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1. General Information

1.1. Scope

The Contractor shall furnish everything necessary, including all labor, equipment, supervision, transportation (i.e., for crews), all materials and supplies (except those designated as Government furnished), and incidentals to perform all work specified under this Performance Work Statement (PWS). This includes, but is not limited to, care, handling, preparation (if needed for bareroot stock), and planting of trees, natural shading treatments, animal damage control (ADC) treatments (i.e., protective netting), and specialized or related services.

1.1.1. Operating Season

Planting may generally occur during the spring following snow melt. Fall planting is not currently planned but may occur in limited circumstances.

- Normal Spring Planting Season: April 1 - July 31

Natural shading and ADC treatments will occur within 48 hours of the time of planting.

1.1.2. Access

1.1.2.1. Road Access

Planting units are accessible by four-wheel drive vehicles equipped for mountain driving, except where Detailed Information Charts specify walk-in units. The Government will provide the initial clearing to access points noted on Detailed Information Chart maps for units either accessible from roads or for walk-ins. After initial clearing of the access roads by the Government, the Contractor shall clear any subsequent obstacles that block passage to access points. Motorized vehicles cannot be used off agency system roads unless otherwise approved by the COR. The contractor shall be provided with a copy of the planting unit maps prior to the start of the normal planting season.

1.1.2.2. Walk-in Units

Some units cannot be directly accessed from open forest roads and require the planting crew to walk to the unit. Vehicle access is to the access point identified on the project map. The Contractor shall transport trees, ADC material, or other materials and supplies (if required) from the access point to the unit using the method of his/her choice consistent with tree handling guidelines and restrictions on motorized vehicle use.

2. Definitions

Acceptable Established Tree. An existing conifer around which a tree shall not be planted to avoid direct competition or detrimental effects to the planted tree. This includes Acceptable Established Seedlings or Saplings as well as Residual Trees. Variations to species and size will be specified in the Detailed Information Charts.

Acceptable Established Seedling or Sapling. An existing conifer of seedling or sapling size with a diameter at breast height (DBH) of 4.9” or less that is of good form and color, free of damage, and has 50% or greater crown ratio. Variations to species and size will be specified in the Detailed Information Charts.

Access Point. The point identified for vehicle access to planting areas. This is generally the closest point of access to the planting unit for calculation of walk-in distance or cost. This may be the same place as the Delivery Point.

Animal Damage Control (ADC). Methods for protecting the seedlings from animal damage, particularly big game. May include Vexar-type tubing or flexible netting.

Bareroot Tree. A seedling grown in a field and then lifted from the soil when dormant, removing soil from the roots. This includes trees grown in a receptacle container and then transplanted to the bareroot beds (e.g., plug one-half and plug-one trees). Roots should be protected from drying out.

Clean Water and Buckets/Tubs. Water and buckets/tubs used for tree dipping that are free of contaminants that could injure the tree.

Clearing. The removal of surface debris in and around the planting spot, exposing mineral soil. Debris includes dead limbs and branches, duff, litter, rotten or charred wood, moss, loose rock, ashes, snow, and surface frost. Removing this material prevents debris from falling into the planting hole.

Maximum Clearing Depth: The maximum vertical height of debris required to be removed by a planter before a spot is considered unplantable.

Container-Grown Tree. A seedling grown in a receptacle containing soil and nutrients. When the container seedlings are extracted from the receptacle, the soil stays intact around the roots. The soil and roots together are referred to as the container plug; the soil is the container media.

Container Plug. See Container-Grown Tree.

Detailed Information Chart. A document that summarizes the specific planting requirements (i.e. species, distribution, desired spacing, microsites, shading requirements, etc.) within each planting unit. This document will be provided to the contractor prior to planting season or at a pre-work meeting.

Delivery Point. The point identified for delivery of trees and other supplies. If there are multiple points for delivery of various items, it will be so noted in the Detailed Information Chart. This may be at the planting unit, where a walk-in begins, at the district cooler, etc. Also see Access Point.

Drip Line. The line extending vertically from the exterior edge of a tree's live crown to the ground.

Excess Trees. Trees that are tallied on the Inspection Plot Sheet that exceed the maximum allowable trees to be planted. These trees are considered wasted trees.

Foreign Material (in planting hole). Large rocks, sticks, litter or similar material not part of the surrounding soil substrate that is in the planting hole after the tree is planted.

Ground Line of Tree Before Planting. The original ground line of the tree before planting is the soil surface level when the tree was in the nursery beds or in the container receptacle. The ground line is represented by the "root collar". Above this point is stem tissue; below this point is root tissue.

Lateral Roots. The horizontal roots extending from the main vertical (tap) root.

MTR. Abbreviation for measurement of 1,000 trees. This abbreviation may also be used for measurement of ADC material, and indicates a quantity of 1,000.

Microsite. A plantable spot favorable to seedling survival and growth, such as stumps, down logs, large woody slash, snags, and standing cull trees that provide protection from sun, wind, animals, and other damaging agents.

Plantable Spot. An area where a tree can be planted in accordance with all specifications in the contract.

Planting Inspection. The standard planting inspection procedure provided in *Exhibit 11*. It includes the description of planting violations that result in unsatisfactorily planted trees, plot sizes, calculations for determining planting quality based on trees planted, and similar information.

Root Collar. The root collar of the tree before planting is the soil surface level when the tree was in the nursery beds or in the container receptacle. The ground line is represented by the "root collar". Above this point is stem tissue; below this point is root tissue.

Root Length. The root length measured from the original ground line (root collar) of the tree to the end of the main vertical or tap root.

Satisfactorily Planted Tree. A tree that is planted in accordance with all planting specifications.

Scalping. The removal of live vegetation, including roots, in and around the planting hole to reduce competition to the planted tree. Vegetation is removed down to and exposing mineral soil.

Shade. Natural and artificial materials that protect the tree from the sun's heat and wind.

Stationary Shade Material. Natural material used to shade or protect the tree that is not movable by the planter. Natural material includes items such as stumps, logs, dead brush, or terrain features used to provide the required protection for a tree. Stationary material generally offers the most shade and protection for seedlings from sun and animal trampling.

Stock. Planting stock, to include tree seedlings, native plants, or shrubs. The terms "stock" and "trees" may be used interchangeably throughout this contract.

Terra-Sorb Hydrogel. Compound used to increase the water holding capacity and prevent drought stress to exposed root systems of tree seedlings that are being planted.

Top Height. The length from the original ground line (root collar) of the tree to the top of the terminal leader; does not include needles extending above the leader.

Transportable Shade Material. Natural material such as woody debris that can be moved to the planting spot to shade the tree from the sun. Although the planter is expected to put reasonable effort into moving shade material, it should be able to be done without putting down the planting tool.

Trees in Possession of the Contractor. The time after trees have been issued to the Contractor. During this time, the Contractor is responsible for all aspects of tree care and accountable for tree quantities.

