United States Department of Agriculture

Practice Guide for Tree/Shrub Establishment

Pennsylvania NRCS

Overview

The establishment of trees and shrubs is a conservation practice that can be planned and implemented to achieve a number of conservation purposes. These purposes can include maintaining or improving desirable plant diversity, productivity, and health; creating or improving habitat for desired wildlife species compatible with ecological characteristics of a site; controlling erosion; improving water quality by reducing excessive nutrients and pollutants in runoff and groundwater; sequestering and storing carbon; restoring or maintaining native plant communities; developing renewable energy systems; conserving energy; and providing for beneficial organisms and pollinators.

Site conditions

Assess the soils and soil condition of the planned tree and/or shrub establishment area. Relative wetness and drainage of the soils each have a dramatic effect on the plant species and plant materials used within the planting area.

Grazing and cropping activities within the planting area should stop prior to installation of the trees and shrubs. If necessary, plan and install livestock-related practices like fences, stream crossings, animal trails and walkways, pipelines, and watering facilities to sustain grazing activities outside the planted area acreage. If previous cropping activities left bare ground or very little residue in the planned tree and shrub planting area, establish a permanent ground cover of grasses or forbs prior to planting trees and shrubs, to provide protection against erosion until the trees and shrubs are established.

Existing vegetation that will hinder planting or provide excessive competition to the tree or shrub seedlings should be controlled or removed prior to planting, using any combination of the following methods:
--Mechanical control of vegetation by mowing or mechanical removal. For erosion and weed control of disturbed areas in non-forestlands, it is normally necessary to have grass seeded and established prior to planting trees and shrubs.
--Chemical control of vegetation with appropriate herbicide(s). In Pennsylvania, foliar herbicide applications prior to October 15th is acceptable; after October 15th, confirm that the target plants are actively growing and have not gone dormant yet. Pre-emergent herbicides are typically applied in either the fall or spring. Follow all label instructions for safety precautions, rates and timing of herbicide application. For herbicide recommendations consult the current Penn State Agronomy Guide, Penn State Extension Herbicides and Forest Management publication, and the USDA US Forest Service's Manual Herbicide Application Methods for managing vegetation in Appalachian Hardwood Forests publication.

Existing trees/shrubs may remain in place if the site is to be interplanted and the existing trees/shrubs are acceptable species which help fulfill the purpose of the new planting. For example, if wildlife habitat is a purpose of the planting, retain native trees that provide den sites or food sources while the new planting becomes established. Undesirable trees that will restrict planting or provide excessive shade should be removed or killed and left standing as "snags".

Species Selection

Select combinations of tree and shrub species that will best achieve the purpose(s) of the conservation activity given the site-specific conditions of the area. Plant selection often depends most heavily on two main considerations: the intended purpose of the conservation practice and the soils in which the planting will be established. For example, a tree/shrub planted area established on relatively dry soils will contain trees and

shrubs that differ greatly from a tree/shrub planted area established on wet soils. Consult the document *Tree and Shrub Information for PA NRCS* located in section IV of the eFOTG which is filed under the Riparian Forest Buffer (391) Conservation Practice folder. This document provides a comprehensive and helpful list of trees and shrubs, and describes their characteristics related to use in a conservation planting activity (i.e., soil drainage, plant hardiness zone, flood tolerance, deer resistance, etc.).

Additional sources of plant species selection information may be obtained through consultation with Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry (PA DCNR-BOF) Service Foresters as well as consultation NRCS Foresters and Biologists. There are also several resources available online through NRCS and external sources. The USDA Plants Database can also be utilized as a source of information on species selection (http://plants.usda.gov).

Plant Materials

Ball-and-burlap nursery stock, container-grown plants, bare-root seedlings, live stakes, direct seeding with seeds/nuts, and natural regeneration are all acceptable options for establishing trees and shrubs for conservation plantings. Limitations may exist in USDA-NRCS Financial Assistance programs on the type of plant stock which can be used. Bare-root seedlings and live stakes must be dormant at installation; their buds should be firm, but show no evidence of new growth.

