

# Seedling Care and Planting Guidelines



ARKANSAS  
AGRICULTURE  
DEPARTMENT



**Arkansas**  
GROWN™

**Arkansas Forestry Commission  
2018 Edition**

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# Table of Contents

General Guidelines	1
How to Hand Plant Seedlings	7
Weather Condition Classifications	19
Trees Per Acre By Spacing	20-21
Sample Tree Planting Contract	22-24
Counties with coolers	25-26

## Foreword

Forest tree seedlings must be handled carefully from the time they are lifted at the nursery, until they are transplanted in the field. This booklet will tell you how.

Proper seedling handling is complicated by the variety of environmental conditions that may occur during this critical time between lifting and transplanting.

Monitor environmental conditions continuously. Adjust field operations as necessary to adhere to these guidelines. By following these standards, you enhance the likelihood of a successful planting.

Reforestation costs are the landowner's primary forestry investment during a timber stand's life. Seedling survival contributes to both the landowner's returns on investment and the future strength of Arkansas's forest economy.

## General Guidelines

These forest tree seedling handling and planting guidelines were developed for broad practical field use. They include a general description of seedling handling, followed by lists of specific “Do’s and Don’ts.” If you have questions regarding a particular field condition or planting project, contact an Arkansas Forestry Commission Forester for professional recommendations.

Bare-root pine and hardwood seedlings are vulnerable plants that require careful handling. The four primary rules for tree seedling care between the nursery bed and out-planting are:

- ☑ Keep seedlings moist.
- ☑ Keep seedlings cool.
- ☑ Handle seedlings gently.
- ☑ Keep storage duration short.

Every effort must be made to keep roots moist while the tree is out of the ground. The nurseries usually spray seedling roots with a gel to reduce moisture loss. The trees are then commonly packed in moisture resistant Kraft boxes/bags. These practices are effective. Once a box/bag is opened, the seedlings should be planted immediately. Keep root exposure to sun at a minimum.

If a box/bag of seedlings is only partially used, the box/bag should be closed and stored in a shady cool place. Seedlings use stored food to survive transplant shock. These critical food reserves are depleted quickly if the trees are stored warm. To conserve this stored energy and promote seedling survival, trees should be stored as cool as practical without freezing. Inside box/bag temperature guidelines for storing bare-root tree seedlings are:

<b>Storage for 1-5 Hours</b>	
Ideal	34° - 40°F
Tolerable	40° - 50°F
Risky	50° - 60°F
Damage Probable	60° - 80°F
Damage Occurring	more than 80°F

<b>Storage for more than 5 Hours</b>	
Ideal	34° - 40°F
Tolerable	40° - 50°F
Risky	50° - 60°F
Damage Occurring	more than 50°F
Damage Occurring	less than 32°F

## **Keep seedlings cool.**

Talk to a Forester before planting trees that have experienced abnormally high or low temperatures. Seedling survival will suffer if seedlings are exposed to excessively high or low temperatures. The amount of mortality is directly related to length of exposure to these temperature extremes. An exposure to 80°F for two hours can significantly reduce survival.

## **Handle trees carefully.**

Seedlings must be protected from physical damage. Seedling boxes/bags should not be thrown or walked on. Physical abuse of the seedlings can lead to reduced seedling survival. Get professional advice before planting trees that have been excessively damaged.

## **Minimize storage time.**

As length of seedling storage increases, seedling vigor decreases. Under ideal conditions this loss in vigor is very slow. The further storage conditions are from ideal, the faster the loss in vigor. Seedlings should be stored without refrigeration only when weather conditions permit. Even under ideal conditions, seedling storage should be kept as short as possible.

## Seedling Transportation

### Do:

- ☺ Transport seedlings in a refrigerated van with temperatures maintained between 34°F and 45°F whenever possible.
- ☺ Keep inside box/bag temperatures below 60°F.
- ☺ Keep truck bed free from pesticides and other chemicals.
- ☺ Keep truck bed free from sharp objects.
- ☺ Promptly repair or replace torn boxes/bags.
- ☺ Shield seedlings from direct sunlight, wind, and temperature extremes.
- ☺ Minimize transportation time.
- ☺ Consider transporting trees at night.

