Seedling Care And Planting Guidelines

FORWARD

From the time of lifting at the nursery until forest tree seedlings are transplanted in the field, there is danger of weakening or killing the seedlings due to improper handling techniques.

This problem is further complicated by the varying environmental conditions that occur during this period. Because of different weather and soil conditions, excessive drying and ultimate seedling mortality may occur within drastically different exposure time periods.

These standards for various weather conditions were developed as guidelines for field use. Three separate sets of standards are provided for the three general classifications of environmental conditions (normal, marginal, and critical) for handling seedlings.

Environmental conditions should be monitored continuously and field operations adjusted as necessary to adhere to these standards.

Included in this booklet are the guidelines and minimum standards used by the Georgia Forestry Commission (GFC) to determine acceptable and unacceptable performances for cost-share assistance under the federal tree planting programs. In addition, a sample tree planting agreement is contained which outlines various responsibilities for landowners and tree planting vendors to ensure an acceptable tree planting performance.

This booklet was written to help landowners and vendors understand their roles and obligations for tree planting under the Forestry Incentive Program (FIP), the Agricultural Conservation Program (ACP) and the Conservation Reserve Program (CRP) which are administered at the state and county level by the Agricultural Stabilization and Conservation Service (ASCS).

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I. CLASSIFICATIONS OF WEATHER CONDITIONS

Day Classification	Weather Conditions	Recommendations
Normal	•Temperature: 33°-75°F Relative Humidity: 50%+ Wind: Less than 10 mph Available Soil Water: 75% to Field Capacity	Excellent conditions for planting
Marginal	•Temperature: 76°-85°F Relative Humidity: 30%-50% Wind: 10-15 mph Available Soil Water: 50%-75%	Planting is O.K. Precautions to limit seedling exposure should be taken
Critical	•Temperature: 32°F or less, or 85°F+ Relative Humidity: 30% or less Wind: 15+ mph Available Soil Water: Less than 50%	Do not plant if *any* of these conditions exist.

*Reference Appendix D.

II. SEEDLING EVALUATION

Seedlings should be inspected at time of pick up and during planting to determine their overall condition.

1. Indicators of seedling deterioration:
   a. Sour smell - fermentation
   b. Yellow needles (in some instances)
   c. Trees warm to touch

2. Indicators of dead seedlings:
   a. Bark, especially on roots, slips off easily
   b. Cambium layer has turned brown
   c. Trees hot to touch
   d. Mold developing

CONTACT DISTRICT REFORESTATION FORESTER PRIOR TO PLANTING

III. DISTRICT/VENDOR TRANSPORTATION AND STORAGE STANDARDS

A. REFRIGERATED TRANSPORTATION/STORAGE 33°F to 38°F

1. Long-term storage (over one day) of seedlings should be in refrigerated coolers.
2. After periods of non-use, coolers should be turned on and run for a three-day test period about one month prior to storing seedlings.
3. Coolers should be turned on and allowed to cool down for two days prior to receiving the first seedling shipment.
4. Bags/bales of seedlings should not be stacked more than three layers deep without the use of spacers (pallets or slats). Spacers should allow 2" - 4" of air space between layers.
5. A recording thermometer should be installed and maintained in each storage cooler.
6. Relative humidity inside storage coolers should be maintained as high as possible (85%+). However, when seedlings are packed in waterproof, sealed bags, precise humidity control is usually not critical.
7. To maintain high humidity, the walls of the cooler can be sprayed periodically with water. Condensation from cooler compressor should also be emptied inside cooler.
8. Cooler should not be used for storage of other products (such as chemicals, fertilizer, etc.) that are lethal to seedlings or damaging to the cooler unit.
9. Seedlings that are lifted before reaching dormancy (usually prior to mid December) should not be stored for periods of more than *one or two* weeks. Dormant seedlings may be stored up to four weeks *(except for longleaf)*. Longleaf seedlings should not be stored for periods exceeding *10* days.
10. A chart similar to EXHIBIT 1 should be maintained currently for each shipment of seedlings. Seedlings should be used in a manner to keep fresh stock.

11. Cooler exteriors should not be painted with dark or heat absorbing colors.
12. Seedlings leftover from a days planting job should be evaluated for viability. Viable seedlings should be returned to the cooler and used first the next planting day. (REFER TO SEEDLING EVALUATION).

B. NON-REFRIGERATED TRANSPORTATION AND STORAGE

1. Normal conditions
   Temperature: 33°F to 75°F
   Relative Humidity: 50%+

a. Transportation
   (1). Vehicles used for transporting seedlings should have a light colored cover to shade and protect seedlings.
   (2). Bags/bales of seedlings should not be stacked more than two layers deep without the use of spacers. Spacers should allow 2" - 4" of air space between layers.
   (3). At least 12" of air space should be left between the protective cover and the top of the bags/bales to avoid heat buildup.
   (4). Vehicles transporting seedlings should not be parked in direct sunlight. In case of emergency stops or breakdowns when stops exceed 45 minutes, seedlings should not be planted until their condition has been determined (REFER TO SEEDLING EVALUATION).
   (5). Inspect and repair torn bags/bales immediately.
   (6). Do not transport seedlings in truck beds containing fertilizer, chemical or fuel residues.
b. Storage
   (1). Store seedlings in buildings, shed, etc. that will protect from freezing, heating, and direct sunlight--preferably in refrigerated coolers at temperatures of 35°F to 38°F.

(2). Bags/bales should be stacked on pallets or slats and should not be stacked over two deep without spacers to allow air circulation between layers.

(3). If temperatures inside non-refrigerated unit is from 38°F to 50°F:

(a) Storage bags can be kept up to three to four weeks.

(b) Bales with seedlings whose roots have been coated will keep two to three weeks. No watering will be required.

(c) Bales with seedlings packed in moss only will keep two to three weeks, but will re quire watering at least two times per week.

(4). If temperatures inside storage area are between 50°F to 70°F, seedlings should be removed and planted within three to five days.

2. Marginal Conditions
Temperature: 76°F to 85°F
Relative Humidity: 30% to 50%

a. Transportation

(1). Field delivery in non-refrigerated vehicles should be held to a minimum. Seedling delivery from a non-refrigerated storage point to destination should not exceed one hour's time.

(2). Vehicles used for transporting seedlings should have a light colored cover to shade and protect seedlings.

(3). Bags/bales should not be stacked over two deep per layer unless spacers are used to provide air circulation between layers.

(4). At least 12" of air space should be left between the protective cover and the tops of the bags/ bales to avoid heat buildup.

(5). Vehicles transporting seedlings should not be parked in direct sunlight. In case of emergency stops or breakdowns, seedlings should not be planted until their condition has been determined (REFER TO SEEDLING EVALUATION).

(6). Inspect and repair torn bags/bales immediately.
(7). Do not transport seedlings in truck beds containing fertilizer, chemical, or fuel residues.

b. Storage
(1). Store seedlings in building, shed, etc. that will protect from freezing and heating.
(2). Bags/bales should be stacked on pallets or slats and should not be stacked over two deep without spacers to allow air circulation.
(3). If temperatures inside storage area is above 75°F, do not store seedlings more than 24 hours.

3. Critical Conditions
Temperature: 32°F or less or 85°F+
Relative Humidity: 30% or less

a. Transportation
(1). Field delivery in non-refrigerated units should not be made when the temperature is 85°F or higher.
(2). Field delivery in non-insulated units when the temperature is 32°F or less should be made only if the vehicle is covered adequately to prevent freezing.
(a) Caution--seedlings can heat excessively on a cold day if vehicle is parked in direct sunlight and seedlings are stacked, preventing air circulation.
(b) Unload seedlings immediately upon arriving at destination.
(3). Inspect and repair torn bags/bales immediately.
(4). Do not transport seedlings in truck beds containing fertilizer, chemical or fuel residues.

b. Storage
(1). Seedlings should not be stored in bags/bales for more than a few hours at temperatures above 85°F.
(a) Lethal temperatures occur in bags/bales at 118°F, but seedlings can be weakened or damaged if the temperatures in the bag/bale remains at 85°F for very long.

(2). Do not store seedlings in an area where the temperature is 32°F or less.
(a). Do not allow seedlings to freeze.
(b). If seedlings have not been frozen more than 36 hours:
--Thaw seedlings slowly and naturally.
--Do not subject seedlings to any artificial heat source.
--Determine condition.
(c) If seedlings have been frozen more than 36 hours they most likely have been sev erely damaged and should not be planted.

IV. FIELD HANDLING AND PLANTING STANDARDS

A. NORMAL CONDITIONS

Temperature: 33°F to 75°F
Relative Humidity: 50%+

1. On Site Storage
(a). Bags/bales should not have prolonged exposure to direct sunlight. Store seedlings in a shaded location at all times.
(b). If no shade is available at site, improvise a portable shelter such as a lean-to made of opaque plastic, canvas or plywood.
(c). Bags/bales should not be stacked in layers more than two deep without spacers. Spacers allow air to circulate freely around the seedlings and keep them cool.
(d). Keep close check on the seedlings stored at the site and *water uncoated roots* of seedlings in bags or bales if roots begin to dry. Do not puddle water in bag as excess water can drown root tips or promote mold on the seedlings.
(e). *Do not water coated roots* of seedlings since the water will remove the coating. If roots begin to dry, dip roots in a super water absorbent gel or clay slurry. Since the coating of roots will not give

absolute protection against moisture loss, restrict the exposure of the roots the same as if they were uncoated.

(f). Inspect and repair torn bags/bales immediately.

(g). Keep opened bags closed tightly by folding flap over bag and laying flat-side down or by placing a band or cord firmly around bag/bale. Keep in shade.

(h). Keep opened bales covered at all times with wet burlap. Keep in shade.

(i). If opened bags of uncoated seedlings, must be kept for over two days before planting, seedling roots must be dipped in water and bag tightly closed, or heel seedlings in.

(j). If opened bales of seedlings are not used shortly after opening, they should be heeled in.

(k). Store trays of containerized seedlings in shade and keep root plugs wet until seedlings are planted. During storage, open book-type containers and check moisture of root plugs.

2. Sorting and Culling Non-Plantable Seedlings

(a). Open only one bag/bale at a time. Be careful not to leave open more than a few minutes.

(b). Remove only a small handful of seedlings at a time. Do not allow the roots to be exposed to the sun or wind any longer than five minutes. Sort and cull this handful and immediately place in protective container.

(c). Sort and cull only enough seedlings to fill planting bags to be carried with hand planters for a one hour supply.

(d). Do not mechanically abuse seedlings by hitting or striking the roots across an object to remove excess soil.

(e). Protect seedlings from mechanical or other damage. Do not crush, stand or sit on seedlings.

(f). Do not build a warming fire within 100 feet of where seedlings are being handled.

(g). Cull seedlings that have:

(1) Broken, skinned, diseased or weak stem.
(2) Fermented smell*
(3) Mold on needles*
(4) Slippery bark*
(5) Been allowed to heat up or dry out*

*Cull entire bag/bale.

(h). Cull seedlings that do not meet specifications for plantable southern pine seedlings, (Appendix A). Only Grades 1 and 2 seedlings should be planted.

(i). Cull containerized pine seedlings that are very small and poorly developed. Also, cull seedling if root plug has become dry and hard.

(j). Cull hardwood seedlings having root collars smaller than one-fourth inch.

(k). Roots must be kept visibly moist at all times. If not visibly moist, dip roots in super water absorbent gel or clay slurry. Close bags/bales properly.

(l). Do not sort and cull an excessive quantity of seedlings at the planting site. Sort and cull only enough that the planter can use in a one hour period.

(m). For best results, assign one trained person to be responsible for culling seedlings. Closely supervise and check on culling procedures.

3. Root Pruning Seedlings

(a). Usually root pruning will not be necessary for GFC seedlings as they have been root wrenched and laterally root pruned at the nursery.

(b). Root pruning is only recommended for those seedlings whose lateral or tap roots exceed 7 inches in length, then only prune back to 7 inches.

(c). Assign only properly trained persons to be responsible for root pruning.

(d). Root prune seedling at same time as being culled. Follow precautions listed under Sorting and Culling.

(e). Prune roots to uniform length. Align root collars in bunches before pruning roots. Use a sharp knife, machete, axe, hatchet or other sharp tool for root pruning. Never break or twist roots off by hand.

4. Tree Planting Operations

HAND PLANTING

(a). Train all new personnel prior to allowing them to plant. (Follow-up training may be necessary if poor techniques are observed.) Do not assume labor is trained or skilled.

(b). Organize hand tree planters into crews of 8 to 12 planters and one foreman. Foreman should monitor each planter's performance and take corrective action as needed to ensure seedlings are being properly cared for and planted.

(c). While hand planting, carry seedlings in a canvas bag, bucket, etc. free of holes and contamination, containing wet moss, hydromulch, clay slurry, etc. to protect and keep seedling roots visibly moist.

(d). Do not carry seedlings in hand with roots exposed. Wait until after the planting hole has been made before removing seedling from bag. Planting hole should be fairly straight and 8 to 10 inches deep. Do not use dibble or hoedad that will not make a hole or slit at least 8 inches in depth.

(e). Leaves, litter, duff, etc. should be removed before planting tool is inserted.

(f). Do not plant seedlings that happen to be carried "roots up" in the planting bag.

(g). To avoid possible root damage, do not use the planting tool to maneuver roots or seedlings into hole.

(h). Insert root system to bottom of hole and lift seedling to proper planting depth. Be sure not to bend, ball or leave roots outside hole. (Appendix B).

(i.). Adjust planting depth according to drainage or soil type:

(1) On well-drained soils (sandy loams and sandy soils) plant root collars two to three inches below ground line except for longleaf. Plant the longleaf root collars at ground level when hand planting and lightly cover bud to allow for soil washing away when machine planting.

(2) On poorly drained soils (silt and clay soils) plant root collars one inch below ground line.

(3) Seedlings should not be planted in excessively wet, sticky soils or in standing water. Allow site to dry before planting.

(j). Plant containerized seedlings deep enough to allow tops of plugs to be covered with soil (prevents drying by wicking effect).

(k). Close hole properly. (If soil is not tightly compressed around roots and collar, moisture cannot be taken up by the seedlings).

(l). Space seedlings as prescribed for the tract. Avoid planting seedlings in areas of loose soil that cannot be compressed around roots or closer than two to three feet of hardwood stumps and sprouts. (See EXHIBIT 3).

(m). Plant seedlings just as near the edge of windrows as possible.

MACHINE PLANTING

(n). Train all new personnel prior to allowing them to plant. (Follow-up training may be necessary if poor techniques are observed). Do not assume labor is trained or skilled.

(o). Organize mechanical tree planters into crews of one tractor driver and two alternate tree planters. Foreman should monitor each crew's performance and take corrective action as needed.

(p). When machine planting, be sure roots are visibly moist before placing in seedling hopper. Cover roots in hopper with wet material to protect from exposure.

(q). Follow steps 4. (h) through (m). (See Appendix C).

B. MARGINAL CONDITIONS
Temperature: 76°F to 85°F
Relative Humidity: 30% to 50%

1. On Site Storage of Seedlings
   (a). Bags/bales should have a minimum exposure to direct sunlight.
   (b). Closely follow same standards for NORMAL CONDITIONS.

2. Sorting and Culling Non-Plantable Seedlings
   (a). Make a special effort to keep roots of seedlings exposed to sun and wind for no longer than three minutes.
   (b). Otherwise follow same standards for NORMAL CONDITIONS.

3. Root Pruning Seedlings
   (a). Usually root pruning will not be necessary for GFC seedlings.
   (b). If root pruning is necessary, make a special effort to keep root exposure to sun and wind less than three minutes.
   (c). Roots must be kept visibly moist at all times. Prior to placing back in bag or container, dip roots in one of the following:
      (1) Super water gel (one ounce of Terra Sorb gel per gallon water).
      (2) Clay slurry (five pounds Kaolin Clay per gallon water).
      (3) Plain water (shake excess from roots before placing in bag).
   (d). Otherwise, closely follow same standards for NORMAL CONDITIONS.

4. Tree Planting
   (a). Closely follow same standards for NORMAL CONDITIONS.
   (b). Do not carry more than one hour's supply of seedlings on the tree planter or in planter bags.
   (c). Plant on moist sites. Avoid dry ridges.

C. CRITICAL CONDITIONS
Temperature: 32°F or less or 85°F+
Relative Humidity: 30% or less

1. On Site Storage
   (a). Seedlings should not be stored at planting site. Bags/bales should be stored in buildings, sheds, etc., that will protect from freezing or extreme heat.

2. Sorting and Culling Non-Plantable Seedlings
   (a). Should not take place at planting site.
   (b). Is permissible in a building, shed or protected areas. Follow same standards for NORMAL CONDITIONS.

3. Root Pruning
   (a). Usually not necessary with GFC seedlings.
   (b). If necessary, pruning should be done in a building, shed, etc. Follow same standards for NORMAL CONDITIONS.

4. Tree Planting
   (a). All planting should stop when temperatures are above 85°F.
   (b). If temperatures are lower than 32°F but are expected to rise later in the day, planting is permissible once temperatures reach 33°F. Follow same standards for NORMAL CONDITIONS.
   (c). If weather forecast indicates cold temperatures that will freeze ground for several days immediately after planting, do not plant.

APPENDIX A.
MORPHOLOGICAL GRADES OF SOUTHERN PINE SEEDLINGS [1]

Species and Grade	Stem or Needle Lenght (inches)	Root Collar (inches)	Nature of Stem
Longleaf:			
1	6-8" clipped	½ or larger	* *
2	6-8" clipped	3/16 to ½	* *
3-cull	6-8" clipped	less than 3/16	* *
Loblolly & Slash			
1	9 to 12	3/16 or larger	Stiff: woody
2	6 to 10	⅛ to 3/16	Moderately stiff
3-cull	Usually less than 5	less than ⅛	Weak; Often succulent
Shortleaf[2]			
1	6 to 10	3/16 or larger	Stiff; woody. Usually a crook at ground line; often branching
2	4 to 6	⅛ to 3/16	Moderately stiff often with crook and branches
3-cull	less than 4	less than ⅛	Weak: often succulent; straight

[1]Adapted from Wakeley 1954.
[1]Sand pine, Virginia pine, and white pine are similar to shortleaf pine.

Bark on Stem	Needles	Winter Buds
* *	Abundant. Almost all in fasicles of 3's or 2's	Present; usually with bud scales
* *	Moderately abundant; at least part in fasicles of 3's or 2's	Buds with scales usually lacking; some without scales usually present.
* *	Scanty: short, often none in fasicles of 3's or 2's	Not present

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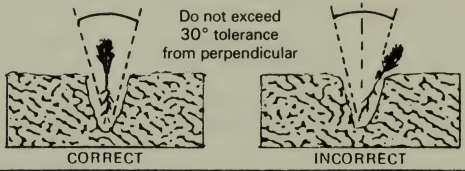
Usually on entire stem	Almost entirely in fasicles of 3's or 2's	Usually present
On lower part at least; often all over	Part at least in fasicles of 3's or 2's	Occasionally
Often lacking	Practically all single	Almost never present

Usually on entire stem	Almost entirely in fasicles of 3's or 2's	Usually present.
On lower part at least; often all over	Part at least in fasicles of 3's and 2's	Occasionally present
Often lacking	Practically all single	Practically never present

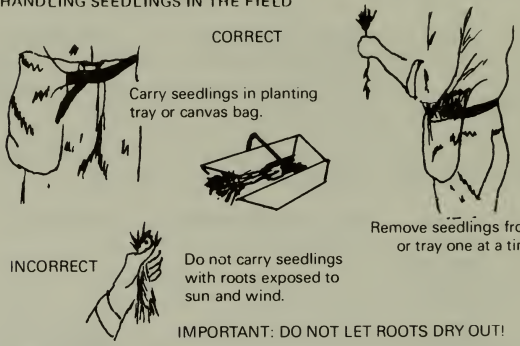
APPENDIX B.

HAND PLANTING

Plant seedling perpendicular to the ground.

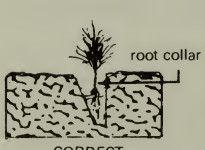


HANDLING SEEDLINGS IN THE FIELD



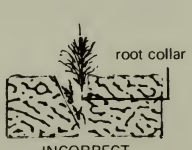
IMPORTANT: DO NOT LET ROOTS DRY OUT!

CORRECT AND INCORRECT PLANTING DEPTHS



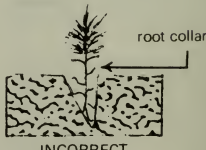
CORRECT

Put seedling well below ground line, shake to spread roots, and raise seedling where root collar is 1" - 2" below ground line.



INCORRECT

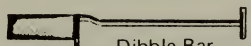
Root collar too low. Seedling J-rooted. Roots will develop into poor root system.



INCORRECT

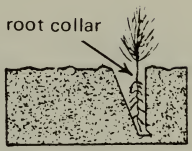
Root collar too high. Lateral roots exposed. Poor chance of survival.

DIBBLE BAR PLANTING



Do not use if blades are worn shorter than 8 inches

1. Insert blade straight down 8 to 10 inches as shown. Pull backward to open hole.



2. Remove dibble. Place seedling at correct depth. (see pg. 16).

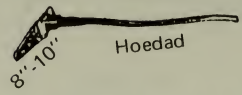
3. Hold seedling in place and insert dibble behind seedling and push forward closing top of planting slit.

4. Insert dibble straight down behind last hole.

5. Push backward then forward packing soil firmly against root.

6. Fill in last hole by firming with heel.

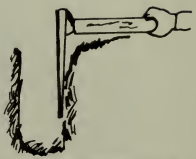
HOEDAD PLANTING



Do not use if blades are worn shorter than 8"

1. Blade perpendicular to soil plane.

2. Lift hoe handle.



3. Retaining soil.

4. Seedling insertion. (see pg. 16).

5. Soil being pushed into hole from top.

6. Closing filled hole from sides.

7. Close holes by firming with heel.

8. Correctly planted seedling.

APPENDIX C.

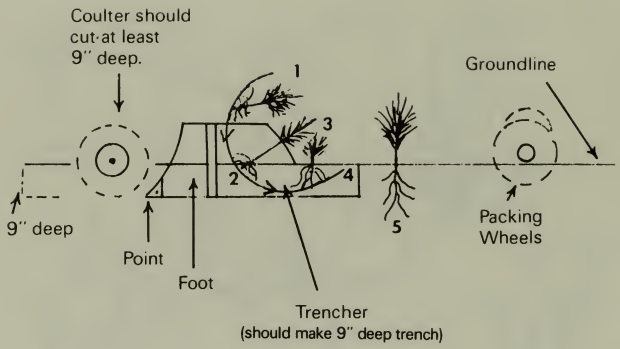
MECHANICAL PLANTING

For safety, tractor and tree planting machines should have protective canopies.

(OPERATIONAL PROCEDURES)

1. It is important the correct tractor be used with appropriate hp to pull planter.
2. Drawbar hookup should be no more than 14" from ground line.
3. Hitch arms for 3 pt hitch planter should be same length to assure straight planting line.
4. Tractor should go no faster than 2-2½ mph.
5. Packer wheels should be adjusted out for sandy soils and angled in for clay soils.

PLANTING SEQUENCE



1. Hold seedling horizontal at top of trencher.
2. Start downward arch motion.
3. Place seedling roots at maximum depth.
4. Start an upward motion to pull any J or L-root out of the seedling.
5. Hold seedling in vertical position where root collar is 1" - 2" below ground line until soil closes around roots.

CORRECT MACHINE PLANTING SITUATIONS

Longleaf - set terminal bud at or ½" below ground line.

Loblolly, Slash, Shortleaf[2] root collar 1 - 2" below ground line.

MACHINE PLANTING ERRORS

L-Drag root. Held on for too long, traveling too fast. Not enough weight on planter. Planter riding on hardpan.

Trench too shallow. J or U-root.

Too shallow. Root collar and roots exposed.

APPENDIX D.

RELATIONSHIP BETWEEN AVAILABLE SOIL MOISTURE, SOIL TEXTURE, AND PERCENT WATER.

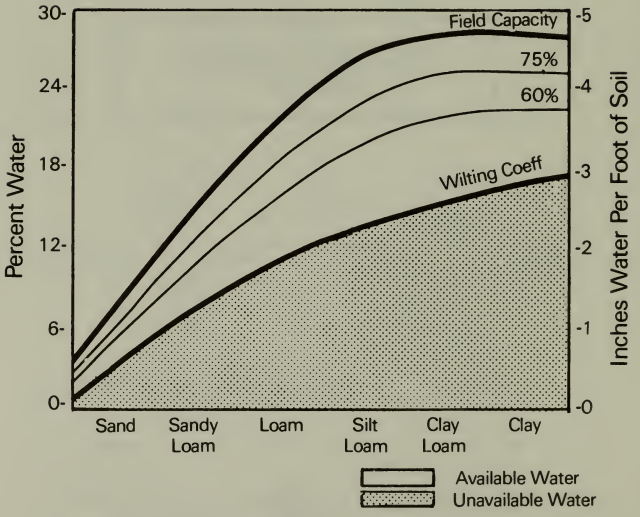


EXHIBIT I
SEEDLING USE RECORD

Tract Name _____ No. & Species Ordered _____ Order# _____

Date(s) Received _____ Number Seedlings _____ Date Packed _____

SEEDLINGS (M)

Date	# Planted	Crew	Min. Temp(°F)	Max. Temp(°F)	Wind (mph)	Rainfall (in.)

EXHIBIT 2

GEORGIA FORESTRY COMMISSION

TECHNICAL GUIDE FOR PLANTING TREES UNDER ASCS FIP, ACP AND CRP COST-SHARE PROGRAMS

I. Purpose

To establish a stand of forest trees for the purpose of timber production, control of excessive erosion, provide suitable wildlife habitat, and preserve and improve the quality of soil, air and water resources.

II. Where Applicable

To eligible lands for the establishment of a stand of forest trees that will provide multi-purpose forest benefits.

III. Eligible Species

Regular Loblolly Pine	High Gum Slash
Improved Loblolly Pine	Shortleaf Pine
Livingston Parrish Loblolly	White Pine
Longleaf Pine	Virginia Pine
Regular Slash Pine	Sand Pine
Improved Slash Pine	Yellow Poplar

Other commercial species of hardwood, or such other trees as determined by the Georgia Forestry Commission (GFC).

IV. PREWORK CONFERENCE AND INITIAL INSPECTION

The GFC will notify landowners and vendors, either through vendor workshops or mailouts, of proper acceptable seedling care, handling, planting techniques and guidelines which will ensure successful establishment. These techniques and guidelines will be the basis for checking performance by the GFC. Upon request by the landowner and vendor, a GFC representative will meet with either at the planting site during initial stages of planting to provide guidance in meeting cost-share performance check standards.

V. SEEDLING CARE AND HANDLING

A. Standards for care and handling during varying weather conditions have been developed in this booklet. The standards include care during transportation, storage, grading and culling, root pruning, and planting. Field operations should be adjusted as necessary during varying weather conditions to adhere to these standards for best survival results.

B. Seedling care becomes the responsibility of the vendor or landowner as soon as they have been picked up by the vendor or landowner at an area office or nursery. This includes, but is not limited to, protection from overheating due to improper stacking, drying or freezing due to exposure, etc.

C. Seedlings should be inspected at time of pick up and during planting to determine their overall condition. Indicators of seedling deterioration are listed in this red booklet. At time of pick up, if any indicators of deterioration are noticed, contact closest GFC representative before seedlings are transported or planted.

D. If, in the opinion of GFC personnel during the performance check, the seedlings have been mishandled and should not have been planted, the GFC will (a) disapprove the practice for cost-share payments unless new seedlings are purchased and planted, or (b) wait 4 weeks after planting to check survival in order to determine if the practice is acceptable or unacceptable for cost-share payments barring no natural disaster such as fire or drought, etc. has occurred.

VI. PLANTING METHODS

Guidelines for dibble, hoedad, and machine planting methods are included in this booklet. Field operations should be adjusted as necessary to adhere to these guidelines and the GFC foresters' Brief Management Plan (Form M-32) for best survival results.

VII. PLANTING RATE

A. Seedlings *should be uniformly spaced over the entire area* so they will make normal growth. Strip planting of trees for multiple purposes within the eligible area to be planted will not qualify for cost-share under standard tree planting practices FR-1, FP-1, and CP-3. If strip planting is desired for wildlife purposes, then the appropriate practice in ACP and CRP should be utilized.

B. Planting rates vary depending on the spacing. EXHIBIT 3, Spacing Table can be used as a guide to judge planting rate.

VIII. CRITERIA FOR PROPERLY PLANTED SEEDLINGS

A. In addition to the number of seedlings actually planted, improperly planted seedlings will be counted against the management plan recommendations in determining whether a practice is acceptable or unacceptable for cost-share payments.

B. The following criteria will be used by GFC personnel to judge whether a seedling has been planted properly:

Above Ground Defects

U = Unidentified cause of death.
D = Debris, grass, leaves or other material in planting hole or furrow.
C = Cull seedling.
Shoot less than 5" long, except longleaf
Root collar diameter less than 1/8" for loblolly and slash pine; 3/16 for longleaf.
Diseased (fusiform rust on stem)
Lacking secondary needles
S = Shallow (not planted deep enough).
Root collar above ground
Roots showing above ground

E = Excessively deep (terminal bud buried or in danger of being buried).

N= Not packed properly.
Too loose - failed four needle test
Top of planting hole not closed
No second dibble hole (dibbles only)
Seedlings pushed over by packing wheels

** Improper planting angle of stem - greater than 30° from the vertical should not be counted as an above ground defect; however, those seedlings in question should be excavated for below ground angle.

Below Ground Defects

X = Improper planting angle of the root system - greater than 30° from the vertical, causing depth of planting to be less than 6 inches measured vertically from ground line to end of tap root.

J = J-rooted

L = L, drag or sweep rooted (more than 1/3 of the length of the firm tap root measured from the root collar is in this condition)

T = Twisted or balled roots

P = Pruned improperly.
5"-12" tops should not be root pruned unless roots exceed 7", then only back to 7 inches.

C = Cull seedling - tap root is less than 5 inches.

N = Not packed properly (bottom of planting furrow or hole not closed).

S = Shallow (root system less than 6" deep).

***NOTE: The planting of multiple seedlings per hole is discouraged.**

IX. GUIDELINES FOR PERFORMANCE CHECKS

A. In order to determine if a tree planting job has been performed to Commission specifications and is eligible to receive cost-share payments, it will be necessary to make a check of the entire area using

sample plots. All tree planting performance checks will be made in the following manner.

B. Determination of the number of evenly spaced sample plots needed will be based on the number of acres in the planted area as follows:

Acreage	No. Plots Required	Spacing (chains)
1-25 Acres	5 plot minimum	Variable
26-100 Acres	1 plot per 5 acres	Variable
101+ Acres	20 plot maximum	Variable

If after inspecting the 5 plot minimum it is determined that planting quality is within allowable ranges, no additional plot inspection will be needed. However, if after inspecting the 5 plot minimum it is determined that planting quality is *NOT* within allowable ranges, additional plot inspection will be necessary according to the above guidelines.

C. Inspectors should use their own discretion in the establishment of properly spaced inspection plots. Generally, it is advisable to run all lines either perpendicular or diagonal to the rows of planted seedlings. Plots should be allowed to fall where they may and should never be arbitrarily moved within the planted area.

D. Each plot center will be designated by a wire flag and numbered according as plots are taken. A permanent felt tip marker will be used for writing plot numbers on the flags for future plot evaluation. Plots will be circular and 1/50th acre in size. Linear radius to be used will be either:
   1. 16' 7¾" when using distance measured in feet and inches,or.
   2. 16.65' when using distance measured in feet and tenths of feet.

E. The plot numbers and all pertinent information will be recorded on the planting Performance Inspection Form. From this form, computations will be made based on the above and below ground data collected

from the plots to determine compliance and eligibility for cost-share assistance.

F. In those cases where a combination of both machine and hand planting occur, a proportionate number of inspection plots should be taken from each area.

X. ACCEPTABLE AND UNACCEPTABLE PERFORMANCE CHECKS

A. If it is determined by the GFC inspector at the time of performance check that the number of properly planted, well spaced, living seedlings meets or exceeds 500 seedlings per acre, the practice will be approved for immediate cost-share assistance.

B. If it is determined by the performance check that the number of properly planted, well spaced, living seedlings is below 500 per acre and the check is made early enough in the season, the GFC forester should contact the landowner or vendor responsible immediately. The forester should make recommendations in order to bring the practice up to the 500 standard. When the recommendations have been followed and the practice completed, the area will be re-inspected. If and when it meets the 500 standard, the practice will be approved for immediate cost-share assistance.

C. If it is determined by the performance check that the number of properly planted, well spaced, living seedlings is between 300-500 per acre and it is either too late in the season to correct the practice, extra seedlings cannot be purchased, or equipment or vendor services are not available, the practice should be *temporarily rejected* pending survival check to be done in October or November after the first full growing season. Practice approval will be based on a survival of 300 or more well spaced seedlings per acre. Cost-share assistance to the landowner will be withheld pending the results of the survival check.

D. If it is determined by the performance check or survival check that the number of properly planted, well spaced, living seedlings is below 300 per acre, the practice will be rejected. Landowner should be advised to apply for an extension from the ASCS Office and start over from scratch.

E. If it is determined by the GFC inspector at the time of performance check that stand failure has resulted from natural causes not associated with landowner or vendor handling or planting technique, approval can be made for cost-share assistance.

F. If surviving stand is less than 300 trees per acre, landowner should be advised to re-apply for cost-share assistance in re-establishing the stand. Stands with more than 300 surviving, well spaced trees per acre will not qualify for *re-establishment cost-share assistance*. Cost sharing can be approved for "pocket planting," i.e. those areas or pockets easily identifiable showing defined boundaries within a planted area where mortality is uniform and of sufficient size to justify replanting the pocket. This is not to be confused with "interplanting" which is not authorized for re-establishment cost-share assistance.

G. Although the overall stocking of a tract may be within the allowable stocking range, it is extremely undesirable for some areas to be overstocked and some areas to be understocked. Even though the overstocked areas compensate for the understocked areas in determining tract average, the planting job will not be accepted until the understocked areas are properly planted.

XI. VENDOR AND/OR LANDOWNER RESPONSIBILITIES

A. The vendor must attend a GFC workshop on tree planting policies and procedures before being included on GFC's vendor list.

B. Vendors will be expected to complete the entire planting job according to the forest management plan and the technical guidelines once they are selected.

C. GFC personnel will inspect each planting job as soon as possible after receiving notice that the job has been completed. All pertinent information of the performance inspection will be recorded on the appropriate form.

D. Neither the GFC, vendor, or landowner are responsible for practices that fail due to conditions beyond any party's control which were properly installed and certified complete by the GFC.

E. The acreage determination made by the GFC, SCS, or ASCS is the official acreage for basing payment.
F. All planting should be completed no later than March 31, unless an extension is recommended by the forester and approved by the ASCS Office.
G. No cost-share payments will be made available until the tree planting practice has been inspected and approved by GFC personnel. It is left to the discretion between the vendor and landowner to determine timely payment of tree planting services rendered.
H. If tree planting problems with a specific vendor continue, the forester, reforestation forester, and district forester will decide on whether to remove a vendor's name from the GFC vendor list.

EXHIBIT 3.

SPACING TABLE

FEET	SEEDLINGS/ACRE
5X10	871
5X12	726
6X8	908
6X9	807
6X10	726
6X12	605
7X9	691
8X8	680
8X9	605
8X10	545
8X12	454
10X10	436

*Please note that the number of properly planted, well spaced, living trees will be no less than 500 per acre for immediate cost-share approval as determined by the performance check.

* WARNING SEEDLINGS ARE PERISHABLE

The Georgia Forestry Commission maintains tree nurseries and seed orchards to provide a wide range of pine and hardwood seedlings for landowners and other residents of the state. Although the quality of the trees has been greatly improved through research in recent years, survivability depends largely on care taken in storing, transporting and planting.

EXHIBIT 4
GFC SAMPLE TREE PLANTING AGREEMENT
(FOR ASCS COST-SHARING PROGRAMS)

THIS AGREEMENT MADE AND ENTERED INTO ON THIS _____ DAY OF _____, 19 _____ BY AND BETWEEN _____, HEREINAFTER REFERRED TO AS **LANDOWNER** AND _____ HEREINAFTER REFERRED TO AS THE **VENDOR.**

IN CONSIDERATION OF THE MUTUAL BENEFITS ACCRUING EACH TO THE OTHER, THE **PARTIES** AGREE AS FOLLOWS:

1. The **VENDOR** agrees to plant eligible tree seedlings on the landowner's land in areas designated by the landowner or representatives of the landowner. The services shall be performed on _____ acres in _____ County, GA.
2. The **LANDOWNER** agrees to provide the vendor with good, plantable seedlings, unless other arrangements have been made to supply them.
3. The **LANDOWNER** agrees to provide rights of ingress and egress to the planting site for all personnel, materials and equipment of the vendor to perform the planting operation.
4. The **LANDOWNER** warrants that he/she is vested with all needful authority to authorize the performance of the tree planting in the designated areas. The landowner agrees to save and hold harmless the vendor, his employees, the ASCS hereafter referred to as the funding institution, and the Georgia Forestry Commission from any and all death or injury from trespass or otherwise arising during the performance of the planting job and occasioned by the lack of authority of the landowner to authorize such services within and upon the designated treatment area.
5. The **LANDOWNER** agrees that upon satisfactory completion of the planting job according to the terms of this agreement and verification of an acceptable stocking or correctly planted seedlings on each acre by Georgia Forestry Commission personnel to pay the vendor at the rate of $ _____ ☐ per acre ☐ per seedling (check one) upon presentation of a proper invoice by the vendor.

6. The **VENDOR** agrees that the planting shall be in accordance with the terms of this agreement, the specifications in the Georgia Forestry Commission *SEEDLING CARE AND PLANTING GUIDELINES* (this booklet) and the GFC management plan on said tract.

A. Seedling care becomes the responsibility of the vendor as soon as bags/bales have been delivered to a location designated by the vendor or picked up by the vendor at the nursery, district or county office. This includes care in transportation, storage, grading and culling, and planting.

B. The need for root pruning will be determined by the Georgia Forestry Commission representative for said tract. Tap roots and lateral roots may only be pruned if they exceed 7 inches in length and may only be pruned back to a 7 inch length.

7. The **PARTIES** agree that the Georgia Forestry Commission shall act as the technical agency for the institution providing cost-sharing assistance. The Commission will delineate the treatment area per the landowner's advice and consent, determine the acreage so delineated, perform periodic and final inspections to certify that the planting has been performed according to Commission guidelines, and report the results of the final inspection to the landowner, vendor, and funding institution.

8. The **PARTIES** agree that a planting job will be considered complete if the number of properly planted, well spaced, living seedlings is not less than 500 per acre as determined by a GFC inspector during the performance check.

The following criteria will be used to judge whether a seedling has been planted properly:

A. Seedlings must be planted at or just below their root collar. On deep sands or excessively drained soils, should be planted 3 inches below the root collar. There should be at least 3 inches of the seedling top above ground.

B. Soil must be firmly packed around the planted seedling. All seedlings must pass the "four needle"

test, i.e. seedling must remain firmly in ground when pulled by four needles.

C. Roots should be planted vertically with only lateral roots in a horizontal plane. An angle of up to 30 degrees from the vertical is permissable.

D. Roots should not be twisted, balled, or planted in a U, J or L-shaped manner.

E. Cull seedlings will not be planted. Cull seedlings are those which any one of the following apply:

a. Shoot or tap root less than 5 inches long.
b. Have root collars less than 1/8 inch in diameter.
c. Have no secondary needles present.
d. Have presence of fusiform rust galls.

Improperly planted seedlings will be counted against the number actually planted in determining success of the planting.

9. The **VENDOR** agrees to begin the planting on or about _____, 19 _____ and shall be completed no later than March 31, 19 _____, unless the time for completing such services be extended by the Georgia Forestry Commission and approved by the funding institution.

10. The **VENDOR** agrees to repair, at his own expense to a condition equal to what existed at the time tree planting began, any damage to roads, gates, fences, bridges, culverts and other improvements, and to leave the property of the landowner free of any debris, refuse, or litter deposited by vendor or his employees.

11. The **VENDOR** may be released and discharged from his obligation to perform the tree planting described herein, if the vendor shall provide the landowner with written notice of the vendor's intention to be released and discharged from said obligations, and such notice is received by the landowner no later than _____.

12. The **PARTIES** agree that if either party defaults on their obligation and responsibility as outlined in this agreement, that party which has defaulted will agree to incur whatever costs in labor, materials, services, and time

necessary to obtain cost-share assistance approval as determined by GFC technical guidelines.

13. The **VENDOR** agrees to save and hold harmless the landowner, the funding institution, and the Georgia Forestry Commission from any and all death, injury or damage to persons or property occurring in connection with the performance by the vendor and his employees of the terms of this agreement.

14. Nothing in this agreement shall be construed as a covenant, condition or obligation of the funding institution or the Georgia Forestry Commission owing to either party hereto.

15. Neither party shall be considered in default in the performance of its obligations under this agreement if such performance is prevented or delayed by Force Majeure. Force Majeure shall be understood to be any cause which is beyond the reasonable control of the party affected, and which is forthwith, by notice from the party affected, brought to the attention of the other party, including but not limited to war, civil commotion, epidemic, accident, fire, wind, flood, drought or because of any law order, proclamation, regulation or ordinance of any government or any subdivision thereof, or because of any act of God.

16. This agreement constitutes the entire and only agreement between the parties hereto and supersedes any prior understanding or written or oral agreements between the parties regarding the subject matter hereof. This agreement may be altered only by a subsequent written agreement signed by both parties.

IN WITNESS WHEREOF, THE **PARTIES** HAVE HERE-UNTO AFFIXED THEIR SIGNATURES.

LANDOWNER _____

VENDOR _____

Georgia Forestry Commission Offices

Georgia Forestry Commission
Central Office
P.O. Box 819
Macon, Georgia 31298
1-800-GA TREES

Rome District
3086 Martha Berry Hwy. NE
Rome, Georgia 30161
404-295-6021

Americus District
Route 1, Box 23A
Americus, Georgia 31709
912-928-1301 or 928-1402

Gainesville District
3005 Atlanta Highway
Gainesville, Georgia 30501
404-534-5454

Tifton District
Route 3, Box 17
Tifton, Georgia 31794
912-386-3617

Athens District
Route 4, Box 168A
Athens, Georgia 30605
404-542-6880

Camilla District
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Camilla, Georgia 31730
912-336-5341

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P.O. Box 1080
Newnan, Georgia 30264
404-253-1207

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Statesboro, Georgia 30458
912-764-2311

Milledgeville District
Highway 49
Milledgeville, Georgia 31061
912-453-5164

McRae District
Route 1, Box 46
Helena, Georgia 31037
912-868-5649

Washington District
Route 2, Box 266
Washington, Georgia 30673
404-678-2015

Waycross District
Route 6, Box 167
Waycross, Georgia 31501
912-283-5464

Atlanta District
6835 Memorial Drive
Stone Mountain, Georgia 30083
404-469-3050

"REFORESTATION DOESN'T COST
–IT PAYS!"

For more information:
call 1-800-GA TREES

John W. Mixon
Director

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