Tree Runners/Carriers. Individual Contractor personnel sent to the dipping site or delivery point to get trees for the rest of the planting crew. This individual may also perform tree preparation (bareroot dipping and wrapping). The tree runner's activities must be performed with approval and oversight from the COR or GTM.

Unplantable Spot. An area in which it is not possible to plant a seedling according to specifications due to site conditions such as acceptable established trees, rock, shallow or saturated soils, etc. One unplantable spot is allowed for each single unplantable area equal in size to the average specified spacing. For example: If a single unplantable area of 64 square feet exists on an 8-by 8 foot spacing, one unplantable spot is recognized.

Hoe planting: A spot is considered unplantable if a suitable spot for planting a tree cannot be found after three attempts of throwing the hoe.

Unsatisfactory Planted Tree. A planted tree which fails to meet one or more of the specifications of a satisfactorily planted tree.

Wasted Material. Government-furnished property that is lost or damaged by the Contractor, or which is installed on trees not in accordance with the requirements of the contract. This may include, but is not limited to, installing shade on the wrong species or netting on the wrong tree(s).

Wasted Tree. A tree that is lost, damaged, destroyed or handled contrary to the standards for care of trees. Planted trees that exceed the maximum allowable number of trees in the Planting Inspection plot procedure are also considered wasted trees.

3. Government Furnished Property

The Contractor shall place orders for trees and other Government furnished property as specified in Detailed Information Charts. Delivery points will be specified in the Detailed Information Charts or on included maps.

3.1. Table of Government Furnished Property

Item	Description	Where Delivered
Bareroot Trees (see *Section 3.2*)	Length of roots and top heights will be defined in Detailed Information Charts. At least 90% of the trees will meet Detailed Information Chart specifications.*	As specified in Detailed Information Chart
Container-Grown Trees (see *Section 3.2*)	Length of container plug and top heights will be defined in Detailed Information Charts. At least 90% of the trees will meet Detailed Information Chart specifications.*	As specified in Detailed Information Chart
Animal Damage Control Materials	Vexar Rigid netting, flexible netting, bamboo stakes, and zip ties.	As specified in Detailed Information Chart
Tree Dipping Materials	TerraSorb for dipping. If required, the government will add the appropriate amount of Terrasorb to the dipping water before trees are dipped. Sontara, Kimtex, and burlap for wrapping to maintain root moisture after dipping.	As specified in Detailed Information Chart

*Stock that do not meet the minimum size standards shall be returned to the Government or disposed of as directed by the COR (see *Section 4.4.9*). Occasional lateral roots on individual trees may exceed lengths specified in the Detailed Information Charts; these shall be planted according to the technical specifications or may be returned to the Government as directed by the COR.

3.2. General Stock Type Descriptions

Species and stock types can vary by individual Detailed Information Chart and may include those not listed below.

Stock Type	Age/Size	Species	Description
Bareroot	2-0	All conifers	A standard bareroot product requiring two growing seasons in nursery field beds.
Container	112	All conifers	6.6 cubic inch, 1.4-inch diameter, 6-inch-long plug
Container	112L	All conifers	10.0 cubic inch, 1.4-inch diameter, 8-inch-long plug

4. Technical Specifications

4.1. Equipment

The Contractor shall provide planting tools, bags, and all other necessary tools to perform planting, shading/ADC treatments, and quality control. Required planting tools will be specified in Detailed Information Charts.

4.1.1. Planting Tools

Hoedads shall have a minimum blade length of 15 inches and width of 4 inches. Shorter blade length for planting containerized trees may be allowed, subject to COR approval. Length is measured from tip of blade to bottom of handle bracket.

Other hand tools used for scalping and clearing shall be capable of chopping and cutting live or dead vegetation and adequate to create minimum or larger scalp sizes listed in Detailed Information Charts.

4.1.2. Planting Bags

Planting bags shall be a minimum of 15 inches deep, free of defects, and light in color. Planting bags must not be transported with or come into contact to petroleum-based products.

4.2. Tree Handling and Care

The Contractor shall be responsible for the care of trees from the delivery or access points and throughout the time that trees are in their possession to assure they are properly cared for and not damaged or exposed to damaging conditions. Trees not properly cared for may be considered wasted trees. The Contractor shall be aware of environmental hazards which affect tree survival and shall alter crew work schedules and tree handling practices to allow planting under optimal conditions. Care shall be taken to adhere to the following requirements any time trees are in the Contractor's possession. Noncompliance with these requirements are grounds for damage payments or for termination of the contract. These requirements shall apply to all planting stock.

a) The Contractor shall take precautions to keep roots moist during the entire planting operation.
b) Trees shall be protected from drying, heating, smothering, freezing, crushing, bending, drowning, abrasion, rapid temperature fluctuations, and shall not come into contact with injurious substances such as petroleum products or petroleum product residues.
c) Shipping containers shall not be tossed or dropped. Punctured or torn shipping containers or liners shall be promptly resealed.
d) Seedlings removed from cold storage facilities or shipping containers shall not stand or lay in water or snow or be covered directly with snow.
e) Trees shall not be removed from shipping containers until needed for planting preparation. Shipping containers shall be opened only in full shade and shall not be exposed to direct sunlight.
f) Trees are to be prepared or planted without further root or top pruning or culling. If pruning or culling appears necessary, or if mold, dry roots, or evidence of injury or drying is seen, the condition shall immediately be reported to the COR.
g) Trees that are frozen shall not be handled until completely thawed. They shall be thawed in accordance with direction from the COR.
h) Containerized stock shall be kept in the baggies they were packed in when placed in planting bags.
i) Bareroot trees shall remain wrapped according to *Section 4.3* while in the planting bags.
j) If trees exchange possession between planters, containerized stock shall remain in plastic bags and bareroot trees shall be rewrapped to maintain root moisture (see *Section 4.3*).

k) Trees in planting bags shall only have tops exposed.
l) Trees carried in planting bags shall not exceed the amount that can be carried and removed without injury, or which can be planted before critical heating or drying occurs.
m) Trees shall not be removed from planting bags until immediately before planting. They shall be handled carefully to avoid damage to roots and buds. They shall be gently removed one at a time to prevent injury and quickly inserted into the prepared planting hole.
n) All trees in a planter's bag should be properly planted prior to taking breaks.
o) All trees placed in planting bags will be planted and not returned to storage, unless approved by the COR as described in *Section 3*.

4.2.1. Tree Transport Within Unit

The Contractor may transport trees from access or delivery points to any areas within the planting unit consistent with the requirements of *Section 4.2* and any Forest-specific restrictions to off-road use, unless specifically accepted in Detailed Information Charts or by the COR.

4.3. Tree Preparation

All tree preparation shall be done under the direct supervision of the Government. All tree preparation shall be done in shaded areas and protected from the wind. Shipping containers shall be kept closed at all times except when removing trees to be prepared for planting.