### Don't:

- ☹ Allow seedlings to freeze.
- ☹ Ship trees without refrigeration when air temperature exceeds 70°F.
- ☹ Stack seedlings more than two boxes/bags deep without spacers to support weight.
- ☹ Walk on or stack heavy objects on seedlings.
- ☹ Routinely open seedling boxes/bags to inspect seedlings. (Open only if the box/bag has been damaged and/or been too hot or cold).

## Refrigerated Seedling Storage

### Do:

- ☺ Store seedlings in coolers if possible.
- ☺ Maintain cooler temperatures between 34°F and 40°F.
- ☺ Provide good air circulation around all sides of the boxes/bags.
- ☺ Plant trees as soon as possible after removal from cold storage.

### Don't:

- ☹ Stack seedling boxes/bags over two deep without supports and spacers supporting weight.
- ☹ Store pesticides or other chemicals that could harm seedlings in cooler with seedlings.
- ☹ Store non-dormant seedlings. (Non-dormant trees should be planted within two days of lifting.)

## Non-Refrigerated Storage

### Do:

- ☺ Plant seedlings as soon as possible.
- ☺ Protect seedlings from direct sunlight and temperature extremes.
- ☺ Allow space for air circulation between seedling boxes/bags.

### Don't:

- ☹ Allow seedlings to freeze. (If freezing briefly occurs, thaw slowly without artificial heat.)
- ☹ Plant seedlings that have been frozen for 2 or more days.
- ☹ Allow inside box/bag temperatures to get above 50°F.

# Field Handling and Planting Guidelines

## Do:

- ☺ Protect seedling boxes/bags from exposure to wind, sun, and temperature extremes.
- ☺ Store seedling boxes/bags in shade or under reflective tarp.
- ☺ Keep seedling root exposure to an absolute minimum.
- ☺ Open only one box/bag of seedlings at a time.
- ☺ Remove only one handful of seedlings at a time from the seedling box/bag when sorting.
- ☺ Keep presorting to a minimum.
- ☺ Use care when separating roots.
- ☺ Transfer trees from seedling boxes/bags to mechanical tree planter boxes or hand planter bags quickly.
- ☺ Keep seedling roots covered with moist burlap, in planting bags, or in buckets with moist medium.
- ☺ Cull seedlings that do not meet established standards.
- ☺ Plant when there is good soil moisture.
- ☺ Train all personnel before allowing them to plant.
- ☺ Closely supervise the planting crew.  
(One foreman should supervise no more than 12 planters.)

- ☺ Replace planters who do not meet quality standards.
- ☺ Do not carry multiple seedlings from one planting hole to the next.
- ☺ Plant pine and wetland species as deep as possible while keeping roots straight in planting hole. Upland species should be planted slightly deeper than the depth they grew in the nursery. The swell at the root collar for oaks should not be seen after planting.
- ☺ Pack soil firmly around the roots and root collar of each seedling. (Don't leave the roots in an air pocket).
- ☺ Plant in accordance with instructions listed in this booklet.

## Field Handling and Planting Guidelines Cont.

### Don't:

- ☹ Empty the whole seedling box/bag when sorting seedlings.
- ☹ Leave seedling boxes/bags open or seedlings exposed.
- ☹ Carry excess trees on machine planters.
- ☹ Expose seedling roots to the elements, especially the sun and wind.
- ☹ Allow seedling roots to dry out.
- ☹ Cull the seedlings before planting.
- ☹ Hit or vigorously shake roots to remove soil.
- ☹ Store seedling boxes/bags close to a fire.
- ☹ Use a fire to thaw frozen seedlings.
- ☹ Plant in unusually dry or hot conditions.
- ☹ Remove seedling from planting bag until planting hole has been made.
- ☹ Allow planted trees to have “L” or “J” roots since survival and growth will be sacrificed.
- ☹ Plant when soil is frozen.
- ☹ Plant in standing water.
- ☹ Allow planting foreman to plant.  
(The foreman should supervise.)

# Root Pruning

## Note:

- ☺ Root pruning and root stripping should not be allowed by tree planters. All nurseries root prune before the seedlings are lifted to produce a balanced seedling. Additional root pruning or root stripping by tree planters:
- Produces an unbalanced seedling.
  - Reduces the ability of the seedling to rapidly produce new roots.
  - May reduce seedling survival.
  - Exposes the roots to sun and wind.
  - Eliminates fine roots and mycorrhizae

# Containerized Loblolly and Shortleaf Pine

## Note:

- ☺ All of the guidelines for proper bare root seedling handling and planting contained in this booklet apply to the proper handling and planting of containerized loblolly and shortleaf pine, with the addition of the following guidelines that are specific to containerized loblolly and shortleaf pine.

## Do:

- ☺ Plant containerized loblolly and shortleaf pine as early in the fall as September, as long as adequate rainfall has occurred.
- ☺ Plant containerized loblolly and shortleaf pine deep. For example, the top of the soil ball should be 2 to 4 inches below the soil line, even for shortleaf pine.

## **Don't:**

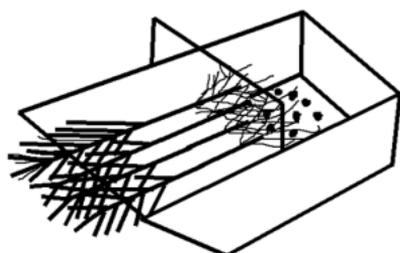
- ☹ Plant containerized loblolly and shortleaf pine late in the planting season. The planting season is extended by using containerized pine seedlings, the extension of the planting season is at the beginning of the planting season, not at the end. Planting seedlings in March is pushing the envelope for seedling survival.
- ☹ Plant containerized loblolly and shortleaf pine shallow. If the containerized soil ball is level with, or even close to the soil line, moisture will wick out of the soil ball and the roots will dry out. This is particularly true if containerized pine are planted late in the season and root growth has not yet extended into the new soil profile to capture available moisture.

## Summary

- ☑ Keep seedlings cool.
- ☑ Keep seedlings from freezing.
- ☑ Keep seedlings moist. Seedling roots must never be allowed to dry out even for a few minutes.
- ☑ Handle seedlings carefully.
- ☑ Keep storage duration short.
- ☑ Don't plant small, weak seedlings.
- ☑ Don't plant when soils are dry.
- ☑ Don't plant when weather conditions are critical. See Page 17.



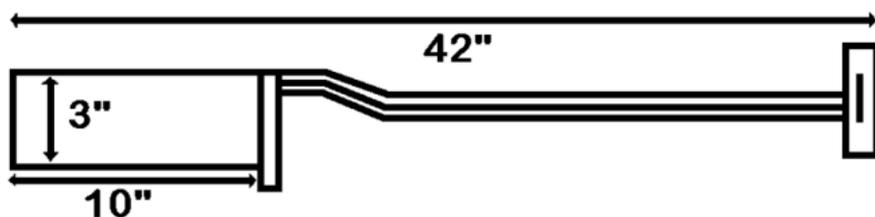
Carry seedlings  
in a planting tray  
or canvas bag.



Do not carry  
seedlings with roots  
exposed to sun and  
wind.

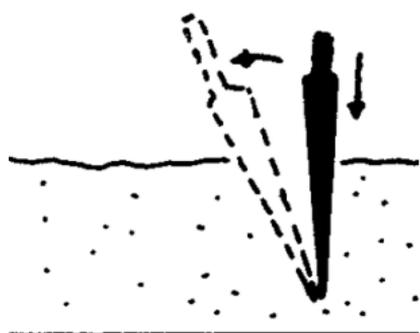


**IMPORTANT:  
DO NOT LET  
ROOTS DRY OUT!**

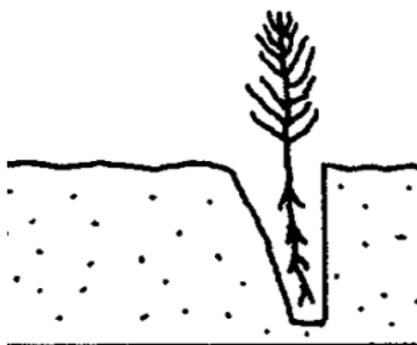


A dibble bar is a simple shop-built tool  
used to plant seedlings.

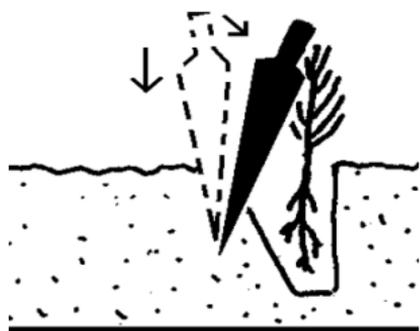
# Hand Planting



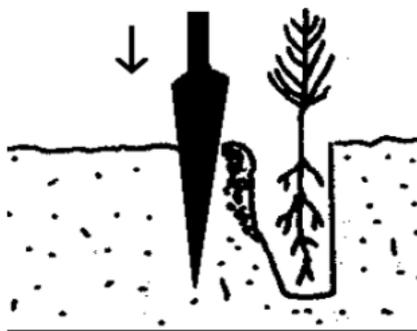
Insert dibble straight down.  
Pull backward to open hole.



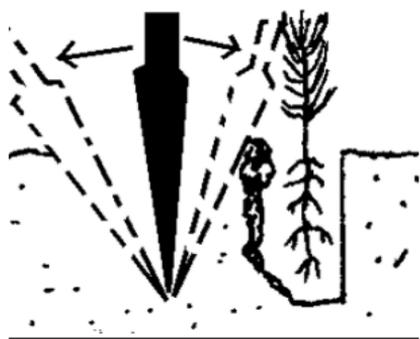
Remove dibble and place  
seedling at correct depth.



To hold seedling in place,  
insert dibble part deep into  
soil- pushing forward,  
closing top of planting slit.



Insert dibble straight down.  
into soil behind last hole.



Pull dibble backward, then  
push forward, packing soil  
firmly against roots.



Fill last hole by  
firming with heel.

# Mechanical Planting

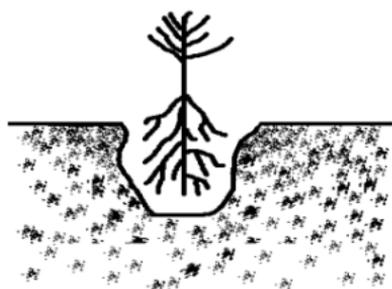


Direction of Travel



1. Insert seedling in vertical position well forward in open trench.
2. Hold seedling in vertical position until soil closes around roots.
3. Release seedling ahead of packing wheels.

# Common Planting Errors



## Too Shallow

Root collar and roots exposed, drying out roots.



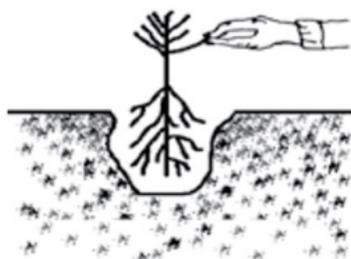
## Too Deep

Hard to plant pine and wetland species too deep. Upland species 2" or more above root collar could be too deep.



## "J" or "U" Roots

Roots form "J" or "U" shape resulting in poor or weak root development.



## Too Loose

A firm pull on one needle cluster moves plant.

## Common Planting Errors



### **Not Erect**

The tap root should not be planted at more than  $30^\circ$  off perpendicular.



### **“L” or Drag Root**

Seedling pulled along in trench by planter.

## Weather Condition Classification

Day Classification	Weather Conditions	
<b>Best</b>	Temperature	33° - 75°F
Plan to do most planting during these days.	Relative Humidity	50%+
	Wind	Less than 10 mph
	Available Soil Water	75% to field capacity
<b>Marginal</b>	Temperature	76° - 85°F
Be extra careful and take precautions if planting on these days.	Relative Humidity	30-50%
	Wind	10-15 mph
	Available Soil Water	50-75%
<b>Critical</b>	Temperature	Less than 32° or more than 85°F
Do not plant on these days.	Relative Humidity	Less than 50%
	Wind	15+ mph
	Available Soil Water	Less than 50%

Note: Day classification should drop to that of the weather condition with the poorest rating.

## Spacing

For Natural Resources Conservation Service conservation programs, conventional pine planting densities must be between 436 and 681 seedlings per acre.

Conventional Hardwood planting densities must be between 302 and 436 seedlings per acre.

Special purpose plantings for agroforestry (carbon sequestration, silvopasture or windbreaks) can vary and will be as planned.

Distance between rows of planted seedlings must be at least 10 feet.

For hardwood plantings, the distance between rows is preferred to be at least 12 feet.

Spacing	Trees per Acre		Spacing	Trees Per Acre
8 x 6	907		18 x 18	303
8 x 8	681		18 x 10	242
			18 x 12	202
10 x 5	871		18 x 15	161
10 x 6	726		18 x 18	134
10 x 7	622		20 x 8	272
10 x 8	545		20 x 10	218
10 x 9	484		20 x 12	182
10 x 10	436		20 x 15	145
			20 x 18	121
12 x 6	605		20 x 20	109
12 x 7	519			
12 x 8	454		25 x 8	218
12 x 9	403		25 x 10	174
12 x 10	363		25 x 12	145
12 x 12	303		25 x 15	116
			25 x 18	97
15 x 6	484		25 x 20	87
15 x 7	415			
15 x 8	363		30 x 30	48
15 x 9	323		40 x 40	27
15 x 10	290			
15 x 12	242			
15 x 15	194			

# Sample Tree Planting Contract

This contract is between (name and address) hereinafter known as the Owner, and, (name and address) hereinafter known as the Contractor, for furnishing labor, and equipment necessary for planting tree seedlings and performing the actual planting in accordance with this contract.

## GENERAL PROVISIONS

### The Owner Agrees:

1. To pay the Contractor at the rate of (\$) per acre for planting. Payment shall be made within (number) days after completion of the Contract.
2. To purchase the necessary seedlings at no cost to the Contractor and make them available at a site mutually agreeable to both parties.
3. To provide rights of ingress and egress to the planting site for all men, materials, and equipment necessary to perform the planting job.
4. To provide a sketch map showing the location of the planting areas.

... continued on next page.

## **The Contractor Agrees:**

1. To provide all necessary equipment, and labor for planting the trees in a satisfactory manner.
2. To provide proper care and handling of the seedlings, while they are in the Contractor's assigned custody using the Arkansas Forestry Commission's booklet "Guidelines for Seedling Care and Planting" as the standard.
3. To plant the seedlings:
  - (a) at a spacing of x (trees/acre) at a rate of (\$) per acre.
  - (b) by (month, day, year)
  - (c) correctly so that planted seedlings will meet, or exceed, the federal program standards.
  - (d) Planter will plant at least the number of seedlings per acre as specified in the planting plan, not to exceed 10% cover.
4. To repair, replace, or pay for damage done to any property in the performance of the Contract beyond ordinary wear and tear.

## **It is further agreed: Penalties for failure to fulfill the contract are as follows:**

1. The Owner shall pay the Contractor for any delay occasioned by himself, his contractors, agents, and/or employees, by not providing trees or necessary means ingress or egress to planting site, at the rate of (\$) per day for each day's delay

caused by default of the Owner; provided that this clause may be rendered null and void by mutual agreement. Cancellation shall be affected by written consent of the Contractor or by striking out the clause and both parties initialing in the margin.

2. In Case of failure of the Contractor to repair damage to property, the penalty shall be equal to the cost of having the repairs done by local contractors.
3. In case of failure of the Contractor to plant at least 90% of the trees in a satisfactory manner or at the location(s) agreed upon, penalty shall be forfeiture of payment in an amount needed for replanting plus cost of trees.
4. In case of failure of the Contractor to plant trees by the closing date of the planting season, the penalty shall be the cost value at the planting site of trees on hand which are unplanted.

