

US Forest Service Tree Planting Contracts

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Tree Planting

- The success of a tree planting project depends on:
 - Design of the planting contract that meet the objectives and requirements for planting
 - Selection of the right species and seed source for the site is very critical and contribute significantly to the success.
 - Care of the seedlings at the nursery applies to both bareroot and container stock

Tree Planting Contract- Specifications

- Should be specific on the actual acres to be planted (the acreage should be within 5 percent tolerance when planting is paid by the acre).
 - Note: in the contract do not include areas that cannot be planted (or that will not be planted based on the contract requirements) if they can reasonably be excluded, especially if the contractor is being paid by the acre.

Tree Planting Contract-Specifications

- Include the species to be planted and the distribution of species if more than one species is being planted (species could be distributed evenly or certain species could be planted in specific locations - for example, the contractor could be instructed to plant cedar only in draws).

Tree Planting Contract-Specifications

- Describe the stock type and size of seedlings (assure that the stock type available is suitable for the site, based on soil depth, the potential for competing vegetation, presence of animals, and so forth).

Tree Planting Contract- Specifications

- Specify the planting period. The period should reflect the projected weather and soil conditions at the time of planting and for several weeks afterward.

Tree Planting Contract-Specifications

- Establish the need for shade and the availability of shade. Determine whether shade is needed, and if so, whether transportable shade is suitable or whether stationary shade is needed. The actual requirement could cover several possibilities. For example: plant in stationary shade if it is available; if not, use transportable shade (dead branches). If transportable shade is not available, plant in the open. The availability of the shade that is required will affect the number of plantable spots and the unit cost. If shade is needed and is not available, plan to provide artificial shade, such as shade cards or tubes.

Tree Planting Contract-Specifications

- Identify the need for protection from animals. Protection could include planting seedlings on any side of a stump or log that can act as a barrier to animals (assuming shade is not required), or installing netting or tubing to protect the seedlings from big game (deer, elk) or insects (gypsy moth and other insects).

Tree Planting Contract-Specifications

- The width and depth of scalps and natural clearings, and the difficulty of scalping.
- Planting spot selection criteria specific to each unit, such as: plant outside the drip line of a shelterwood tree; don't plant in game trails; and so forth.

Tree Planting Contract- Specifications

- The minimum distance a tree can be planted from another planted or acceptable natural tree.
- The average spacing based on desired density

Tree Planting Contract-Specifications

- The tree preparation that will be necessary such as water dip, or slurry dip and wrap.
- Other specific requirements that must be met for the trees to survive and grow.

Forest Service Policy to Validate Tree Planting

- The USDA Forest Service will check representative sample plots to determine planting quality. The contractor may check additional plots for quality assurance. This section deals with the procedure of checking plots, regardless of who does so.



Planting Compliance

- The inspection procedure is consistent across the nine Forest Service Regions. However, the forms used to record plot results may differ slightly.

Planting Compliance

- Forest Service requires the presence of an on-site inspector (s). For consistency, all inspectors on a specific project must use the same process and forms. Written instructions on how to interpret the inspection form, calculate quality, determine implantable spots, and count wasted trees are important for consistency. These instructions must be included in the contract.

Planting Compliance

- Observe the tree planters while they are planting. Check to see that the contract requirements for the inspection procedures of aboveground and belowground compliance are completed as described in Planting Quality—Inspection Plots. Select plots randomly and check for shade, scalping, tree spacing, proper planting depth and stem orientation, and properly tamped and filled holes. Dig up an occasional tree to see whether its roots are J-rooted or whether it has been stripped by the planters. If you suspect planting problems, inspect (“swing”) more plots and dig more trees. Although you should not supervise the crew, you should make the crew's foreman aware of contract nonconformance issues.

Planting Compliance

- Plots should be checked whether planting is performed regarding the workforce type used. . Based on the following formula, quality usually is acceptable when it is at least 90 percent or higher. Quality between 80 and 90 percent is generally considered unacceptable and a pay adjustment is required. Quality below 80 percent is unacceptable. In such cases, a pay adjustment and liquidated damages are assessed. Contract language establishes payment based on quality categories

Planting Compliance

- The foreman is responsible for the crew's quality control. If performance problems continue, take contract action to get conformance early on.
- Do not wait until these problems show up in the inspection plots. Work with your contractor to remedy the situation.

Inspection Procedure

- It is important to monitor the planting crew during planting to mitigate problems as they occur. Inspecting such items as tree dipping, tree wrapping, and handling of seedlings and monitoring weather conditions are critical to seedling survival

Planting Quality Percent

- $PQP = (NSAG/NTP) \times (NSBG/NTD) \times 100$
 - Where:
 - PQP = Planting Quality percent
 - NSAG = number of trees satisfactory above ground
 - NTP = number of tree planted
 - NSBG = number of satisfactory trees below ground
 - NTD = Number of tree dug

Planting Quality Inspection Plots

- A formal plot inspection checks for contract compliance, which includes:
 - •Proper planting depth
 - •Firming or tamping the soil after planting
 - •Roots that are extended downward properly
 - •Trees that are “center-hole” planted (not slit planted)
 - •Proper scalping
 - •Shade and protection for the seedling
 - •The proper number of trees

Sample Design

- The inspection plot sample that is used to determine the level of pay must be an unbiased sample that represents the job or pay item as a whole. Plots should cover at least 1 percent of the planting area. When the results are disputed, a 2 percent sample may be needed. Use a fixed-area plot arranged on a systematic grid from a random center point. If inspection plots are installed before the entire unit has been planted, do not make the location of the next plot obvious to the planters. Measuring distance by pacing is usually adequate for locating plots except on steep slopes or in heavy slash; often a tape is useful for measuring distances in these situations. Be sure to adjust the pacing distance based on the slope.

Sample Design

- If an inspector follows behind planters and puts in a plot occasionally, the distribution of plots can be biased, with some portions of the unit being oversampled, and other portions are being undersampled. This method may be used to monitor specific planters. It is not suitable for determining overall planting quality because different planters may plant with different levels of quality.

Sample Design

- The plot size influences the quality as calculated by the formula. The plot size should be selected to include at least four to six trees on a fully stocked plot. Small plots favor a more even distribution of seedlings. Larger plots allow for more spacing variability, which may be desirable on certain sites. If spacing is important, it may be necessary to specify the plot size in the contract. The number of trees desired per plot to meet the prescribed tree density must be provided as well. Generally, the maximum number of trees on any one plot must not be more than 10 to 15 percent higher than the desired number of trees. Any trees above the maximum number are considered wasted. The contractor may be charged for the wasted trees.

Tree Care and Field Handling

- Observe tree care and handling practices. Poor handling will contribute to tree mortality or poor vigor. If you see poor practices, take contract action to assure conformance. Work with your contractor to remedy the situation.

Tree Care and Field Handling – Watch Out Situations

- Water dip (if required)—If trees are to be pulled from tree boxes and dipped in water before being put in the planting bags, make sure that all the roots are moist. If too many trees are in a bundle, trees in the center of the bundle may not be moist. Protect the trees from heat and wind when the planting bags are being filled.
- Tree handling—Trees must be handled gently to prevent damaging their roots and must be kept moist and cool. Be sure that the contractor is not trimming the roots, unless the contract allows the contractor to do so during wrapping

Tree Care and Field Handling Watch Out Situations

- Storage of tree boxes

- Do not expose tree boxes to the sun or wind.
- Boxes may be stored in insulated truck canopies, under tarps in the shade, or in similar conditions, so long as the boxes stay cool. Boxes that have not been wrapped should be closed except when the planting bags are being filled with trees. Dormant trees that have not been acclimatized should be cooler than 45 degrees.
- Trees that have been acclimatized should be planted relatively quickly, usually within 24 hours. Actively growing trees, such as those used during fall or summer planting, should be kept cool.
- Trees can be warmer than 45 degrees Fahrenheit without harm, but only if the tree boxes are kept open and the trees are watered.
- Measure the temperature inside the tree box or planting bag throughout the day.

Tree Care and Field Handling Watch Out Situations

- Care while trees are in the planting bag
 - Monitor trees in the planting bags to make sure their roots stay moist (wrap them if necessary). Ways to minimize drying include putting trees in the bags more frequently, using insulated planting bags, and avoiding planting during the heat of the day.
 - Do not allow to overfill the planting bag. Roots will be damaged when trees are pulled from the planting bag if the bag is too full or if the wraps are too tight.

Tree Care and Field Handling Watch Out Situations

- Careless treatment
 - Do not allow planters to lie on planting bags that have trees in them.
 - Do not expose trees to heat, gas, oil, or other toxic materials.

Planting Quality Inspection Plots

- A formal plot inspection checks for contract compliance, which includes:
 - Proper planting depth
 - Firming or tamping the soil after planting
 - Roots that are extended downward properly
 - Trees that are “center-hole” planted (not slit planted)
 - Proper scalping
 - Shade and protection for the seedling
 - The proper number of trees

Planting Quality Inspection Plots

- Exposing roots
 - During planting, minimize the time that roots are exposed to air. Roots will be damaged if they are allowed to dry. Have the planter remove one tree at a time from the planting bag, and only after the planting hole has been prepared. Do not allow planters to carry exposed trees between holes. After the hole has been prepared, the tree should be planted promptly to assure that the soil in the planting hole stays moist.

Planting Contract - Specifications

- All trees that are planted should meet specifications for root length, top height, root condition, and so forth.
- The contract should state that planters should return substandard trees to the Government. If the contract does not require that substandard trees be returned to the Government, you may not be able to distinguish between a tree that was altered by the contractor (root stripped) and one that was provided in that condition.

Planting Contract - Specifications

- Substandard trees may include trees that are too small, trees that have poor root development, and trees that have long tap roots, among other characteristics. If the contractor plants a substandard tree, it must be planted properly. Trees with long roots should not be planted with a J root (a root that is bent in the shape of a "J" in the planting hole).

Planting Contract - Specifications

- Substandard tree



Aboveground Compliance

- Inspect each tree on the plot for aboveground compliance. A poorly planted tree may have more than one violation; only list the most severe violation. When a tree has been planted, the spot is considered to be plantable and the tree must be planted properly, even if the inspector determines that a tree should not have been planted there.

Aboveground Compliance

- Planting depth—The tree should not be planted too deep or too shallow. After the planting hole has been filled, packed, and leveled, the soil should be even with or up to 1 inch above the root collar. Needles should not be buried and the roots should not be at or near the surface.

Aboveground Compliance

- Soil firmness - Soil throughout the planting hole should be packed sufficiently to eliminate air pockets and excessive settling during the next rain. Loose soil is a violation. An inspector should not be able to uproot the seedling by gently tugging it upward. Use care when tugging on the tree because tugging in some soil types can damage the tree

Aboveground Compliance

- Spot selection

- The tree should be planted in mineral soil
- Trees should not be planted in concentrations of bark, debris, duff, ashes, mounds of loose soil, unsuitable material as specified in the contract, a depression that could collect water or erode, or near debris that could roll on the tree. Planting trees in such situations is a contract violation.

Aboveground Compliance

- Spot selection
 - The contract is also violated if the contractor leaves a depression beside the seedling by “heeling in” the seedling.

Aboveground Compliance

- Shade can be critical for tree survival. All trees must be planted to the contract specifications. Shade clauses will vary by unit and can be very specific. Requirements will determine whether trees can be planted if no shade is available, whether movable shade (such as logs) can be used, whether stationary shade is mandatory, and so forth.

Aboveground Compliance

- Scalping—Measure the size of the scalp to ensure that it meets the specifications stated in the contract. The tree should be near the center of the scalp



Aboveground Compliance

- Spacing—Measure the distance between trees that are planted closely together. A tree planted closer than the minimum distance to another planted tree or to an acceptable existing tree is a contract violation.

Aboveground Compliance

- Stem position—The stem should be oriented between vertical and perpendicular to the slope, or as specified by the contract. Hoe planting on flat ground commonly leads to poor stem position if the hole is opened improperly.



Aboveground Compliance

- Species—When several species are being planted, and the contract specifies where certain species should be planted (for instance, plant spruce near the stream bottoms), you should check for compliance.















Aboveground Compliance

- Cull trees—Check the quality of the planted tree. If the contract prohibits the contractor from planting trees that do not meet the size specification, planting a substandard tree is a contract violation.

Aboveground Compliance

- Tree care
 - If a tree has been damaged, and the damage appears to have occurred during planting, notify the foreman. On some contracts, damaging trees during planting (leaving cull trees) will be considered a violation. Regardless of the cull tree provisions of the contract, the contractor should not be allowed to continue damaging trees during planting.