Dipping and wrapping is for bareroot stock only. Container-grown trees will not be dipped or wrapped.

The tree inventory on each nursery box shall serve as the official tree count for dipping operations. No additional counting of trees will be allowed to minimize seedling exposure time outside of boxes or planting bags.

Specifications for Tree Preparation:

a) Water for Tree Dipping. The Contractor will haul water necessary for dipping operations. Water can be brought with or acquired from a location agreed to by the COR.
    i. Where required by Detailed Information Charts, Terra-Sorb Hydrogel used in dip water will be provided by the Government.
b) Dipping Tubs. Dipping tubs shall be provided by the Contractor. The Contractor shall utilize at least one dipping tub per 4 planters. Dipping tubs shall be a minimum of 14 inches deep.
c) Water Dip. The Contractor shall dip the roots of bareroot trees in clean water at the planting site, prior to wrapping and placing trees in the planter's bag. Dipping in water is intended to increase root moisture.
    i. Bareroot stock shall be removed from the shipping boxes and immediately dipped in water. Tree roots shall not be exposed to air for more than 20 seconds.
    ii. Trees shall be dipped in water long enough to moisten the tree roots. Roots shall be fully wet, but soil particles shall not be washed off the roots during the dipping process.
    iii. Trees shall not be forcibly packed into water tubs during dipping.
d) Wrapping. Immediately after dipping, trees shall be wrapped in a wet Sontara or Kimtex material to maintain root moisture.
    i. The Contractor shall wrap trees in bundles of 20 to 50 trees.
    ii. Trees shall be wrapped so that the roots are in contact with the wet Sontara or Kimtex material.
    iii. Wrapping operations shall occur at the time of each individual bag-up, unless the COR specifies otherwise.
e) Trees shall not be forcibly packed into planting bags, and shall not exceed the amount that can be carried and removed without injury.

f) Trees will be planted immediately after dipping and wrapping.
g) The planting crew will be required to dip and wrap as an entire group during the course of the day. Tree planters will not be allowed to return to the dipping site in a random fashion to dip and wrap trees on an individual basis. With approval and oversight from the COR or GTM, the Contractor may send individuals to the dip site to get trees for the rest of the planting crew (tree runners).

4.4. Tree Planting

4.4.1. Tree Planting Types

4.4.1.1. Regular Spacing Planting

Trees shall be planted to achieve the average spacing specified on Detailed Information Charts. It is expected that an irregular distribution will result as planters avoid acceptable established trees, rock or shallow soils, and seek planting spots in the best microsites and soil conditions. For individual trees, the spacing may be varied as much as 50 percent in any direction to attain the best plantable spot, unless otherwise specified in Detailed Information Charts. The total number of trees planted shall not be materially changed by the method of selecting planting spots.

4.4.1.2. Microsite Only

This type of planting will consist of planting trees as specified in Detailed Information Charts to take advantage of the best available microsites within units. Planting spot selection takes precedence over spacing requirements.

4.4.1.3. Interplanting

This type of planting consists of planting only portions of units that have not fully reforested naturally after a disturbance or after prior planting attempts. Detailed Information Charts will specify the species and densities to be planted intermixed among acceptable established trees.

4.4.2. Planting Spot Selection

Trees shall be planted in the best available microsites and soil conditions. It is expected that an irregular distribution will result as planters avoid acceptable established trees, rock, or shallow or saturated soils. For individual trees, the spacing may be varied as much as 50% in any direction to attain the best plantable spot, unless otherwise specified in Detailed Information Charts. The total number of trees planted shall not be materially changed by the method of selecting planting spots. For Specialized Tree Planting, the Detailed Information Chart will specify how planting spots will be identified.

Trees shall be planted up to the edge of all unit boundaries, at the proper spacing requirement. Temporary roads, skid trails, cut/fill slopes, and fire lines shall be planted where compaction, soil availability and general plantability permits, unless otherwise directed by the COR.

The Contractor shall find plantable spots in difficult as well as easily plantable ground. Should the initial attempt to open a planting hole fail because of subsurface rocks, roots, saturated soil, standing water, or other obstacles, a second effort shall be made in a slightly different part of the planting spot. If this effort fails for similar reasons, a third attempt shall be made in another part of the planting spot. If the third effort fails, the spot shall be abandoned as unplantable.

4.4.3. Acceptable Established Trees

4.4.3.1. Acceptable Established Seedlings and Saplings

A tree shall not be planted in direct competition with acceptable established seedlings or saplings. Detailed Information Charts will define acceptable established seedling and sapling requirements. Trees not meeting requirements shall be disregarded and a seedling planted according to Detailed Information Chart specifications.

4.4.3.2. Acceptable Residual Trees

A tree shall not be planted at a spacing that is less than that prescribed from a bole or within the drip line of a residual tree, unless otherwise specified or excepted by the COR.

4.4.4. Clearing

Each planting spot shall be free of surface debris to prevent foreign material from falling into the hole. All debris down to the mineral soil surface shall be removed by the Contractor according to the size and depth specified on Detailed Information Charts. Debris to be removed includes dead limbs and branches, duff, litter, dry soil, rotten or charred wood, moss, loose rock, ashes, snow and surface frost. Small down woody material such as branches and limbs shall not be included in the measurement for maximum clearing depth. If the clearing of branches and limbs can be done with a reasonable effort, without setting aside the scalping tool, the spot shall be considered plantable.

4.4.5. Scalping

Each planting spot shall be free of live vegetation, including roots, to reduce competition from existing vegetation. Mineral soil shall be exposed over the scalped area. The minimum diameter and the maximum depth required to expose mineral soil are specified for scalping in the Detailed Information Chart. The Contractor shall not destroy or remove any existing tree seedling that meets the criteria of an acceptable established seedling (see *Section 4.4.3.1*).

4.4.6. Tree Planting Procedure

Trees shall be planted satisfactorily both above and below ground as defined and shown in *Exhibit 05*. To give the best chance for tree survival and growth, trees shall be planted according to the following standards:

a) Planting holes shall be located near the center of the cleared and scalped area, except as required to meet stationary shade, artificial shade or ADC installation specifications.
b) Trees shall be planted in an open hole, deep and wide enough to fully accommodate the roots of the tree being planted. The tree roots shall be in their natural configuration and not wedged, jammed, spiraled, twisted, or doubled up into the hole. Slit planting (the opening of a hole without breaking it out) will not be permitted.
c) The hole shall be filled and firmed with moist soil, so the tree is firmly in the soil and there are no air pockets. Firming the soil around the tree shall be done in a manner to ensure no damage is done to the tree or root system. There shall be no material in the hole which is foreign to the hole such as dry soil, debris, ash, organic matter, or rock.
d) Bareroot trees shall be planted deep enough so that after filling and firming, the soil surface is at or up to one inch above the root collar of the tree with no roots exposed and no branches buried. The location of the root collar will vary considerably between seed lots and tree species.
e) Container trees shall be planted so that after filling and firming, there is ½ inch to 1 inch of soil on top of the container plug. The Contractor shall take care to keep the container growing media intact, but where the media falls away from the roots, the tree shall be planted ½ inch to 1 inch deeper than the original ground line.
f) After planting:
    i. The tree stem shall be erect and oriented between vertical and perpendicular to the slope.
    ii. Trees or tree branches shall not be weighted down with mud or debris.
    iii. There shall be no excessive depressions on the ground surface that may collapse on the tree hole and the tree shall not be in contact with the dirt bank.
    iv. The tree shall be free from damage.
g) Once a tree has been planted, the tree shall not be uprooted and replanted.
h) All additional or auxiliary holes created during the planting operation that are within 18 inches of the planted tree shall be filled-in or collapsed.

4.4.7. Tree Species or Stock Type Mix

The species and stock types to be planted will be indicated on the Detailed Information Charts. Where a mixture of species and/or stock types is required, the Contractor shall distribute the variety of species and/or stock type evenly over the entire unit, except when otherwise noted in individual Detailed Information Charts or by the COR. When there is a geographic preference for certain species (e.g., western red cedar in draws), the Contractor shall discuss the requirements for species placement with the COR before the unit is planted.

4.4.8. Shade Requirements

Planting in favorable microsites protects seedlings from potentially harmful conditions and improves the probability of survival. Trees shall be planted consistent with the shade requirement for each planting unit as specified in Detailed Information Charts. The type of shade available and the effort required by the planter to shade seedlings varies depending on the site conditions of each unit.

When shade is required, each tree shall be shaded at the ground level from the afternoon sun. Trees shall be planted on the north, northeast, or east side of the shade material (refer to *Exhibit 06*). Each tree shall be as close to the shade material as possible (without touching), and within ½ the distance equal to the height of the shade material (for stumps, downed logs and similar) or ½ the distance equal to the width of the shade material in the case of standing snags. Exceptions will be noted on Detailed Information Charts.

Stationary shade material as defined in *Section 2* includes downed logs, stumps, and standing snags meeting minimum specifications. A stationary shade source may be used as part of the scalp.

When transportable shade material is required, it must be at least 3 inches in diameter, and be available within ½ of the distance to the next plantable spot, unless otherwise specified in Detailed Information Charts. Shade material should not be placed on the uphill side of the planted tree or where it can roll onto a plant tree.

Detailed Information Charts will specify one of the following shade clauses:

1) Microsite Only: Trees shall be planted (regardless of spacing) next to stationary shade sources, listed in order of preference with the most favored first, on Detailed Information Charts. Planting spot selection takes precedence over spacing requirements. When a preferred stationary shade source is not available, no tree is planted. Refer to *Exhibit 07*.
2) Stationary Material Only: Trees shall be planted next to stationary material only. When stationary material is not available, no tree is planted. Refer to *Exhibits 06 and 07*.
3) Stationary Material First, Then Plant in Open: A tree shall be planted next to stationary material when it is available. When stationary material is not available, the tree may be planted in the open.
4) Stationary Material First, Then Transportable Shade: A tree shall be planted next to stationary material when it is available. When stationary material does not exist within the spacing allowance, shade shall be transported to the seedlings. When neither stationary nor transportable material exists, no tree shall be planted.
5) Stationary Material First, Transportable Shade Second, Plant in Open Last: Trees shall be planted next to stationary material when it is available. If stationary material does not exist within the spacing allowance, shade shall be transported to the tree. When neither stationary nor transportable material exists, the tree may be planted in the open.
6) No Shade: There is no requirement to select the planting spot based on shade or protection. Trees may be planted in the open.

4.4.9. Trees Not Meeting Specifications

The Contractor is not obligated to plant trees that do not meet minimum specifications in *Section 3*, and they shall be returned to the Government or disposed of as directed by the COR. Except as noted below, if trees not meeting specifications are planted, they shall be planted satisfactorily.

a) In no case shall bareroot trees with root systems less than eight inches long and fewer than three roots (vertical or lateral) be planted.
b) Container trees shall have a minimum top height of three inches with the exception of high elevation five-needle pines. Roots shall have a defined main root and still maintain some soil media.
c) In the case of Per Planter/Hourly Rate for Specialized Tree Planting, this specification may not apply.

4.5. Shading and Animal Damage Control

4.5.1. Animal Damage Control (ADC) Installation, Maintenance, or Removal (Netting or Tubing)

Flexible or rigid netting shall be installed around trees to protect young seedlings from being browsed by big game. Netting shall be applied in a timeframe before big game use in the area. Installation of netting may be performed in conjunction with tree planting operations or may be performed as a separate operation, but shall be accomplished within 24 hours of planting. In either case, it will be inspected and paid for as a separate subitem. Netting shall be installed so as not to damage the tree, which includes, but is not limited to, skinning the bark, breaking the leader, damaging the root, or excessive bud stripping. The tree leader must be free to grow, and branches shall be upward and generally in a natural configuration.

Flexible netting shall be at least one inch and no more than two inches above the terminal leader. Flexible netting that is too long shall be folded up at the bottom to achieve desired position. During maintenance, the height of the flexible netting shall be adjusted and maintained one inch and no more than two inches above the terminal leader to prevent animals from browsing the seedling. Refer to *Exhibit 08* for an example diagram of properly installed flexible netting.

Rigid netting shall be installed using one or two bamboo stakes attached with zip tie strips or woven three times through the tube (see example in *Exhibit 08*). Stakes will be forced into the ground to a depth of at least six inches or flush with the top of the tube on the uphill side of the tree, to keep it secure during winter snows. The number of bamboo stakes to be used will be specified in the Detailed Information Charts. During maintenance, the height of the rigid netting shall be adjusted and maintained at least 2 inches above the terminal leader, or as specified.

Removal of flexible or rigid netting will include the removal of netting material as well as bamboo stakes and zip ties, consolidation of the materials, and transportation of the materials to a location specified in the Detailed Information Charts or by the COR. After completion, no materials shall remain at the site.

5. Performance Requirements Summary

Performance Objective	Required Task/ Performance Standard	Acceptable Quality Level	Method of Surveillance	Positive/Negative Incentive % for NOT meeting the Task
Tree Handling, Care, and Transportation	See *Section 4.2 – Tree Handling and Care*	Trees are properly handled and cared for. Box temperatures are below 45 degrees F while in the Contractor's possession. When violations occur, Contractor takes corrective action immediately.	COR and GTM(s) will monitor operations and conduct visual inspections.	• The Contractor's care and handling of trees will affect the performance assessment as either a positive or a negative incentive. • If Contractor meets the standard, no deduction. • If Contractor does not meet the standard and/or take corrective action, the Government may assess liquidated or actual damages (see S*ections* 10.3, 10.4, and 10.5*)* and provide adverse performance evaluation.
Tree Planting	See *Section 4.4 – Tree Planting*	Planting quality meets or exceeds performance standard of 93% quality.	COR or GTM(s) conduct periodic inspection consisting of plots consistent with Planting Inspection Method *(Exhibits 09 – 14)*.	• The Contractor's planting quality will be reflected in the performance assessment as either a positive or a negative incentive. • If Contractor achieves 93% planting quality or greater, full unit price as incentive. • If Contractor does not achieve at least 93% quality, deductions will be made as per *Section 10.3* and may result in adverse performance evaluation.
Shade or ADC Treatment	See *Section 4.5 – Shading and Animal Damage Control*	Shade or ADC quality meets or exceeds performance standard of 93% quality.	COR or GTM(s) conduct periodic inspection consisting of plots consistent with Shading/ADC Inspection.	• The Contractor's Shade or ADC quality will be reflected in the performance assessment as either a positive or a negative incentive. • If Contractor achieves 93% quality or greater, full unit price as incentive. • If Contractor does not achieve at least 93% quality, deductions will be made as per *Section 10.3* and may result in adverse performance evaluation.

Performance Objective	Required Task/ Performance Standard	Acceptable Quality Level	Method of Surveillance	Positive/Negative Incentive % for NOT meeting the Task
Quality Control	See *Section 8.0 – Inspection and Acceptance*	Contractor maintains good quality control on all aspects of operation including tree handling, preparation and planting, artificial shade and animal damage control (ADC) treatments. Actions not consistent with contract specifications are corrected as per the Quality Control Plan.	COR and GTM(s) will monitor operations and conduct visual inspections.	• The quality of Quality Control provided by the Contractor will be reflected in the performance assessment as either a positive or a negative incentive. • If the Contractor fails to meet standards, work may be suspended, or the Contractor put in Default for failure to take corrective action immediately and result in adverse performance evaluation.
	See *Section 8.0 – Inspection and Acceptance* and *Section 10.0 – Measurement, Remeasurement, and Payment*	Contractor's plot inspections are within +/-5% of Government's quality. Inspection completed to meet timeframes. Inspection records are complete and accurate.	COR or GTM(s) randomly sample and observe Contractor inspection. Reviews Contractor inspection sheets daily.	• The ability of the Contractor to meet the standard will be reflected in the performance assessment as either a positive or a negative incentive. • When Contractor's plot inspections meet standards, no deductions.
Work Plan and Schedule	See S*ection 6.0 – Deliverables/ Schedule, Section 7.0 - Key Personnel, Crew Organization, and Communications* and *Section 9.2.4 – Work Plan and Schedule*	Work meets schedule as per the accepted work plan.	COR and GTM(s) conduct periodic monitoring.	• The Contractor's ability to maintain the work schedule and complete work on schedule will be reflected in the performance assessment as either positive or negative incentive. • Work not completed on schedule is subject to Default and may result in assessment of actual costs.

6. Deliverables/Schedule

Deliverable	Objective/Contract Section Reference	Due
Quality Control Plan (QCP)	Describes how Contractor's quality will be monitored to assure appropriate tree handling and care, that performance standards are met, the supervision of crew and work, and personnel that will be performing the quality control. Reference *Section 8.0*.	With technical proposal

Deliverable	Objective/Contract Section Reference	Due
Work Plan and Schedule, including designation of Key Personnel.	The Contractor shall prepare a work plan and schedule that demonstrates how the work will be completed within the period of performance identified. Provide a list of key personnel responsible for overseeing the parent contract and each Detailed Information Chart. Reference *Sections 7* and *9.2.4* and *Exhibit 02*.	With technical proposal and updated one week prior to commencing work on any Detailed Information Chart.
Contractor Quality Control Inspections	Completed and legible quality control inspection forms for tree planting and artificial shade/ADC treatments. Reference *Section 8.0*.	By 8:00 a.m. the day after completion of items/subitems.

7. Key Personnel, Crew Organization, and Communications

7.1. Key Personnel

The Contractor shall comply with the following requirements, unless otherwise approved by the CO, or mutually agreed to in writing by the CO and the Contractor. At all times during performance of this work item and until work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent Contractor Representative who is satisfactory to the CO and has authority to act for the Contractor. The Contractor shall designate at least one supervisor/foreman as specified in Detailed Information Charts.

The Contractor shall assign key personnel identified below in the technical proposal (reference sample Designation of Key Personnel Template in *Exhibit 02*):

Role	Responsibilities
Contractor Representative(s)	Has the authority to act on behalf of the Contractor. Shall not be engaged in inspections or work covered under this contract (e.g., planting, dipping, etc.)
Supervisor/Foreman	Oversees the implementing crew and quality control inspectors and directs work. Coordinates with CORs. Shall not be engaged in inspections or work covered under this contract (e.g., planting, dipping, etc.). Can be the same as the Contractor's Representative.
Quality Control Inspectors	Individuals responsible for monitoring crew work based on Contractor's quality control plan. Shall not be engaged in work covered under this contract (e.g., planting, dipping, etc.).

Any proposed changes in key personnel from the original Contract solicitation must be submitted along with the Work Plan and Schedule. Any substitutions of key personnel after award shall be submitted in writing to the Contracting Officer within one week prior to the start of work. The Contractor shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on this work item. Proposed changes in key personnel should have comparable qualifications to those of the persons being replaced. The Contractor shall provide an updated Designation Form for the new key personnel.

All key personnel and tree runners/carriers shall be able to fully comprehend and interpret English Language instructions fully and completely to the native tongue of their crew.

All key personnel shall have access to the parent contract, Detailed Information Charts, and any attachments (especially maps), on the work site.

7.2. Crew Organization

Planting shall be performed in an organized, systematic manner. Crew members shall not be scattered within or between units except as necessitated by on-the-ground conditions and only when authorized by the COR.

The Contractor shall comply with the following requirements unless otherwise approved by the Contracting Officer or specified in Detailed Information Charts. The crew configuration information identified here does not dictate required production rates. Individual Detailed Information Charts may specify different crew size requirements than those listed below. There shall be one inspector for each Supervisor/Foreman.

National Forest/Agency	Maximum Number of Crews per Detailed Information Chart	Minimum Crew Size Per National Forest/Agency*	Maximum Crew Size Per Supervisor/Foreman*
Kootenai	3	12	15

***Does not include key personnel**

7.3. Communications

The Contractor shall keep the CO or the COR advised of where the Contractor or Contractor's Representative may be reached by phone during periods of work, suspension, and periods of time without work. Further, the Contractor shall maintain contact with the CO during periods of work, suspension, or periods of time without work.

8. Inspection and Acceptance

8.1. Contractor Quality Control

The Contractor shall provide quality control for all planting, tree preparation, animal damage control, and shade operations, ensuring that seedlings are handled in accordance with *Section 4.2*. The Contractor is also responsible for the quality of planting on site and is expected to conduct their own prompt inspections to ensure proper planting procedures are being followed. Government inspections, as described below, are for payment determination only, and are not intended to be used as a quality control by the Contractor. Any delay in Government inspections will not cause the Government to be responsible for the Contractor’s planting quality.

8.1.1. Quality Control Plan

The Contractor shall provide a general Quality Control Plan (QCP) with the contract technical proposal. The Contracting Officer will review the QCP with the Contractor at the scheduled Post Award Conference. Any necessary revisions to the QCP must be made and included in a finalized contract QCP, which shall be submitted to the Contracting Officer prior to the start of work date designated on the Detailed Information Charts. The Quality Control Plan must demonstrate how the Contractor will ensure quality meets the requirements and specifications of the contract. The Plan shall describe: 1) how quality will be monitored to assure the requirements and specifications provided herein are met (including performance, safety, and reliability standards that apply to this requirement); 2) the method to be used for crew and work supervision; 3) the personnel that will be performing the quality control; and 4) the corrective actions that will be taken when necessary. Quality control shall include monitoring tree handling and care and other associated tasks, quality while planting and shade/ADC treatments are in progress, and an unbiased sample of planting, shading and/or ADC treatments for determining actual quality percentage.

8.1.2. Inspections

Inspection shall be maintained concurrent with work. Contractor inspection results shall be available to the COR by 8:00 am the day after completion of items/subitems. The Contractor shall submit legible inspection sheets and work maps. Inspection sheets shall be **fully completed**, signed, and dated by the person who conducted the inspection and shall certify that the inspection records are complete and accurate. Illegible and incomplete inspection sheets will be returned to the Contractor for correction and resubmission. Completed Planting Inspection Sheets (see *Exhibit 09*), Artificial Shade/ADC Inspection Sheets (see *Exhibit 15*), and sketch maps remain a part of the contract file.

The Contractor shall maintain a plot system that provides a sample of planting quality which represents the entire area planted. The plot system shall be consistent with the planting inspection method described in *Exhibit 11 – Planting Inspection Method* using the Planting Inspection Sheet (*Exhibit 09*). Plots shall be marked and identifiable on the ground with flagged markers. Flagging shall be marked in permanent marker with unit name and number, plot number, date of inspection and inspectors' initials.

The Government may observe or re-examine the Contractor's plots at any time. Each subitem will be assessed separately and results will not be averaged with those of other subitems. The Contractor shall inspect artificial shade/ADC installation (except for flexible netting), where required, concurrently when inspecting tree planting.

8.1.2.1. Tree Planting: Regular Spacing Planting

The Contractor's plot system shall provide an unbiased sample of planting quality, and which represents the entire area planted. The Contractor shall sample at least 1-percent of the planted area, with a minimum of 5 plots per subitem. A 1/20th, 1/50th, or 1/100th acre plot size shall be used during inspection, depending on density of tree planting and slope of sub-units. The Government and Contractor must be consistent in plot size used in each unit.

Calculation of planting quality will be based on the following formula (refer to columns of the Planting Inspection Sheet in *Exhibit 09*). All computations will be carried out to at least thousandths (.000), and the final percentage of planting quality will be rounded to the nearest whole percent:

$$\frac{\text{Number of Satisfactory Trees Above Ground (Column 9)}}{\text{Number of Plantable Spots (Column 5)}} \times \frac{\text{Number of Satisfactory Trees Below Ground (Column 11)}}{\text{Number of Dug Trees (Column 10)}} \times 100$$

Plot inspection shall include a tally of trees that are planted in excess of the maximum allowable trees on each plot and noted in Column 8 of the planting inspection sheet. These excess trees are considered wasted trees. The sum of wasted trees on all plots on the subitem will be used to determine the damage assessment.

8.1.2.2. Tree Planting: Microsite Only Planting

The Contractor shall maintain a plot system that provides a sample of planting quality representative in portions of subunits where trees were planted (this can be a biased sample). Plots should be placed uniformly in areas where trees were planted, with a grid system recommended in these areas but not required. The plot system shall be consistent with the planting inspection method (*Exhibit 11*), using the Planting Inspection Sheet (*Exhibit 09*). The Contractor shall sample at least 1-percent of the planted area, with a minimum of five plots per sub-unit. A 1/20th, 1/50th, or 1/100 acre plot size shall be used during inspections depending on planting density and slope of sub-units. The Government and Contractor must be consistent in plot size used in each unit.

The desired number of plantable spots (Column 3 of the Planting Inspection Sheet) will be determined at each plot based on the number of available microsites within a plot.

If appropriate microsites are available and if no shade or protection violations are noted on a plot (code 'X' on *Exhibit 10*), more trees than the maximum trees per plot can be planted on each plot and will not be considered wasted trees. If shade or protection violations are noted on any plot, these will be considered wasted trees. The sum of wasted trees on all plots on the subitem will be used to determine the damage assessment.

8.1.2.3. Aspect Planting

The average spacing required by aspect as listed on Detailed Information Charts, in combination with plot size, will be used to determine the desired number of plantable spots (Column 3 on the Planting Inspection Sheet) by aspect on any given plot (this may vary by plot). Wasted trees will be determined as described in *Exhibit 11*. The sum of wasted trees on all plots on the subitem will be used to determine the damage assessment.

8.1.2.4. Interplanting

The desired number of plantable spots (Column 3 on the Planting Inspection Sheet) will be determined at each plot based on the number of acceptable established seedlings/saplings and residual trees within each plot. Wasted trees are those that are planted closer than minimum distances away from acceptable established seedlings/saplings and residual trees within each plot. The sum of wasted trees on all plots on the subitem will be used to determine the damage assessment.

8.1.2.5. Shading/Animal Damage Control

When included with Tree Planting Inspection, the same plots and identification methods used for inspecting tree planting shall be used for shade/ADC installation.

When not included with Tree Planting Inspection, the Contractor shall sample at least one percent of the planted area, with a minimum of five plots per subunit. For Per Acre unit of measure, plots shall be unbiased. For Per Thousand unit of measure, plots can be biased. In either instance, plots should represent the entire area planted.

A 1/20th, 1/50th, or 1/100-acre plot size shall be used during inspections depending on planting density and slope of subunits. Results shall be recorded on the Shade/ADC Inspection Sheet (*Exhibit 15*). The Government and Contractor must be consistent in plot size used in each unit.

Calculation for percent quality for artificial shade and/or ADC treatments will be based on the following formula (refer to the columns of the Shade/ADC Inspection Sheet in *Exhibit 15*):

$$\frac{\text{Satisfactory Trees}}{\text{Total Trees Requiring Treatment}} \times 100$$

The inspection shall include a tally of wasted materials due to: 1) excess or unspecified material used or treated within the inspection plot; and 2) materials dropped or damaged by Contractor. Wasted material shall be tallied by plot. The Government will use the sum of all plots on the subitem to determine the damages assessment.

8.1.3. Government Quality Assurance Surveillance Plan (QASP)

The Government will ensure the Contractor is providing the quality promised and that work meets the performance standards. Surveillance will consist of visual observations of the entire operation and will include tree preparation (when applicable), tree handling and care, planting operations, and shade/ADC treatment operations. A series of inspection plots to evaluate the quality of planting and shade/ADC treatments (when applicable) shall be performed. The Government will use the Planting Inspection Sheet (*Exhibit 09*) or Artificial Shade/ADC Inspection Sheet (*Exhibit 15*) and follow the procedures outlined for Contractor inspection. Plot densities and locations, however, may differ from that done by the Contractor. Each subitem/unit will be verified separately and inspection results on one subitem/unit will not be averaged with those of other subitem/units.

The Contractor may observe Government inspections while they are underway.

Trees that are mishandled, dropped, or stashed will be declared wasted trees.

The Government will document the number of trees that the Contractor requests, is issued, and returns at the end of each workday.

8.1.3.1. Tree Quantity for Per Thousand Tree Unit of Measure (UOM)

The COR may determine tree quantity by taking a series of "count" plots, where trees planted and wasted (excess trees) are tallied using the Planting Inspection Sheet. The COR may also use a count of the boxes of trees issued to the Contractor and planted on a particular day. A minimum of two percent sample will generally be taken. The Government's plots taken for purposes of quality assurance may also be used for the determination of quantity of trees planted. The Government shall investigate large discrepancies between plot calculations and trees issued.

9. Deliveries or Performance

9.1.1. Unsuitable Conditions

Whenever it is determined that environmental or physical conditions become unsuitable for tree survival, or when extreme weather conditions create the potential for blowdown or other safety hazards, the Contractor shall move to another area identified by the COR or take other mitigating actions directed by the COR. When there is no other area available or mitigating actions to be taken, the Contracting Officer will issue a Notice to Suspend which will suspend work and stop the contract time. When conditions are again suitable, the Contracting Officer will issue an oral Notice to Resume and confirm that order in writing. The count of contract time will resume on the day indicated by the Contracting Officer. If the Contractor fails to keep in contact with the COR, a written Notice to Resume will be mailed and the count of days of contract time will resume on the date specified in that order.

9.1.2. Personal Protective Equipment

Personal protective equipment, including personal protective equipment for eyes, face, head, and extremities, shall be provided, used, and maintained by the Contractor in a sanitary and reliable condition wherever it is necessary by reason of hazards or processes encountered in a manner capable of causing injury or impairment in the function of any part of the body. Defective or damaged personal protective equipment shall not be used. The Contractor shall provide training in the safe operation and use of equipment to all workers using such equipment.

- The Contractor shall assure that each employee wears foot protection that provides adequate traction and ankle support. Employees operating chain saws shall wear foot protection that is constructed with cut-resistant material which will protect the employee against contact with a running chain saw.
- The Contractor shall provide, at no cost to the employee, and assure that each employee who works in an area where there is potential for head injury from falling objects or flying objects wears a hard hat that meets the minimum requirements of American National Standards Institute (ANSI) standard Z89.1-1997.
- The Contractor shall provide, at no cost to the employee, eye protection where there is potential for eye injury due to flying objects. This eye protection must meet the minimum requirements of ANSI standard Z87.1-2003.
- The Contractor shall provide, at no cost to the employee, hearing protection where there is a potential for hearing loss due to high intensity noise e.g., chain saw operation.
- The Contractor shall provide, at no cost to the employee, to each employee who operates a chain saw, chain saw chaps and assure the chaps are worn during saw operations. These chaps must be approved by Underwriters Laboratory or meet Forest Service specification 6170-47. The chaps shall cover the full length of the thigh to the top of the boot on each leg.

10. Measurement, Remeasurement, and Payment

10.1. Measurement

All linear and area measurements under this contract are measured on a horizontal plane.

10.1.1. Per Acre Unit of Measure

When the unit of measure is Per Acre, the Contractor will be paid based on the acres indicated in the Detailed Information Chart. When the acres provided are an estimate, it will be labeled as such, and the COR will provide the correct acres to the Contractor prior to invoicing.

10.1.2. Per Thousand Tree Unit of Measure

When the unit of measure is Per Thousand Tree, the actual number of trees planted will be computed based on the trees issued to the Contractor minus trees returned, and verified by the Government's plots conducted for this purpose, using the following formula (reference columns of *Exhibit 09 - Planting Inspection Sheet*) and rounded to the nearest tenth (for example, 4.2 thousand trees).

$$\frac{\left(\text{Total Number of Trees Planted (Column 7)} - \text{Total Wasted Trees (Column 8)}\right)}{\text{Number of Plots}} \; X \; \text{Reciprocal of Plot Size} \; X \; \text{Acres} = \frac{\text{Number of Trees}}{1000}$$

If the difference between the number of trees issued and the number of trees calculated from Government plots is within 10%, the number of trees issued will be used for payment, less any wasted trees. If the difference exceeds 10%, the calculated value from the formula above will be used.

10.1.3. Walk-Ins

Distances will be measured horizontally from the access point to the unit boundary along the route designated by the Government or the route taken by the Contractor, whichever is shorter, and will be rounded to the nearest hundredth of a mile (i.e., 1.55 miles) or the nearest 100 feet, depending on what the parent contract Schedule of Items specify as unit of measure.

10.1.4. Netting or Tubing

When unit of measure is Per Acre, the Contractor will be paid based on the acres indicated in the Detailed Information Chart. When the acres provided are an estimate, it will be labeled as such, and the COR will provide the correct acres to the Contractor prior to invoicing.

When the unit of measure is Per Thousand or Each, the actual number of materials used will be computed based on the quantity issued to the Contractor minus quantity returned, and verified by the Government's plots conducted for this purpose, using the following formula (reference columns of *Exhibit 15 - Artificial Shade/ADC Inspection Sheet*) and rounded to the nearest tenth (for example, 4.2 thousand).

$$\frac{\left(\text{Total number of Trees Requiring ADC} - \text{Total Wasted Material}\right)}{\text{Total number of Plots}} \; X \; \text{Reciprocal of Plot Size} \; X \; \text{Acres} = \text{Quantity}$$

If the difference between the number of materials used and the quantity calculated from Government plots is within 10%, the number of materials used will be used for payment, less any wasted materials. If the difference exceeds 10%, the calculated value from the formula above will be used.

10.2. Remeasurement

The Contractor may at any time after award request re-measurement of any subitem. The request must be in writing within 10 calendar days after completion of a subitem. The Government's re-measurement of the subitem will be made within the established boundaries:

a) Payment will be based on the re-measurement of the acreage or quantity count except when:
   i. Per Acre Unit of Measure: No payment adjustment shall be made for areas less than one acre.
   ii. Per Thousand or Each Unit of Measure: No payment adjustment shall be made for quantities of 500 or less.
b) The Contractor shall pay for the cost of remeasurement if the remeasurement results in:
   i. Per Acre Unit of Measure: An increase of less than one acre on units less than or equal to 20 acres; or an increase of less than five percent on units larger than 20 acres.
   ii. Per Thousand or Each Unit of Measure: An increase of less than five percent.

10.3. Method of Payment

10.3.1. Work Quality

For each completed subitem, the Contractor's quality control inspection percentage for tree planting, shade, or animal damage control will be compared to the Government's assessment results. If the results differ by five percent or less, and the inspection has been conducted to the standards specified, the Contractor's inspection will be considered acceptable, and that quality percentage will be used as the basis for payment. When the results differ by more than five percent, the Government's inspection percentage will be used as the basis for payment.

If the Government's results are objectionable to the Contractor, the Contractor may request a re-examination in writing within five calendar days after receipt of the Government's quality assurance inspection results. The request shall include documentation that supports the probability that an error exists. The Government's re-examination will consist of a two percent sample utilizing the same inspection method as the original examination, but new plots will be selected with different plot centers than the plots previously inspected by the Government. If the results of the re-examination are within five percent of the Contractor's submitted quality control results, the Contractor's results will be considered acceptable and used for payment. If results of the re-examination exceed five percent of the Contractor's submitted quality control results, the Government's re-examination results will be used for payment, and the Contractor will be assessed the costs incurred by the Government that are directly related to the performance of such service. The Government is not required to perform a re-inspection.

No reinspection will occur for subitems utilizing the per person/per hour unit of measure. Any rework will be completed at the Contractor's expense.

10.3.2. Tree Planting Payment Calculation

Payment, less damages, is based on work quality percentages described below.

10.3.2.1. Quality Meets or Exceeds 93 Percent

Whenever the quality of planting meets or exceeds 90 percent, based on the Contractor's quality control inspection (plots) and verified by the Government assessment, the quality of planting will be acceptable, and payment will be made at the full unit price for tree planting.

Payment Example: With a unit price of $100 and a unit size of 60 acres, the bid price would be $6,000. If the Contractor's planting quality was 95 percent, payment would be $6,000.

10.3.2.2. Quality Less Than 93 Percent and At Least 80 Percent

Whenever the quality of planting is below 89 percent but is 80 percent or greater, based on the Contractor's quality control inspection (plots) and verified by the Government assessment, the work is unacceptable, and the value of the services is reduced. Payment will be made after a one percent deduction in the unit price for each one percent the planting quality is below 100 percent. This payment will only be made after the Government determines that no further work shall be required, nor allowed.

Payment Example 1: With a unit price of $100 per acre and a unit size of 60 acres, the bid price would be $6,000. If the planting quality were 85 percent, payment would be $100 x 85% x 60 acres = $5,100.00.

Payment Example 2: With a unit price of $390 per MTR and a quantity of 20 MTR, the bid price would be $7,800. If the planting quality were 85 percent, payment would be $390 x 85% x 20 MTR = $6,630.

10.3.2.3. Quality Less Than 80 Percent

Whenever the quality of planting is below 80 percent, based on the Contractor's quality control inspection (plots) and verified by the Government assessment, the work is unacceptable, and the value of the services is reduced. Payment will be made after a one percent deduction in the unit price for each one percent the planting quality is below 100 percent. This payment will only be made after the Government determines that no further work shall be required, nor allowed.

In addition to the quality percentage deduction, the contractor will be assessed liquidated damages for inappropriately planted trees using the following formula. Liquidated damages will be considered equivalent to wasted trees.

(100% - Planting Quality Percentage) *X* Total Trees Planted *X* Cost per Tree = Liquidated Damages

Liquidated Damages Calculation Example: If the planting quality were 70 percent in a unit planted with 10,000 trees and the value of those trees was $0.70 per seedling, the liquidated damages would be 30% X 10,000 X $0.70 = $2,100.

Final Payment Example: With a unit price of $100 per acre and a unit size of 60 acres, the bid price would be $6,000. If the planting quality were 70 percent, the quality percentage payment would be $100 x 70% x 60 acres = $4,200.00, less liquidated damages of $2,100 for a total final payment of $2,100.

If the final payment goes below zero, the contractor will be paid a fee equivalent to the cost of travel to the town closest to the planting unit plus the cost of lodging and meals/incidental expenses for the planting crew. Copies of the Contractor's lodging receipts will be required to justify payment. All meals and incidental expense calculations will be derived from rates found on the Per diem rates | GSA website and calculated per worker assigned to the project.

10.3.3. Netting or Tubing Payment Calculation

Payment, less damages, will be based on work quality percentages described below.

10.3.3.1. Quality Meets or Exceeds 90 Percent

Whenever the quality of artificial shade or ADC treatments meets or exceeds 93 percent, based on the Contractor's quality control inspection (plots) and verified by the Government assessment, the quality of planting will be acceptable, and payment will be made at the full unit price for artificial shade or ADC.

Payment Example: With a unit price of $30 per thousand and 60.0 thousand trees tubed or protected, the bid price would be $1,800. If the Contractor's quality were 95 percent, payment would be $1,800.

10.3.3.2. Quality Less Than 93 Percent and At Least 80 Percent

Whenever the quality of artificial shade or ADC treatments is below 89 percent but is 80 percent or over, based on the Contractor's quality control inspection (plots) and verified by the Government assessment, the work is unacceptable, and the value of the services is reduced. Payment will be made after a one percent deduction in the unit price for each one percent the shading or ADC quality is below 100 percent. This payment will only be made after the Government determines that no further work shall be required, nor allowed.

Payment Example: With a unit price of $30 per thousand and 60 thousand trees to be treated, the bid price would be $1,800. If the quality were 85 percent, payment would be $30 x 85% x 60 thousand trees = $1,530.

10.3.3.3. Quality Less Than 80 Percent

Whenever the quality of artificial shade/ADC treatment is below 80 percent, based on the Contractor's quality control inspection (plots) and verified by the Government assessment, the quality of artificial shade/ADC treatments will be considered unacceptable. No payment will be made where quality of work is below 80 percent. Contractor would have the option to rework to attain quality above 80 percent.

10.4. Unacceptable Work

When the Contractor delivers work determined to be unacceptable, the Government may:

- Accept the work at a reduced price;
- Require the area to be reworked at no additional expense to the Government; or
- Reject the work in its entirety. The Contractor's right to proceed may be subject to immediate termination for default.

The Government will permit the Contractor to rework an area only if planting stock or other material is available and/or the existing deficiencies can be corrected. