryland are trying a different approach to shelters that must be removed. They are splitting the shelters with a knife, and leaving them in place for additional time. If trying this unproven method, be sure to cut the full length including the portion in the soil which is least degraded by UV light and the first place constriction will occur.

Explanation: As trees grow, shelters can become a problem for trees. The worst problem occurs when the broad flare at the base of the tree approaches tube diameter. Moisture and debris can collect in the tube, leading to disease and damage. Forestry professionals in the mid-Atlantic suggest that shelters with a vertical perforated line can be left on trees indefinitely unless they are causing specific problems. This is not conclusive for other types of shelters, and thus removal, or at least splitting, is required. However, removing shelters exposes trees to increased risk from voles, buck rub, herbicide and mowers. Deer and voles will damage trees up to about 4-5" diameter.

Herbicide and mowers can damage even larger trees. For sites with tubes lacking perforated vertical lines, there may be helpful middle ground - splitting the tubes with a knife and leaving them in place for additional time. Be sure to split the bottom-most portion that will first constrict the tree. Periodic monitoring can help avoid damage due to shelters of any type.

Timing: If removal is needed, it can be done as part of early spring check of tree shelters or as separate step later in spring, using the shelters to protect trees for an additional herbicide application before removal. Shelters delay hardening-off of tree tissue. If removed in fall, tender tissue may be harmed by winter temperatures. Buck rub and vole damage may be reduced for another year by removal in spring rather than fall.

Size: Remove or split all shelters that lack a vertical line of perforations when trees are 1 ½ to 2 inches in diameter at the top of the shelter. Trees will reach 1 ½" to 2" diameter at varying rates, depending on species and site conditions.

Stakes: **Regardless of type of tree shelter, any non-biodegradable stakes must be removed before tree growth entraps them. This is for health of trees and safety of future users of the site such as its potential timber products.** If shelters are removed, wooden stakes can be left in place and provide some benefits. If trees become droopy (typically happens only after leaf-out), fasten tree to stake with twine that will rot. Stakes may also deter buck rub. If located upstream of tree, stakes may also help in the event of flood. Stakes give limited protection from large debris, but will help reduce the amount of grassy debris collecting on the tree (which could lead to rot).

Periodic monitoring can help avoid tube damage.



Details for Spring Activities

(April-May):

Applying herbicide around sheltered plants:

Routine herbicide use is probably the single most important step for a successful project. **Do not apply herbicides directly to the trees.** Tree shelters are a big help when spraying herbicide by preventing accidental application to the trees. A broad-spectrum herbicide such as a glyphosate product (ex. Roundup Pro™) provides excellent control of grass and broadleaf vegetation, and has no soil residual activity that could harm trees. Eliminating vegetation near trees is highly effective in preventing rodents (mainly voles) from damaging trees. This method is standard practice in orchards, nurseries and tree farms. Voles are a serious threat, and have damaged plantings on hundreds of sites to date. For more information on voles, see references on page 17.

When using any herbicide, follow all label instructions. The surfactant (sticking agent) in Roundup Original™ and many generic products is highly toxic to aquatic life. To reduce risk, use Roundup Pro™ (or similar product) and avoid overspray or drift onto open water. Rodeo™ (and equivalents) can be even safer if the surfactant (which must be added) chosen by the landowner is safe for aquatic systems. Knowledgeable sales staff can assist with choosing a surfactant.

If you apply glyphosate only, you will need to apply it repeatedly during the growing season to maintain a weed-free (and vole-free) area. To extend the effectiveness of

herbicide applications, landowners should consider adding a pre-emergence herbicide. Pre-emergence herbicides kill weed seedlings as they germinate or soon thereafter, thus extending the time between spray applications while boosting survival and growth rates.

Use of pre-emergence herbicides increases the complexity of applications. If you plan to use pre-emergence products, you will need to calibrate your sprayer to assure a proper dosage, or hire a professional to do the application (your CREP staff person can direct you to any number of such professionals). There are many publications to show you how to calibrate a sprayer, such as “calibrating a backpack sprayer” at <http://www.bae.ncsu.edu/programs/extension/agsmachine/turf>. Be prepared to do math if you want the benefits of using pre-emergence herbicides.

The following list of options begins with simpler, lower risk methods and moves to methods with more risk to trees (if misapplied), but increased control of unwanted vegetation. In each case, trade names are only examples of the active ingredient. Several of the products below have equivalents.

Level 1: Roundup Pro at 2 to 4 quarts/acre (or equivalent)

Level 2: Roundup Pro at 2 qt/ac + Surflan at 2 qt/ac (or equivalent)

Level 2: Roundup Pro at 2 qt/ac + Pendulum AquaCap at 3.2 qt/ac (or equivalent)

Level 3: Roundup Pro at 2 qt/ac + Surflan at 2 qt/ac + SureGuard at 8 oz/ac (note: SureGuard is a dry product)

Level 3: Roundup Pro at 2 qt/ac + Surflan at 2 qt/ac + Goal 2XL at 1.5 qt/ac

Comments:

Level 1: No pre-emergence control. Will require repeat applications for full control.

Level 2: Extends control, especially for grasses (which are vole habitat).

Level 3: Extends control to delay regrowth of both grasses and broadleaf plants (including most noxious and invasive weeds). SureGuard and Goal can injure trees if they contact swollen buds or leaves.

Don't be overwhelmed by the options.

Choose a plan that works for you and follow it. While not ideal for maximum growth, twice a year application of glyphosate alone (spring and late summer/early fall) should provide reasonable protection from voles on many sites. Clearly, any regrowth between applications can reduce tree growth rates and can harbor voles. For sites with serious vole problems and for anyone wanting maximum growth rates, additional applications of glyphosate alone (up to 1x/month) or use of glyphosate with pre-emergence herbicides can provide real benefits. If a pre-emergence herbicide will be used, calibrating your sprayer is required to assure safe and effective dosage. Calibration will also save you money when applying glyphosate

by avoiding over-application typical when spraying without calibration. Hiring a professional is another option. A third application of glyphosate alone, applied June-July, is another option that avoids the need to calibrate a sprayer, yet helps assure strong survival and growth rates. Whatever option is chosen, the key is to follow the plan and get the herbicide applied to assure survival and growth.

You can easily apply herbicides with a backpack sprayer with a spray wand that has a single, off-center, flat fan spray tip. With properly maintained shelters to keep spray off the trees, you can spray each row of trees with a single pass. You can minimize the unsprayed “shadow” behind each shelter by doing a quick wiggle of the spray wand as you pass each shelter.

Best results come from applying spray to a continuous strip 4' wide, centered on the row of shelters. This is especially the case if mowing will be done. Bumping shelters and stakes with mowing equipment will lead to broken stakes, loose shelters and tree losses. The continuous sprayed strip eliminates the vegetation where the mower cannot easily reach. Mowing remaining areas provides complete vegetation management on the site. Good results also come from 4-6' diameter spots sprayed around each shelter. **Avoid applying herbicides to any part of desired plants – most herbicides will kill trees. Follow all label directions.**

Details for Summer Activities

(June-August):

Managing vegetation that was not sprayed in spring with broad-spectrum herbicide:

This means the vegetation in areas other than right around tree shelters. There are two common tools for this work—herbicide treatment or mowing.

Use of herbicides to control targeted species:

There are many different noxious and invasive weeds. The best control methods often vary by species. Help in identifying problem weeds can be found at <http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/streamreleaf/Docs/Invasive%20Plants.pdf>, or your local CREP staff can direct you to resources. In general, avoid using broad-spectrum sprays that also kill grasses and thus require repeat applications over time. (An exception is for the areas immediately next to trees as described above where repeated applications are planned.) Weeds prosper on bare soil. Grasses help suppress noxious and invasive weeds. Consult a conservation professional and/or the following reference. The Maryland Department of Natural Resources Forest Service *Riparian Forest Buffer Design and Maintenance* (52 pages) is the most comprehensive and recent (2005) publication on forest buffer maintenance for the mid-Atlantic region. It has specific herbicide recommendations for controlling noxious and invasive plants in appendices c and d. Access it at http://www.dnr.state.md.us/forests/download/rfb_design&maintenance.pdf. Or call 1-410-260-8509 to request a hard copy.

Mowing:

Mowing is permitted in CREP buffers during the first 2-3 years. Mowing helps control competing vegetation, invasive plants and rodent damage to trees. Unfortunately, mowing also delays natural tree regeneration. Regeneration varies by region and by site, with little potential on grassy sites that lack strong seed sources within a hundred yards. If mowing is not needed to control voles, omitting mowing may increase natural tree regeneration, which mowing would delay. Mowing should not be viewed as an alternative to broad-spectrum herbicide use around shelters, but as an effective companion. Mowing is especially

helpful in the first two or three years. It should be done at least twice in the growing season, more often if needed to control competition or avoid seed formation by noxious invasive species. Mowing helps trees by exposing rodents to increased predation. A late season mowing will provide added control of rodents by reducing cover during the winter. Mowing may not be effective against Canada thistle. Mowing extensive areas of CREP buffers is not allowed beyond year three, unless approved by Farm Service Agency's county committee for specific reasons such as controlling vole populations or noxious weeds.





Details for Fall Activities

(For Fall and “As Needed” in Any Season):

Details for Fall:

The above sections (April-May and June-August) have information that applies to late summer and fall as well. Please note that spring herbicide application around shelters would benefit from including a pre-emergent to prevent weed regrowth after spraying. In late summer or fall applications, the pre-emergent is less useful and can be omitted. It would provide control for winter annual weeds, but these are not typically a problem.

Fall is also the right time to consider additional steps to avoid vole damage over winter. A late fall mowing removes cover for voles and increases predation. Mowing is allowed in CREP projects during the first 2-3 years. Additional mowing up to year five may be approved if vole problems are severe. If not needed for vole control, omitting mowing may increase natural tree regeneration – particularly in northern PA where that potential is higher. Extreme vole problems may justify the use of an economical rodenticide containing zinc phosphide, applied by a professional. Consult your CREP project staff to discuss mowing or rodenticides.

Details for “As Needed” Activities:

Following Floods:

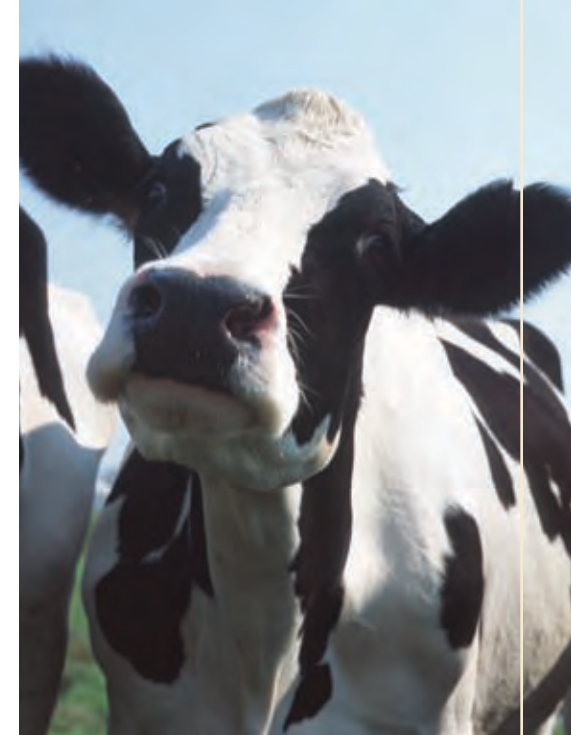
Trees trapped in shelters knocked down by floods will generally die even without rodent damage, which also increases in down tubes. It is unclear how long trees survive if pinned down, but getting tubes and trees upright sooner vs. later will help. Within a week of any flood, check that shelters and stakes are upright and sound. Also check for damage to any fences, crossings, etc. as applies to your project.

Survival check and possible replanting:

Late summer or fall is a good time to check plantings for overall health and success. Noting problems early will allow time to remedy them vs. expensive replanting. Your local CREP staff can help troubleshoot or you can consult the MD DNR maintenance guide noted above. Page 34 of the MD DNR guide offers help on identifying and solving problems. Shelters on apparently dead trees should be left in place. Trees that appear dead may resprout from the root. You may also want to drop a few seeds of native trees in the tube with some weed-free soil such as potting mix, or you may simply replant. Before replanting consult with your CREP staff about possible cost share. Also, before any replanting, be sure to fix the problem that caused the mortality the first time. Often, this

is voles. Regular use of herbicides and mowing are key control methods. Rodenticides containing zinc phosphide may also be practical and economical in dealing with **extreme** cases of rodent damage where conscientious herbicide use around tree shelters has not kept voles from damaging plantings. Check label restrictions and always follow label directions.

Farmers with livestock appreciate CREP which pays for high quality fencing, stabilized stream crossings and watering systems (alternatives to the creek) as part of buffer projects. Here is a watering trough with stabilized apron





**CHESAPEAKE BAY
FOUNDATION**

Saving a National Treasure



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