

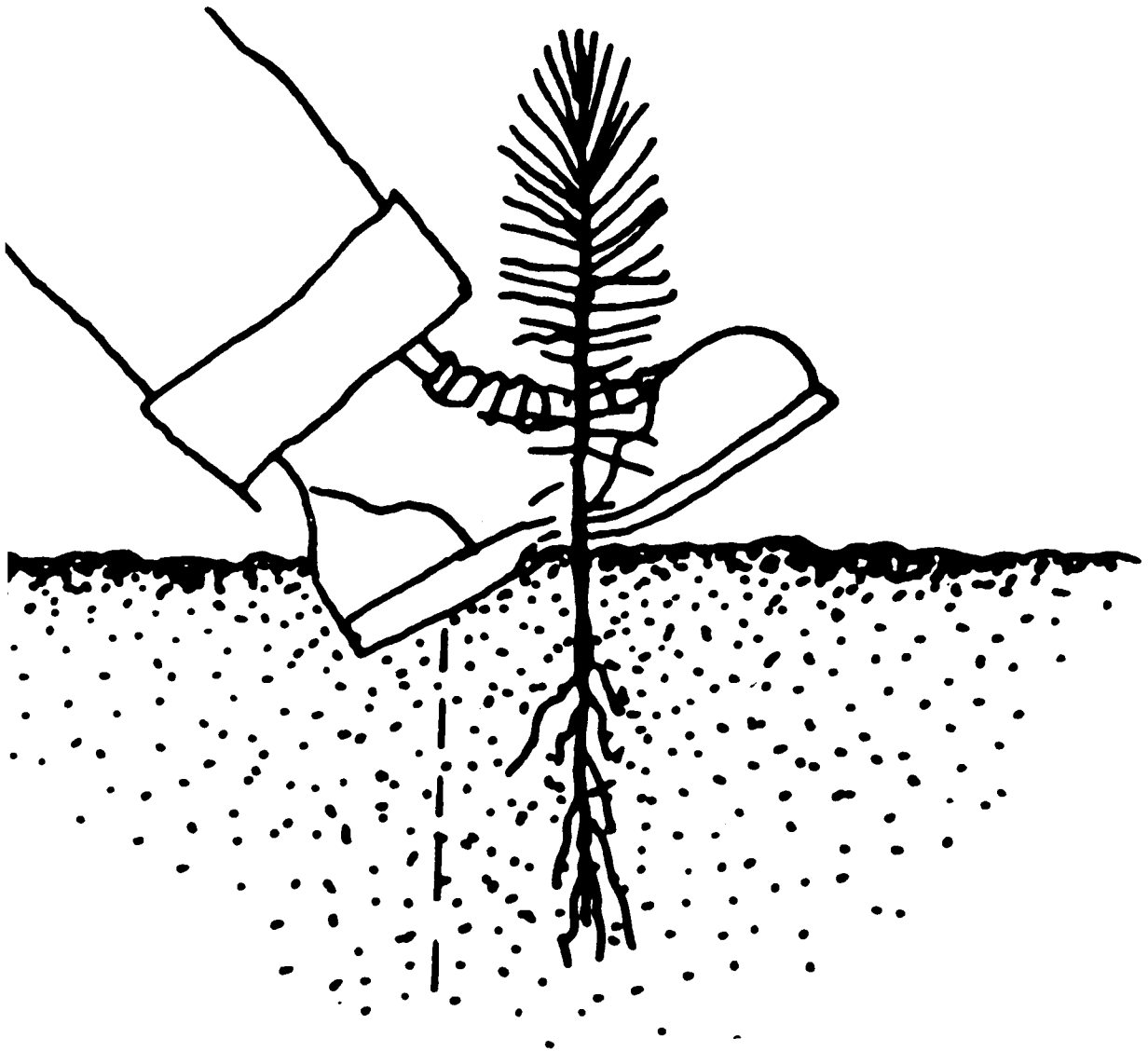


United States
Department of
Agriculture

Forest Service
Southeastern Area

The Yazoo-Little Tallahatchie Flood Prevention Project:

Reforestation Procedures For Erosion Control



CHAPTER 1.

PLANTING, TRANSPORTATION, AND STORAGE

PLANTING AREA DESIGNATION

Locating critical areas that require treatment and obtaining agreements from landowners are year-round jobs. When enough critical land has been so secured for one season's planting, finding areas for the following season should continue without a break. A seasonal approach will never suffice.

Boundary Designation

After each planting area is approved by the USDA Soil Conservation Service farm planner, it should be posted to an inventory control record. This record should show areas to be planted, and each day's planting accomplishments. The boundaries of these areas will be flagged and mapped by a qualified person as described in the following paragraphs. *Deviations from this procedure must be approved by the project manager.*

Mapping

Mapping should be kept current. Boundaries that are clearly defined on aerial photographs (fences, roads, distinct tree lines) offer no problems. Areas inside woods, of sheet erosion, shallow gullies, and the like require ground mapping using a plane table and compass or any method with comparable accuracy. Distances may be determined by pacing if accuracy within 3 percent of actual distances over varying terrain can be maintained.

1. On areas with well-defined boundaries (fences, etc.), the flagger will draw the boundary on an aerial photograph (8 inches to the mile - 1:7920) as he or she flags the boundary. Sufficient flagging tape should be used so that each point flagged can be seen from the previous point.

2. Small areas with boundaries poorly

defined on the photograph may be mapped and flagged by a single person. Larger areas may require two operations; flagging and roughly outlining areas on an aerial photograph; then exact boundary mapping with plane table and compass, following the line previously flagged.

Those boundaries clearly visible on the photograph will have been drawn in at the time of flagging.

After an area is mapped, two overlays are prepared, one for office use and one for the planting foreman. Acreage and number of trees will be posted in the inventory control record.

Inspection

The PMO timber management specialist will inspect each field unit annually for proper mapping procedures, including field checks to confirm the validity of decisions to map poorly defined areas, and for accuracy.

FIELD PLANTING GUIDES

Planting Season.

Planting seasons normally begin in early December and end by early April in north Mississippi. When the weather is cool and wet, it is possible to plant after April 1, but hot, dry weather in late March and early April reduces seedling survival.

By mid-November, usually, frost has hardened off the seedlings, conditioning them for lifting at the contract nursery. It takes about 2 weeks after a hard freeze at the nursery for trees to be safely hardened off. Leave trees in nursery as long as possible to avoid early lifting and prolonged cold storage to await planting.

Circumstances such as labor shortages may occasionally demand an extended planting season. Planting may start as early as November 20 if seedlings can be lifted at

the nursery and soil moisture is adequate. But no planting should start until the soil is moist to the depth of 10 inches.

Suitable Field Planting Conditions

Once plantation is started, it should be a continuous operation; freezing, a prolonged dry period or inclement weather can, of course, interrupt the process. (Good judgment must be used; it may be better to wait for favorable conditions than to insist on getting a certain number of trees planted by a given time.)

Seedlings may be planted through a light snow cover if the ground is not frozen, or when the top ½ inch or less of the soil is frozen and the air temperature is above freezing.

Take care not to bruise the seedling stem when closing the slit in frozen soil. Suspend planting if the temperature is expected to remain below freezing most of the day. Under such conditions seedlings roots will freeze together in the planting bag and break easily when pulled apart for planting. If bundles become frozen, allow them to thaw naturally before planting; do not heat.

Species and Spacing

Loblolly pine has been established as the best tree species for reclaiming severely eroded land on the Y-LT. Compared to other southern pines, it grows faster, achieves quicker crown closure, and casts more litter at an earlier age.

The primary purpose of Y-LT tree planting is flood and erosion control; growing timber for wood products is secondary. Successful erosion control requires that trees are spaced to provide crown closure as soon as possible and to produce enough litter to stop soil movement in 5 to 10 years.

Control erosion in the most actively eroding (gully control) areas by planting about 1200 trees per acre using a 6 x 6 foot spacing *on the average*. On some of the more severe, near-sterile sites, closer spacing is usually necessary to obtain a protective

cover as soon as possible. Because of these factors seedlings may be planted at a 5 x 5 foot spacing on these sites. Closer spacing must be approved by the project manager.

Do not rigidly follow this spacing, but take advantage of natural or prepared planting sites which are more favorable.

In less severe Critical Area Stabilization areas, spacing should be 7 x 8 feet, or about 780 trees per acre. (For normal planting sites with no visible erosion the recommended silvicultural spacing is 8 x 8 feet.)

Avoid underplanting established clumps of pine, desirable hardwoods, or den trees. Place seedlings so that crowns of pine or other desirable trees will not suppress seedlings as they develop.

Hand Planting

Each tree planter will be trained to perform the following steps (see figure 1) when planting a seedling:

1. Using boot heel or a planting bar blade, clear a 4 to 6 inch strip of all grass, leaves, or trash.

2. Using both hands and one foot, with the bar inclined slightly toward the body so that the far side of the blade is vertical, sink the blade to its full length into the soil to make a planting slit at least 4 inches beyond the near edge of the cleared strip.

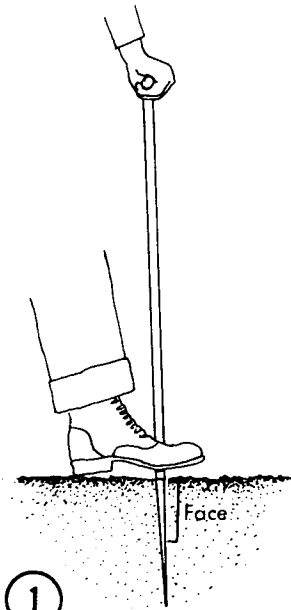
3. Pull the handle of the bar about 4 inches toward body to open the top of the planting slit a maximum of 1½ inches. Do not push the bar from body; this will disturb the face of the planting slit, which should remain vertical to keep the seedling upright and to ensure maximum movement of water through the soil to the roots.

4. Pull the bar from the slit and rest the blade 1 inch behind the rear edge of the planting slit, supporting the bar with one hand.

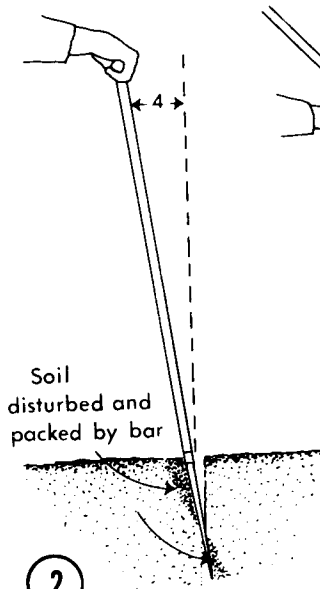
5. Take one seedling from planting bag and insert the roots into the slit so that the root collar is 3 to 4 inches below the ground surface.

6. Shake the seedling to enable the roots

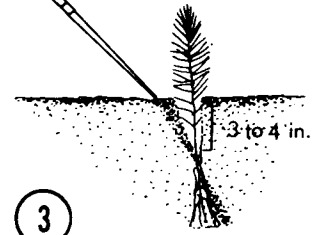
Figure 1.-- Y-LT Planting Technique



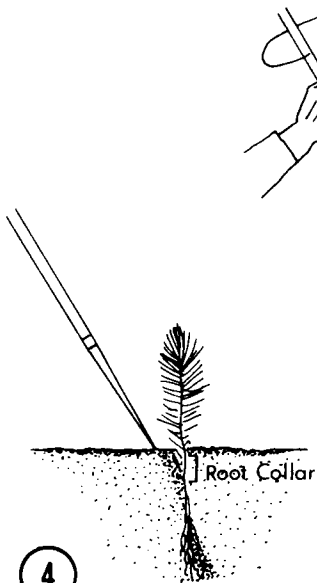
1
INSERT BAR
IN GROUND.



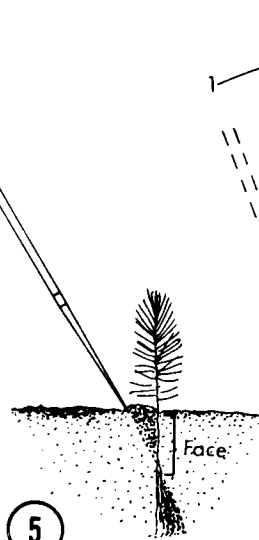
2
PULL TOP OF BAR
ABOUT 4 INCHES
TOWARD BODY.



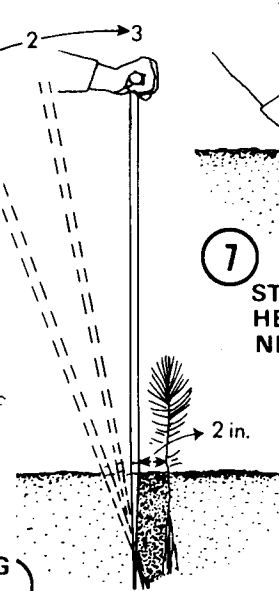
3
PLACE SEEDLING
IN SLIT — ROOT
COLLAR 3 TO 4" BELOW
GROUND LEVEL.



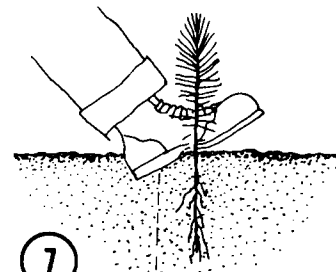
4
RAISE ROOT COLLAR
TO WITHIN 0 TO 2" OF
GROUND SURFACE.



5
TACK SEEDLING
WITH BAR.



INSERT BAR
2" BEHIND SEEDLING
AND ROCK.



7
STEP IN HOLE WITH
HEEL & PACE TO
NEXT PLTG SPOT.

to stand in a natural position, and raise the root collar to within 0 to 2 inches of the ground surface. This action will straighten the lateral roots and prevent U-rooting of the tap root. (The root collar represents the depth the seedling grew in the nursery.)

7. While holding the seedling upright in this position, twist the bar blade so that soil forced into the top of the slit will hold the seedling in place.

8. Release the seedling and set the bar 2 inches from the seedling stem in a vertical position and insert the full length of the blade to make a closing slit. Push forward and pull back once to tighten the tree.

9. Insert the bar about 1 inch behind closing, about 1 inch deep, and twist it to close the closing slit. Firmly press soil into the top of the closing slit with the heel of boot without stepping on seedling. NOTE: The planting bar blade is 10 inches long. When the edges of the blade become rounded and the length is worn to less than 9 inches, replace the bar.

Using this planting method, one person should plant 150 to 200 trees per hour, depending on planting conditions.

Quality Control Checks

The planting crew foreman will inspect the following items:

1. *Planting Slit* — (a) correct depth, (b) removal of debris such as trash and leaves, (c) top and bottom properly closed.
2. *Planting Quality* — (a) trees vertical, (b)

U-roots, (c) loose seedlings, (d) root collar more than 2 inches below the surface, (e) root collar above the surface, (f) more than one seedling in a slit, (g) correct spacing, (h) cull seedlings.

3. *Care of Planting Stock* — (a) ample wet moss in the bag to keep the roots moist, (b) planter holds only one tree in hand at a time.

Gully Planting Site Selection

Because of the severity of conditions, planting sites should be selected one at a time. Instead of following rigid spacing guidelines, the planter should select naturally advantageous spots and man-made improved sites. The best soil and moisture available are critical for pine establishment and growth.

Normally, seedlings should not be planted on narrow hogbacks without top soil, on steep side slopes, or in intermittent water courses without sediment-collecting barriers.

Quality of Planting Stock

From each shipment of 1-0 loblolly pine planting stock, one bale will be sampled and graded using Wakeley's specifications for 1-, 2-, and 3-grade seedlings (see table 1). Record the following: nursery name, bundle weight, bundle condition (loose, tight), type and adequacy of packing medium, roots dry or moist, length of roots in inches, number of trees in bale, evidence of heat, evidence of rough handling, evidence of insects or

Table 1. — Specifications of grades of uninjured 1-year-old loblolly pine seedlings

Grade	Stem lengths (Inches)	Thickness of stem at ground (Inches)	Nature of stem	Bark of stem	Needles	Winter buds
1	5 to 12	3/16 or larger	Stiff; woody	Usually on entire stem	Almost entirely in 3's	Usually present
2	4 to 7, sometimes 10	At least 1/8	Moderately stiff	On lower part at least, often all over	Part at least in 3's	Ocasionally present
3	Usually less than 5	Less than 1/8	Weak; often juicy	Often lacking	Practically all single; usually bluish	Almost never present

Source: Wakeley, P.C. *Planting the Southern Pines*, USDA, Monog. 18, p. 103 (1954).

disease, date seedlings packed, date seedlings received, and number of seedlings by grade.

Spot check bales upon receipt for excessive heating or drying, particularly bales toward the interior of the shipment. Stock that is dry or has received excessive heat should be set aside for later determination of suitability.

Plant all seedlings except culls. A cull is a seedling damaged by disease or insects, has injured stems or roots, or has a tap root less than 4 inches long. If, however, a seedling meets all other specifications for grade 2, it may be planted with a 4-inch tap root.

Each planter must be taught to recognize culls.

Root Pruning

Seedling roots are usually pruned to the correct planting length at the nursery. Seedlings with excessively long roots received in the field should be carefully trimmed before planting. This must be done by the crew foreman or someone designated and trained by him. Prune tap roots to 7 or 8 inches below the collar. Do not prune laterals. Care must be taken to prevent roots from drying out during the pruning operation.

Use a sharp instrument and cut cleanly; severe damage will result from jerking or tearing the root system.

SEEDLING TRANSPORTATION, STORAGE, AND PROTECTION

Survival success or failure depends on the care of seedlings at all points between being lifted at the nursery and being planted. Constant vigilance is required to prevent injury from exposure to sun and wind, freezing, mistreatment, and heating or drying during shipment or storage. On the Y-LT, physiologically strong seedlings are particularly necessary because adverse planting sites predominate in this fragile soil.

Transportation

Drying and heating are the two principal causes of injury in transit. If possible, load seedlings at the nursery and unload them at their destination during the same day. They should not be transported when the air temperature is 60°F or higher.

Use of spacers between layers of bundles has been suggested, but Y-LT experience has not shown this practice to be necessary. Also, covering seedlings on open-bed trucks with a tarpaulin has proved more harmful than helpful; it causes overheating.

Refrigerated Storage

Use a cold storage unit to the maximum extent. Pine seedlings can be held in cold storage for 2 to 3 weeks without apparent damage, but after 3 weeks they become progressively weaker until, from 10 to 12 weeks, survival will be down to 10 percent or less.

The relative humidity should be above 90 percent. Check the seedlings for dryness at least three times a week. Seedlings lifted after dormancy will probably require watering (discussed later). Although dormant seedlings normally do not require periodic watering, this assumption must not be taken for granted.

Planning should ensure that seedlings are stored for the shortest possible time before planting, leaving them in cold storage for maximum protection. Seedlings held in cold storage longest will be removed and planted first — unless others have been physiologically weakened by adverse conditions.

In the past, refrigerated railroad cars have been used to store seedlings, but this practice is discouraged because of the difficulty in maintaining first-in-first-out removal, and in the lack of block ice service.

Storage In Protected Sheds

The most common method for temporary seedling storage on the Y-LT is in protected sheds where seedlings can remain for 2 to 3 weeks without harm. Heat should be

available to avoid freezing.

Bales should be stored in slanted, tiered racks where the slant provides drainage of excess water. A drain or trough may be

needed to handle water runoff.

Bales should never be stacked on top of each other. (See figure 2.)

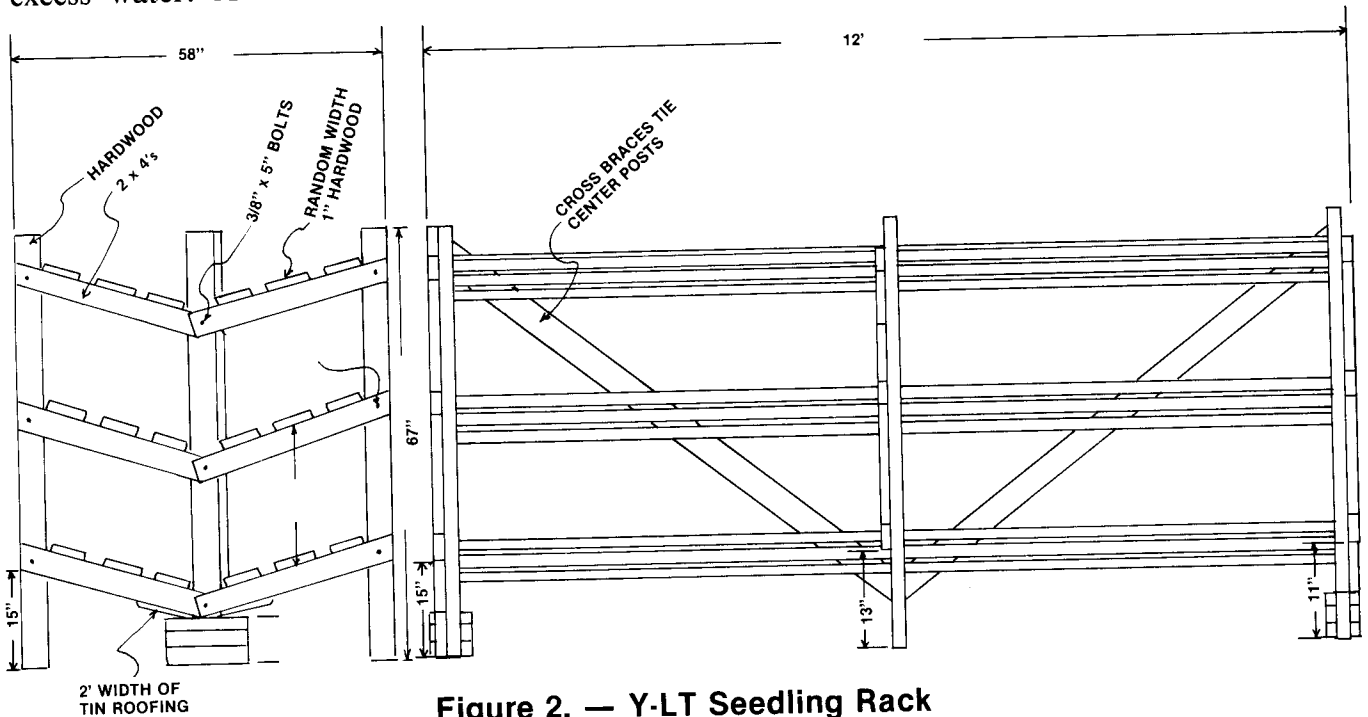


Figure 2. — Y-LT Seedling Rack

Watering Seedlings

Upon arrival from the nursery, seedlings may need watering, and they should be checked at least 3 times a week for proper moisture. Roots and packing medium should be damp at all times. Remember that seedlings lifted after breaking dormancy will dry out much faster than dormant seedlings.

The best watering device is a perforated metal tube with a cutoff valve (see figure 3).

The proper watering procedure is:

1. Insert tube into the end of a bale and turn on the water. Do this in three or four places so the entire area is covered.
2. Roll the bale 180 degrees and repeat.

Protection from Freezing

Both the literature and Y-LT experience offer contradictory information on the length of time that seedlings can remain frozen and still survive when planted. It seems certain, however, that freezing harms them and that after 48 hours, survival is unlikely.

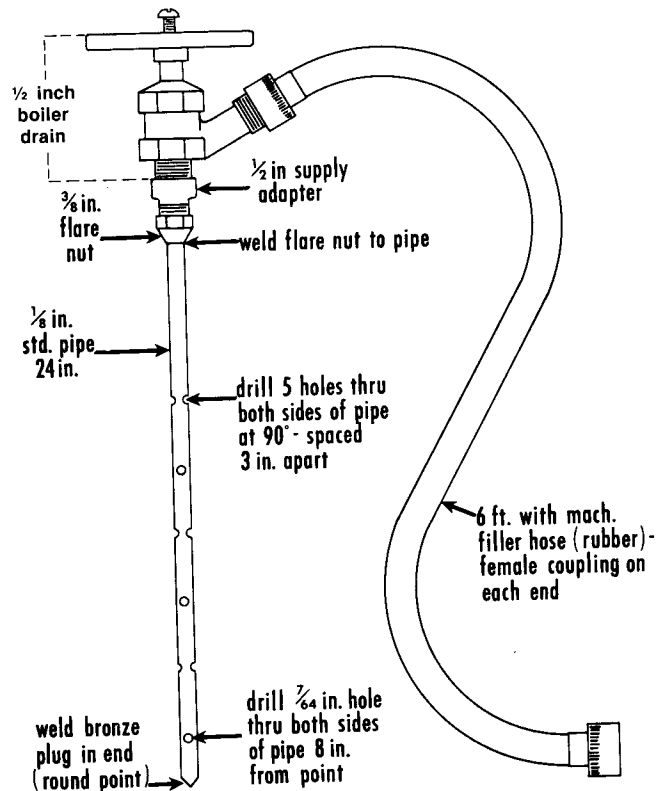


Figure 3. — Y-LT watering nozzle

If seedlings do become frozen, they must be thawed slowly *without* applying heat. Great care must be taken then in separating the roots from the bundle. The slightest injury will lessen even more the chance of survival.

Because freezing can only lessen the chances of survival, make every effort not to let them freeze.

Protection in the Field

Crew foremen must watch constantly to insure that seedlings are not exposed to adverse conditions after they leave the storage shed. Bales removed and not used must be noted when they are returned to the shed so that they will be loaded last on the trucks the following morning — then planted first.

Trucks should not be parked in the sun on warm days. If they must be parked in the sun, put the trees in the shade of the truck or under it. Do *not* cover them in the truck; this makes them hotter. Bales that are partly used will be re-wrapped and packing medium spread over the roots to prevent drying.

Large, open areas should be planted in December and January to avoid hot, windy weather.

Other precautions:

- Don't overfill planting bags — roots can be damaged. Also, the last trees in the bag may dry out. Depending on the weather, wind and other factors, put only the number of seedlings in a bag as can remain moist. Experience must be the guide.
- Plant seedlings first that have been in the bag the longest, and so on.
- Avoid exposure of the roots, particularly in dry, windy weather. Even a full minute may be too long.
- Use care when separating seedlings from bale. Tightly packed lateral roots become entwined and are easily broken.
- Keep wet sphagnum moss in the bag to prevent drying of the roots.

FUNDING

In its reforestation work to heal and prevent erosion, the Y-LT operates under a memorandum of understanding with the Soil Conservation Service. Funding is established through a determination by the SCS of the severity of land damage.

Gully Control with 100 Percent Funding. — Gully control (GC) planting protects severely eroding lands which produce or are likely to produce severe offsite damage, usually on lands in capability classes VI and VII. Usually, 100 percent of the cost of establishing vegetation on these critical areas is Federally funded. Such land must be open, with less than 10 percent forest cover.

Critical Area Stabilization (CAS). — Planting of seedlings may be done with less than 100 percent cost-share payments. CAS planting, often called 80-20, treats areas which are less critical than those covered by the GC-100 percent program, but which still contribute substantially to offsite damage through erosion and high runoff. Treatment may be cost-shared, with the cooperator paying a minimum of 20 percent; the Federal government, a maximum of 80 percent.

Non-assistance Trees. — Seedlings can be furnished for landowners themselves to plant on critical areas if the land qualifies under one of the higher cost-share rates (100 or 80-20 percent). This practice may be followed when personnel shortages, funding, or other limitations prevent planting by the agency. Some seedlings may be given to local landowners and homeowners for planting on house lots and other areas to control erosion. The total number of such seedlings should not exceed 3 percent of the unit's annual planting program.

HANDLING COST-SHARE COLLECTIONS

Landowners participating in the 80-20 program must pay a minimum of 20 percent

of the planting costs for establishing a stand of trees on critical areas. With one exception, payment must be in advance. The exception is in-kind contributions, i.e., when the landowners contribute their own services instead of money.

The project forester is the collection officer on each unit, and sends collections to the PMO collection officer *on the same day* they are received. If they must be held overnight, they must be kept in a locked file or drawer. Personal checks may be accepted, but payment is preferred in cashier's or certified checks, postal or bank money orders. Payee is *Forest Service, USDA*. Cash will not be accepted.

Upon receipt of payment at the PMO, Form 6500-89, *Bill for Collection*, will be prepared. The pink copy (payer's receipt) and the yellow copy will be returned to the project forester who will give the payer's copy to the landowner and put the yellow copy in the collection officer's file. Only after the project forester receives these copies can the Forest Service begin the work covered by that payment.

INSPECTIONS

Force Account Planting

This planting is accomplished by project crews. Project foresters, forestry technicians, crew foremen, and the PMO timber management specialist will periodically inspect each crew to evaluate planting quality, identify errors, and take corrective action to meet planting standards.

Inspection schedules:

Crew foreman — Daily

Forestry technician — Twice weekly

Project forester — Weekly

Timber management

specialist (PMO) — Monthly

Early in the season more frequent inspections by the project forester and forestry technician will be necessary until quality and quantity are achieved by the crew. All deficiencies are to be corrected immediately.

All inspection reports will be filed in a folder set up specifically for that purpose under file designation 2470. After the planting season, these reports will be filed with the seedling receipt and overlay map in the farm folder.

Crew Foreman

The foreman will check each planter regularly for planting techniques and seedling grade, culling, and root condition. During the day the foreman will dig at least three seedlings planted by each planter at varying times of the day; planting quality can suffer because of fatigue, weather, terrain and other factors. Spacing will be checked on ten 1/100-acre plots.

Project Forester and Forestry Technician

The project forester's weekly inspection will cover the same items as the technician's, described below.

The technician will inspect the same items as the foreman on ten 1/100-acre plots randomly spaced over the planting area, digging one seedling per plot. This seedling should be the one closest to the plot center.

The technician will also check crew organization. There will be a lead worker to set the pace, and each crew member should be lined up one space from and one space back of the person being followed. (A space, of course, will be the designated planting space, 6 x 6, 7 x 8, etc.) The crew should progress without any noticeable break in the line.

Safety will be a part of all inspections. The technician will check the crew vehicle, equipment, field clothing, and hazards peculiar to the area and the weather.

Deficiencies will be discussed in the field with the crew foreman, and the technician will help the foreman find solutions and apply corrective action. The technician will file a report with the project forester and give a briefing on the field situation.

PMO Timber Management Specialist

This check will be the same type as those of the project forester and technician and they will accompany the TMS during an inspection.

On the Y-LT, the terms "hot" and "cold" checks have been used to describe inspections. A hot check is one conducted while work is in progress. A cold check is carried out on work performed the previous day or earlier. The TMS will make both hot and cold checks at random times and will visually inspect each crew working during a visit.

Particular care should be taken in checking spacing. Spacing should be correct for the particular terrain and soil being planted, i.e., closer spacing for gullied or critically eroded areas.

Minimum planting standards require 90 percent of seedlings to be correctly planted. An individual crew member who consistently fails to meet quality and production standards will be released.

Within 5 days of the field check, the unit will be furnished a report of the inspection. Records and reports are described in the appendix.

STOCKING EXAMINATIONS

General Requirements

Stocking examinations should be conducted after the first growing season is completed, i.e., summer or fall following planting. In October or November, after the first frost, the young trees are easier to see. The inspection should be completed by early December to allow time to schedule replanting during the planting season in progress.

For each county and planting type (100 or 80-20 percent, other) the following data will be shown: acres planted, acres checked, areas lost, percent of checked acres lost, and reasons for loss. Show grand totals for the unit. Use the daily inventory sheet to

analyze the causes for poor survival.

Examinations, including replanting, will be grouped into two categories:

- (1) All force account, GC and CAS
- (2) Non-Assistance, 10 acres or more

Field Procedures

Field examination will be conducted in quadrats as follows:

1. Less than 10 acres — a minimum of 10 quadrats.
2. 10 to 100 acres — one quadrat per acre.
3. More than 100 acres — 100 quadrats.

Quadrats will correspond to seedling spacing, i.e., where seedling spacing is 7 x 8 feet, quadrats will be 7 x 8 feet.

Before going to the field, draw lines of travel on a plantation map showing the number of plots to take on each line and the distance between them. In the field, cover the areas systematically, using a hand compass and pacing distances.

A quadrat is stocked if it contains one or more living planted or natural desirable seedlings.

On form FP-53 use a check mark (✓) in all columns except the ones headed "Planted" and "Natural." In these two columns, dot-tally actual trees counted.

The minimum acceptable stocking count per acre is 400 trees for 7 x 8 foot spacing, and 600 trees for 6 x 6 foot spacing. Calculate adequate stocking as follows:

<u>Spacing</u> <i>feet</i>	<u>Round No.</u> <u>Seedlings/Ac.</u>	<u>Quads</u> <u>Stocked</u> <i>percent</i>	<u>Number of</u> <u>Seedlings/Ac.</u>
6 x 6	1,200	50	600 (adequate)
7 x 8	800	25	200 (inadequate)

Some areas within a plantation may be found to be inadequately stocked. These should be flagged and mapped. Although, for reporting purposes, a plantation is considered adequately stocked when 50 percent or more quads are stocked, there may be sections which do require replanting. Conversely, the entire plantation may show inadequate survival although segments of it do

not require replanting. Such situations should be noted.

TRAINING

Project-wide Reforestation Workshop. — This session covers such subjects as planting techniques, care of seedlings, inspection systems, safety, records, and the scope of the entire program. This workshop should be given each year in November before the start of planting season. Even experienced workers need a refresher course.

Pre-planting Training. — Sessions to train crew members in planting techniques, care of seedlings, crew organization, and safety.

Selection of Gully Planting Sites. — Project forester and technician will conduct this training periodically for foremen and crew members.

Training of New Crew Members. — Before placing new employees in the line, the crew foreman will give them 2 hours of field training by demonstration and by observation of experienced crew members. Recognition of safety hazards and how to avoid them will be emphasized.

Root-Pruner Training. — Either a crew foreman or a crew member may be designated a root pruner. Training will be conducted annually. Ability to properly prune roots will be checked on periodic inspections. Root pruning should not be done unless authorized by the project forester.

Pacing. — Individuals who perform flagging and mapping duties must refresh their skills on a designated pacing course as needed to maintain accuracy.