Above Ground Compliance

Satisfactory and Unsatisfactory Plantings		
<p>SATISFACTORY</p> 	<p>SATISFACTORY</p> 	<p>Unsatisfactory</p>  <p>Too deep. Needles buried.</p>
<p>Unsatisfactory</p>  <p>Improper orientation. Not planted into the slope or near vertical.</p>	<p>Unsatisfactory</p>  <p>"L" roots. Shallow hole.</p>	<p>Unsatisfactory</p>  <p>"J" roots. Shallow hole. Roots often exposed.</p>
<p>Unsatisfactory</p>  <p>Jammed roots. Hole too narrow and shallow.</p>	<p>Unsatisfactory</p>  <p>Hole too shallow. Roots exposed.</p>	<p>Unsatisfactory</p>  <p>Air pocket because of improper tamping.</p>
<p>Unsatisfactory</p>  <p>Planted in rotten wood. Roots not in mineral soil.</p>	<p>Unsatisfactory</p>  <p>"U"- or "J"-shaped tap root.</p>	<p>Unsatisfactory</p>  <p>Compacted roots. Hole too narrow.</p>

Belowground Compliance

- A subsample of the trees on the plot also will be inspected for belowground compliance. Select the trees to be dug randomly from trees that were satisfactory aboveground. Use a hand trowel or similar tool to dig a hole beside the tree. Dig as deep as the lowest root. Carefully scrape away the dirt, exposing the tree's roots and the planting hole. Inspect for the following:

Belowground Compliance

- Root configuration—Root systems must not be twisted, jammed in one place (slit planted), or curved in the shape of the letters U, J, or L. Individual lateral roots may be slightly curved, but the primary vertical root cannot be distorted. Container plugs must not be jammed into the planting hole from the top (accordion effect) or have their sides flattened.

Belowground Compliance

Foreign material in hole

- Material such as bark, snow, large rocks, dry soil, or other foreign matter should not be in the hole, unless its presence is unavoidable.
- Poor clearing of the planting holes, especially holes drilled with an auger can leave debris in the planting hole.

Belowground Compliance

Foreign material in hole

- When holes are being drilled with augers, check for dry soil in the planting hole. Soil in the auger holes will dry out if the crew drilling the holes gets too far ahead of the crew planting trees.

Belowground Compliance

Firmness

- Throughout the root zone, the soil in the planting hole should be about as firm as the undisturbed surrounding soil.
- Soil that is hard packed can damage root systems.
- Do not allow any air pockets in the soil around the seedling's roots. Air pockets can damage the seedlings.

Belowground Compliance

Orientation

- Major roots should be oriented between vertical and perpendicular to the slope.
- Generally, roots that are not oriented properly will be identified during the aboveground inspection.

Belowground Compliance

Orientation

- Occasionally, the roots may not appear to be distorted when viewed from the ground level, but during the belowground inspection, the inspector will see that the hole was opened improperly and the tree was planted improperly.

Estimating the Number of Trees

- **Per-Acre Method**

- Pay is relatively easy to determine when pay is based on acreage planted. Pay will equal the bid price per acre times acreage completed less deductions for poor quality, wasted trees, and so forth. The contractor may dispute the number of acres within the unit, requiring the Government to re-traverse the unit.

Estimating the Number of Trees

- **Per-Acre Method**

- The contract may state the range of trees that must be planted per acre or the total number of trees that are expected to be planted. The Government may need to negotiate a price adjustment if the contract was incorrect.

Estimating the Number of Trees

- **Actual Tree Quantity Method**

- When the pay is based on numbers of trees planted, there is more room for dispute. You cannot assume that all trees that were issued to the contractor and not returned to the Government were actually planted. A statistical approach supplements the inspection plots with additional plots where you count only the number of trees per plot.

Estimating the Number of Trees

- **Actual Tree Quantity Method**

- The statistical confidence of the estimated number of trees planted depends on the variability of the number of trees planted in different plots and other factors of the plots.
- The most defensible method of estimation is to determine whether the number of trees issued is within the 95 percent confidence of the statistical range of the number of trees counted in plots.

Estimating the Number of Trees

- **Actual Tree Quantity Method**
 - Payment is based on the number of trees issued. If not, the COR should be checking a larger sample of planted trees or looking for stashed or lost trees. In any case, the COR should be comfortable that the Government is paying for services that actually were provided.