Choose, and combine as necessary, plant materials to maximize tree and shrub survival and establishment. Match the plant materials to the site conditions, keeping in mind that some plant materials are better suited to certain conditions *(see Table 1, below*). For example, live stakes may be the most successful plant material for extremely wet portions of a planting site, while bare root seedlings, container plants, or balled-and-burlap plants may be successful plant materials for drier portions of the same site.

Table 1. Plant material suitability based on predominant site conditions.

	A suitable plant material would be…					
If the site is…	**Balled-and-burlap**	**Container plant**	**Bare root**	**Live stake / cutting**	**Direct seeding**	**Natural regeneration**
dry or well-drained	•	•	•		•	•
very wet or very poorly drained	o	o	o	•	•	•
prone to flooding	o	o	•	•	•	•
streambank				•		
prone to "frost heave"	•	•				•

- • Acceptable plant material for given site condition
- o Acceptable, but may require specific or seasonal site conditions for this type of plant material (i.e., using this material may present challenges during wet periods)

Site Preparation

A precondition for tree/shrub establishment is an appropriately prepared site. Site preparation is needed if competition from grass, weeds, and/or woody materials will interfere with plant establishment and growth. Refer to PA conservation practice standards Tree/Shrub Site Preparation (490), Brush Management (314), and/or Herbaceous Weed Control (315), as applicable.

Storing Plant Materials

To optimize survival, bare root seedlings and live cuttings should be planted immediately upon arrival from the supplying plant nursery. However, if immediate planting is not possible then plant materials may be stored in cool, but not freezing, conditions (air temperatures of 35° F to 50° F). Avoid damage to roots of all plant types during storage. Do not allow the roots of any plant materials to dry out. The roots of bare root plants and live stakes should be kept moist, but not wet. When cool storing plant material temporarily the plant materials should remain bundled. Depending on the bundling materials and methods used it may be necessary to unpack and/or unroll bundles in order to keep the roots adequately moist. Following watering the bundles should repacked in bundling materials using the same bundling methods and returned to cool storage. Bundles under cool storage should be checked periodically for moisture and re-watered as necessary.

If bare root seedlings must be stored for more than one week and cold storage is not available, the seedlings should be "heeled-in" in a moist, shady location. This is done by digging a trench, placing the bare root seedlings' roots in the trench and covering the roots with moist soil. The trench should be of an adequate size to completely bury the roots of the seedlings within the soil. A 1 foot deep trench is typically adequate for heeling in seedlings.

Plant Inspection

Planting stock should be carefully inspected at the time of planting to confirm that the individual plants are free of disease, insects, and mechanical injury. Inspection should also confirm that the individual plants have well developed root systems and that those roots have not dried out during shipping.

In general, bare root seedlings should not be less than ¼ inch caliper at 1 inch above the root collar. Bare root hardwoods seedlings should have a minimum height (root collar to terminal bud) of 6 inches and a minimum root length of 10 inches. Bare root conifer seedling should have a minimum height (root collar to terminal bud) of 6 inches and a minimum root length of 8 inches.

Site Layout

The planting layout should allow access for long-term maintenance of shelters, weed control, and fence maintenance (if applicable). If fencing is involved, carefully consider gate locations during site layout to allow adequate access for later maintenance activities.

Determining planting density and spacing is essential to determining the layout of the site. Desired stocking levels for trees and/or shrubs should be based on ecological characteristics, including the presence of desired regeneration, of the site and species, and landowner objectives.

Calculate the number of seedlings needed per acre by multiplying the spacing between seedlings, for example (10 X 10 = 100); dividing 43,560 sq ft per acre by the sq ft spacing provides the number of seedlings needed per acre. Example: 43,560/100 = 436 seedlings per acre. Thus, you can substitute any spacing and determine the number of seedlings needed per acre.

Table 1: Various spacing for initial planting densities, Tree /Shrub Seedlings

Spacing (feet)	Square Feet per	Number of Tree/Shrub Seedlings per

		Acre
5 x 5	25	1,742
6 x 6	36	1,210
6 x 8	48	907
8 x 8 8 x 10	64 80	680 544
10 x 10	100	436
10 x 14	140	311
12 x 12	144	302
12 x 16	192	227
14 x 14	196	222
10 x 20	200	218

To improve plant diversity and pest resistance, mix plant species within the project area. If possible, avoid putting plants of any one species next to other plants of the same species, with the exception of trees and shrubs requiring close pollination (e.g. Persimmon and Holly trees, which must be planted in groups of male and female plants to allow pollination and fruit production).

Avoid planting trees in utility line right-of-ways; they may be cut or sprayed without notice during maintenance of the right-of-ways. Right-of-ways should be seeded to grasses or forbs. As an extra precaution against maintenance-related damage, the rows of woody plants at the edge of the right-of-way should be low-growing shrubs like raspberries, red-stemmed dogwoods, or silky dogwoods. These plants will never get large enough to interfere with the adjacent utility line (even overhead lines), and will probably re-grow if they suffer maintenance-related damage. If possible, install signs adjacent to utility right-of-ways identifying the areas as a conservation planting and requesting no mowing or spraying.

Planting

Hand Planting Seedlings:

Hand planting allows areas to be planted that are not suitable for machinery due to debris, terrain, wet conditions and availability of suitable machines.

1. If the area has duff, litter, etc., rake to bare mineral soil to ensure proper seedling depth and tightness.
2. Remove no more than 3 or 4 seedlings from the planting bag.
3. Make the planting hole wide and deep enough to insert the root system so the seedling is straight and the roots are straight down in the planting hole. It is highly undesirable to have the roots curled up in the planting hole.
4. Lift the seedling up in the hole until the root collar is at the soil level keeping the terminal bud above ground.
5. Pack the seedling firmly using your planting tool, eliminating the air pockets.
6. Plant when there is good soil moisture.
7. Don't plant when the ground is frozen.
8. If needed, root-prune seedlings that have extremely long main roots or roots longer than the effective depth of planting tools (which is usually about 8 inches). However, no more than one-quarter of the root system should be removed.

Tools for hand planting include a dibble bar, hoe dad, or sharp shooter shovel. A planter bag worn around the

waist makes the planting faster and more efficient keeping the seedlings moist and readily available. Seedlings properly planted by hand should have a high percentage of surviving trees. A 70% survival rate of planted materials at the end of the 3rd growing season is considered satisfactory if trees/shrubs are well distributed over the planted area. Planted areas should be evaluated to determine the necessity of replanting concentrated failed areas or if natural regeneration will meet the site objectives for adequate stocking.

Hand planting with bare-root seedlings usually occurs between late December and early April. The seedlings have to "harden off" or set buds at the end of the growing season and in nurseries this usually does not occur until the Autumn once deciduous trees have lost their leaves and once buds can be easily seen. This hardening off is a little easier to visualize with hardwood seedlings as the leaves fall off and one can easily see the buds. The seedlings should be planted at the root collar which is the location the seedling grew in the nursery (where the above ground and below ground portion of the seedling meet).

Bare root seedlings can be planted in the fall from the time that growth stops until when the soil is frozen; or in the springs after the soil has thawed until bud break which usually occurs by mid-spring. The earlier one can plant seedlings (Jan – Feb) the more time the seedling will have to establish their root systems. The better the roots get established, the better the seedlings can survive dry conditions that will occur during the summer months.

Containerized seedlings have a wider window for planting beginning in late October and going through April. Containerized seedlings are grown in tubes that help the seedling develop a dense root system that is fairly easy to plant. Containerized loblolly, slash and shortleaf pines can be planted with the entire root plug placed in the planting hole. The terminal bud is well away from the ground line. Containerized longleaf pines however are planted in the grass stage meaning that you have a root plug, a very short stem and a terminal bud surrounded by the needles. Plant containerized longleaf pine with a small portion of the plug above the planting hole to ensure the terminal bud is above the ground.

Machine Planting Seedlings:

Machine planting can be accomplished on areas that have received good site preparation, have little debris remaining on the site; areas that have been windrowed or bedded; old fields or farmland being converted back to forest.

Machine planting is an effective method of planting seedlings if the operator and planter work as a team. The operator has to be constantly aware of the safety hazards and protect the individual riding in the planter.
There are many safety concerns to consider during machine planting operations as a person is being pulled behind a tractor or dozer. Some items to consider for safety are how the planter communicates with the tractor operator, first aid kit, personal safety gear, fire extinguisher, etc.

1. Only open enough seedlings to fill the planting box. Keep the seedlings upright with the roots down out of the wind. A little water can be added to the planter box to keep the roots moist.
2. Do not cut or prune the roots.
3. Do not leave unplanted seedlings exposed to sun and wind.
4. Plant seedlings along the contour.
5. Do not plant the seedlings too deep or too shallow. When holding the seedlings and placing them in the planting rip do not release them until the packing wheels start to close the rip. Otherwise the seedlings will drop too deep, covering the terminal bud. On the other side, do not pull the seedlings upward as the seedling will be planted too shallow, exposing some roots.
6. Periodically check the planted seedlings for firmness or and number of seedlings per acre.

7. Look for skips in planting as the planter may have difficulty in getting seedlings out of the holding tray.
8. The planting operation needs to occur at speeds where the proper number of seedlings are planted which takes coordination between the operator and planter.

With machine planting, make sure the seedling depth is satisfactory and that the seedlings are not leaning due to being dragged by the planter. The seedlings should be upright and firmly packed in the soil.

Ball-and-burlap, container-grown, bare-root plants, live stakes/cuttings, and direct seedings may be installed in late winter or spring, as long as the ground is thawed. Container-grown plants, bare-root seedlings, live stakes, and direct seedings must be planted while dormant. For planting methods and tips, refer to *A Guide to Conservation Plantings on Critical Areas for the Northeast* (Salon and Miller, 2012)

Protecting or sheltering the new trees and shrubs is highly recommended, and can be a major factor in plant survival and growth. Various types of protection exist, ranging from plastic tree tubes and shelters to enclosures made from fencing materials. The use of 5-foot tree shelters to protect deciduous tree seedlings and single-stemmed shrub seedlings is highly recommended, especially in areas with deer pressure. **Do not** use plastic tree shelters or tubes on evergreens or multi-stemmed shrub species, as they will severely stunt or kill those plants; if sheltering is needed for those plants, consider a fence-based option: one "fence ring" per plant, or a larger regeneration area enclosure to protect many plants at once. Drive all plastic tree shelters/tubes 1-2 inches into the ground, or pile soil around the shelter base to a similar depth. This prevents entry by rodents, limits the flow of hot air through the shelter in summer months, and promotes a greenhouse effect that increases moisture levels within the shelter. Anchor tree shelters/tubes with at least one stake, to which the shelter should be firmly and tightly attached in at least two places. Anchor single-plant fence rings with at least two stakes, and firmly attach the fence to the stakes in at least two places. Stakes should be at least 4' long, and should be driven a minimum of 8 inches into the ground on the upstream or upwind side of the shelter. Install larger enclosures as regular fencing projects with appropriate fence posts and anchoring methods. (Refer to NRCS' standards for Fence and/or Access Control.)

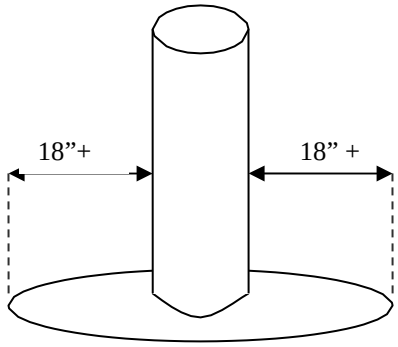


Diagram 1. Herbicide ring around tree shelter.

Establishment Activities

Weed Control: Competing vegetation may be controlled as needed after planting. Weed control is often the most important factor in tree and shrub survival, especially for deciduous species. Weed control may be accomplished through mulching, mowing, or herbicide. For all methods, the vegetation should be controlled in either an 18"-wide band down each side of the seedling row, or in a 18" radius circle around each seedling (*Diagram 1*). Spray competing vegetation near the trees in May and September to ensure that 1) there won't be too many other roots competing with the trees, and 2) rodents will have no cover or food immediately around the tree and tree shelter. Apply herbicides for at least the first three years that the trees are in the ground—additional spraying would be optional, depending on how well the plants are established.

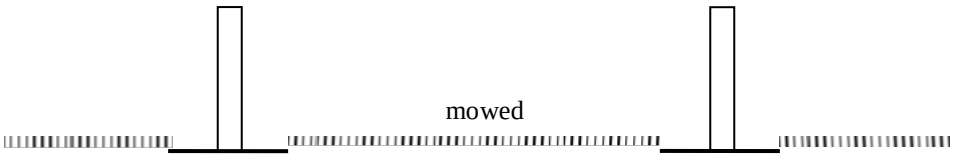
Mowing is also very beneficial during establishment, since it reduces the amount of competing vegetation around the new plants. While it is possible to mow the area as often as desired during establishment, there are

three key times to mow: spring (May), mid-summer (early July), and fall (late September). Spring mowing will reduce the amount of cover available to rodents, and hopefully force them to look elsewhere for places to make nests to have young.

Summer mowing will prevent weeds from producing seed, and could be replaced with an appropriate herbicide treatment. Fall mowing is the most important, since it greatly reduces the winter habitat available for rodents. Discouraging rodents from living in the planted area over winter months decreases the chances of rodents chewing on the plants over winter (*see Diagram 2*). Mow at a height of 6" or more—mowing lower won't discourage rodents any more, but may increase erosion.

Diagram 2. Mowing options.

If the entire planted area won't be mowed, focus mowing efforts ***near*** the plants—such as one mower width on each side of plant rows—rather than mowing down the middle of the row and leaving uncut vegetation near the plants.



Fall mowing should include the entire field, to reduce winter cover for rodents. Leave at least 6" of cover. If possible, direct the grass clippings away from the tree shelters, to reduce the amount of nesting material available to rodents near the new plants.

Mowing doesn't provide total weed control, since roots still remain to compete with the tree and shrub seedlings for nutrients and water. Herbicides provide weed control, both above- and below-ground, but does not remove or shorten nearby vegetation enough to limit rodents. Therefore, a combination of mowing the entire planted area and applying herbicide treatments around individual plants yields the best establishment of trees and shrubs. Please be aware that mowing and herbicide treatments may also kill any naturally-growing trees and shrubs in the planted area, and precautions should be taken if natural tree/shrub growth is desired within the tree/shrub planted area.

Other weed control options include weed mats and mulching, both of which limit competing vegetation by creating physical barriers around the base of the new plants. Place mats or mulch at the time of planting, and maintain them as needed to continue their proper function. Mats may need to be re-anchored over time to maintain tight contact with the soil; this is a particular concern because any gaps or crawl spaces under mats often become rodent burrows. In contrast, many mulches (particularly stone or large wood chips) discourage burrowing by rodents, but require re-application or "topping off" to replace materials lost to flooding or decomposition.

Shelter Maintenance: Another major component of successful tree establishment is the year-round maintenance of tree shelters. Shelter maintenance isn't difficult, and will greatly improve the growth and survival of the plants. Tree shelters must be checked regularly, to ensure the following: 1) shelters should be upright and solidly attached to their stakes; 2) plastic shelters/tubes should be seated 1-2 inches into the soil, or soil should be piled around the base of the shelters; and 3) plastic shelters/tubes with holes or sizeable cracks in them should be replaced. Shelters that are leaning, sitting loose on the surface of the ground, or cracked/chewed open will actually do more harm than good for the trees inside.

Failure to ensure the three conditions described above generally results in dead plants, because they give rodents easy access to the trees inside the shelters or cause other problems like bent or broken trees, hot air flowing through shelters in summer months, and so on. If tree shelters are capped with bird netting, remove

the netting when the tree grows within a few inches of the top of the shelter. Seedlings **will not** grow through the netting, and their growth will be severely restricted or distorted if the netting remains in place. Remove tree shelters only after the seedlings have been visible out of the top of the shelters for at least two years.

Regeneration Area Protection

(Adapted from the PA Department of Conservation and Natural Resources – Bureau of Forestry and PA Game Commission)

1. Hazard Trees

After the location of the fence has been determined, all hazard trees, which are within tree length of the fence, must be felled. Hazard trees are dead and dying trees, split trees, heavily leaning trees, and/or root sprung trees, which are in a position to fall across the fence. A qualified forester or biologist will mark the hazard trees for felling.

2. Clearing Fence Area

Clear and level a path at least six feet wide, but not more than eight feet wide, of all brush, stumps, rocks, or other obstructions. Obstructions, which in the opinion of the landowner or a qualified forester/biologist will cause greater installation or maintenance problems, may be left in place. This path will lie outside of the fence and will serve as the access corridor for equipment during installation, serve as a level location for the fence to be erected, and as a maintenance corridor. Disturbance of the entire perimeter may not be necessary. In those areas where the ground is naturally level, free of stumps, and/or free of rocks, no disturbance will be required.

3. Erosion and Sedimentation Control

Equipment will not be operated when ground conditions are such that excessive damage will result. Repair areas that become rutted due to work, install water bars in areas that are of sufficient slope that erosion may occur, and seed and mulch areas that may be prone to erosion and/or sedimentation along the fence line according to the Critical Area Treatment (342) conservation practice standard. Small intermittent or perennial streams, adjacent stream banks, or seeps, which are unavoidable, will be cleared by hand to prevent sedimentation.

4. Fence Supports

Fence will be erected by fastening the fence to posts or pole timber trees. No trees of a diameter breast height (dbh) greater than 12 inches will have fasteners driven into them. If trees greater than 12 inches dbh are to be used to secure the fence, alternate means of attachment that does not damage the tree must be used. All trees will be protected by having a 2" x 4" board of sufficient length placed between the fence and the tree and the fence will be attached to the board.

Posts that must be added to serve as in-line posts must be 4" x 4" treated square posts, four inch round treated posts, or steel posts that weigh two pounds/foot. Line posts are to be ten feet long and placed in the ground at least two feet. Corner posts must be at least a 6" x 6" treated post or five inch round treated post and braced or supported in place. Bracing and/or guy wires may be used to support the corner post(s) but must be sufficient to prevent the post from bending or pulling free of the ground. All bracing or guy wires

outside the fenced area must be clearly marked to prevent a safety hazard to people or animals.

5. Fence Materials

The fence will be at least 7 to 8 foot high using two-47 inch rolls or one-eight (8) foot roll of galvanized steel woven wire or fixed knot fencing. Wire fencing materials will have no more than six inches between stay wires and have at least ten graduated line wires. The top and bottom wires will be at least 12-1/2 gauge wire and stay wires will be at least 14-1/2 gauge wire.

6. Fence Stretching

The finished fence will be approximately 7½' high with approximately a 6"overlap on the ground pulled to the outside of the fenced in area. The fence will be stretched so that the wire is pulled against a corner or turning support. Maximum distance between fence supports will be no greater than 30 feet between posts and 40 feet between trees. The top and bottom rolls of fence will be fastened to each other every three feet by twisting, tying, or fastening the bottom wire of the top roll to the top wire of the bottom roll.

Where a post is used, the top wire of the top roll must be secured to the post. Each roll of fence will be fastened in three places: Top, middle, and bottom. Ties to secure the fence to metal poles will be 14-1/2 gauge galvanized or stainless steel wire ties or other commercially suitable ties. Stainless steel or galvanized hog rings may be used to fasten the top fence to the bottom fence. Twisting the bottom wire of the top fence section and the top wire of the bottom fence section may be used. Ties may also be used to secure the two sections together but must be 14-1/2 gauge stainless steel or galvanized wire. No aluminum may be used in the installation of the fences.

7. Fasteners

Staples will be one and one-half inch galvanized steel. No staples will be driven into trees. The nails used to fasten the 2" x 4" board to the trees have no specifications but must hold the board securely to the tree while the fence is being stretched. The nails used should be long enough to securely hold the 2" x 4" in place and still leave approximately one inch exposed to facilitate eventual removal. Nails used must be larger than #8 common.

8. Securing Fence Bottom

Top fence height must be a minimum of 90" from ground. Fencing is required to have 1 of either the following 3 options installed: (1) a 6" lip of galvanized wire facing the outward side of the fence on the bottom, (2) staking every 10', or (3) securing with stones or soil to prevent animals from entering through the bottom of the fence.

Gaps between the ground and the fence of over three inches in height and six inches in length will be filled with sound wood and the fence will be stapled at the bottom to the wood.

9. Access

Walk-through type gates (see diagram and construction specifications below) are required on all fence projects. Locations for these gates will be determined by the landowner and qualified forester/biologist with the person building the fence. Sixteen-foot wide equipment gates may be required for the fence project. The specific number of 16' equipment gates required for each fence project will be determined by the landowner

and qualified forester/biologist.

10. Operating Area

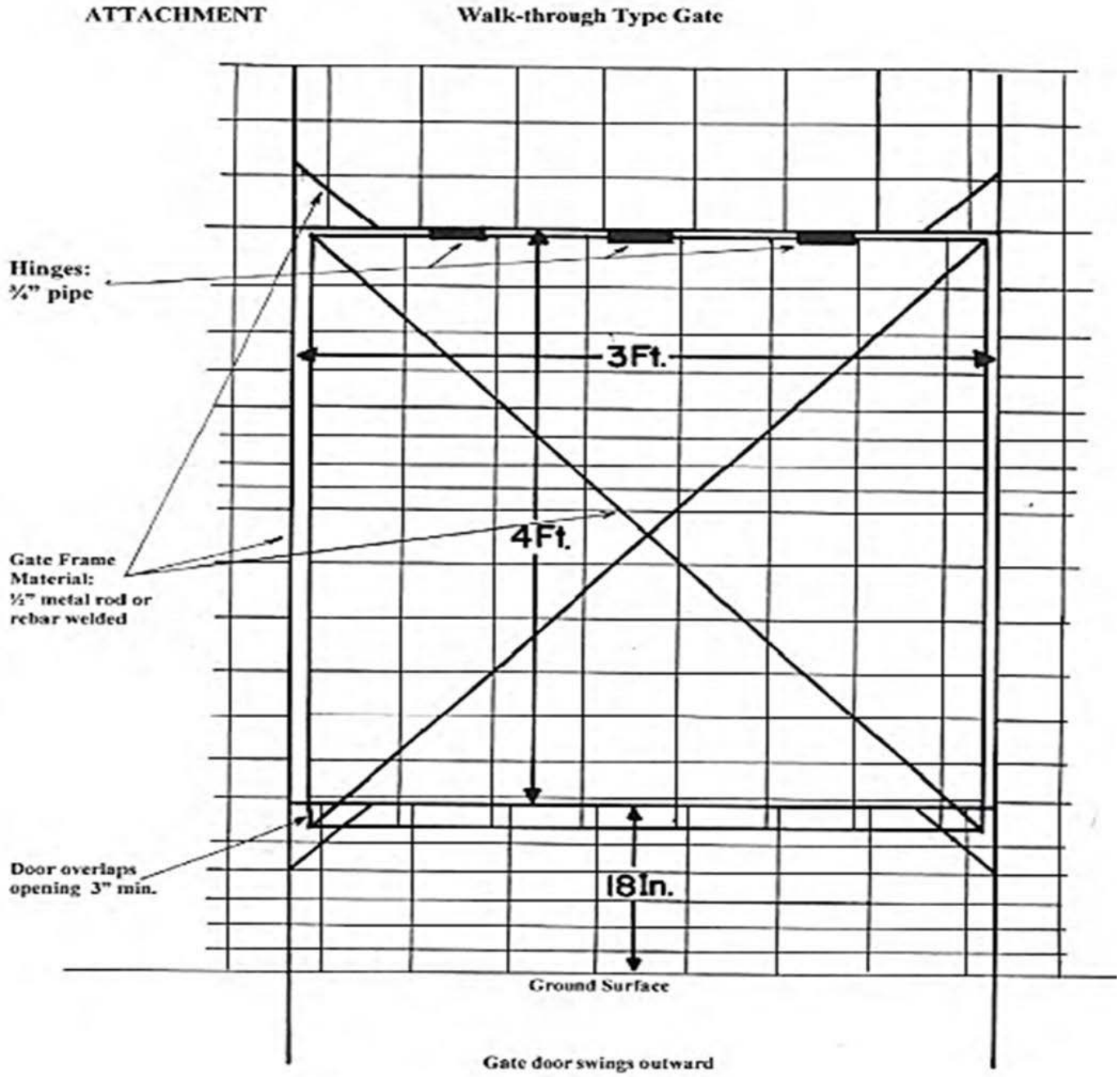
Vehicles may be operated on the cleared exterior fence path. Vehicles may not travel into the area to be fenced in without approval of the landowner and qualified forester/biologist.

11. Debris/Garbage

All trash and garbage generated during the completing of this practice will be removed from the site. This is to include all materials generated from the installation of the fence and items generated by people building the fence.

12. Deer Drive

All deer must be driven from the fenced area prior to the closing of the fence. The deer drive must be conducted with a qualified forester/biologist on site. All gates will be closed immediately after the deer drive takes place.



Pest Management: Plant injury or death should be minimized through preventative measures. Exclude domestic animals and wildlife that could damage or browse the plants. To limit damage from wildlife, consider reducing nearby vegetation (which may hide rodents or rabbits), increasing hunting and predation, or the use of pest repellants. Monitor new plantings for potential insect and disease problems. Contact NRCS, the DCNR Bureau of Forestry, or Penn State Extension Services for prevention and control recommendations.

Replanting: Over time some of the plants will die, from a variety of possible causes. A survival rate of 70% is considered acceptable; lower survival rates require replanting or acceptable levels of natural regrowth/regeneration in the planted area. If replanting is necessary, follow the same guidance given above for the original planting (*see* **Planting** *section above*); consider adjusting tree and shrub selection to favor those species from the original planting which survived the best.

Operation and Maintenance Activities

Maintain trees and shrubs for the life span of the conservation practice (15 years). Noxious weeds *(see list below)* must be controlled at all times. Control of invasive plants, while not required, is highly recommended to prevent excessive competition with the desired plants. Spot treatments with appropriate herbicides may be done at any time, following label directions for rate and timing of herbicide application. After trees and shrubs are established (roughly 3 to 4 years after planting), stop or greatly reduce the amount of mowing in the planted area, to encourage additional tree and shrub recruitment via natural regeneration.

NOXIOUS WEEDS: Canada Thistle, Johnsongrass, Marijuana, Jimsonweed, Giant Hogweed, Multiflora Rose, Shattercane, Mile-a-minute, Goatsrue, Bull or Spear Thistle, Musk or Nodding Thistle, Kudzu-vine and Purple Loosestrife. (This list is subject to periodic updates).

INVASIVE PLANTS (partial list*)*:* Norway Maple, Tree-of-Heaven / Ailanthus, Princess tree / Paulownia, Callery Pear, Barberry, Burning Bush, Lespedeza, Privet, Tartarian honeysuckle, Wineberry, Japanese stiltgrass, Phragmites, etc.
*A full list of invasive plants is available at
http://www.dcnr.state.pa.us/conservationscience/invasivespecies/index.htm

Regeneration area protection woven wire fences should be walked at least once a month or after a weather event (e.g., wind, lightning, heavy snow, etc.). It is important with woven wire fences to find maintenance issues before deer find them because deer can exploit maintenance issues and gain access inside the fenced area. The fence should be checked at least monthly until it is removed or the silvicultural treatment has been determined to be a success.

If deer do happen to get inside a woven wire fence, all-practical methods should be used get the deer out of the fence unless the fence is slated for take down. First, a section of the fence or gate should be opened up and an adequate number of people should attempt to drive the deer out of the fenced area. If repeated attempts at a deer drive fail, the landowner can be advised that they should attempt to remove the deer as soon as possible through control methods such as not-for-profit legal means of deer hunting or by notifying hunters. Any hunting must be conducted in accordance with PA laws and regulations.