**Contractor:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Owner:** \_\_\_\_\_

**Date:** \_\_\_\_\_

## **Cooler Locations**

**Arkansas Forestry Commission Baucum Nursery Pulaski County**  
**1402 Highway 391 North North Little Rock, AR 72117**  
**501/907-2485**

Arkansas Forestry Commission Drew County  
137 Scogin Drive Monticello, AR 71656  
870/367-6767

Arkansas Forestry Commission Howard County  
106 North Main Street Dierks, AR 71833  
870/286-2139

Arkansas Forestry Commission St. Francis County  
1690 Linden Road Forrest City, AR 72335  
870/633-6693

Arkansas Forestry Commission Craighead County  
2301 Fox Meadow Lane Jonesboro, AR 72403  
870/932-2251

Arkansas Forestry Commission Arkansas County  
Municipal Airport Road (Highway. 11) Stuttgart, AR 72160  
870/673-2851

Arkansas Forestry Commission Lafayette County  
1171 Lafayette 31 (Central Avenue North) Stamps, AR 71860  
870/533-4641

Arkansas Forestry Commission Union County  
2165 Champagnolle Road El Dorado, AR 71730  
870/863-7051

## **Cooler Locations**

Arkansas Forestry Commission Hot Spring County  
207 Airport Road Malvern, AR 72104  
501/332-2081

Arkansas Forestry Commission Johnson County  
#1 Smokey Lane Clarksville, AR 72830  
479/754-3125

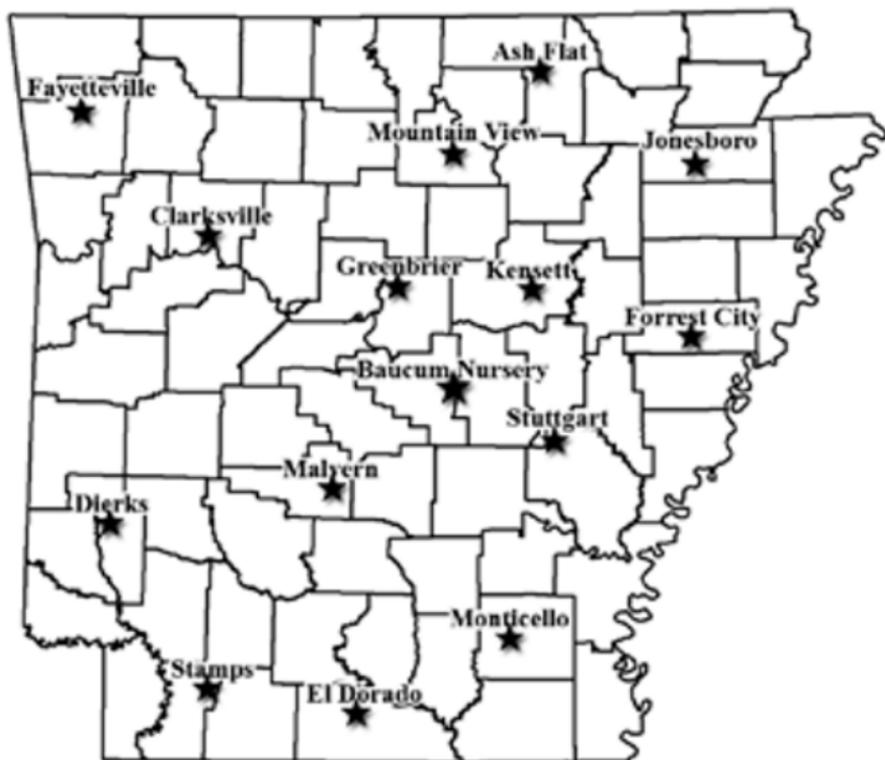
Arkansas Forestry Commission Washington County  
2752 North Garland Avenue Fayetteville, AR 72704  
479/587-1442

Arkansas Forestry Commission Faulkner County  
#20 Industrial Park Boulevard Greenbrier, AR 72058  
501/679-5316

Arkansas Forestry Commission White County  
101 East Searcy Street Kensett, AR 72082  
501/742-5446

Arkansas Forestry Commission Sharp County  
#40 Arnhart Street Ash Flat, AR 72513  
870/994-2188

Arkansas Forestry Commission Stone County  
208 Wilcox Avenue Mountain View, AR 72560  
870/448-5014



**Arkansas Forestry Commission**

**Baucum Nursery**

**1402 Highway 391 North**

**North Little Rock, Arkansas 72117**

**501/907-2485 or 2486**

**888/457-4221**

**FAX 501/907-2487**

**[baucumnursery@agriculture.arkansas.gov](mailto:baucumnursery@agriculture.arkansas.gov)**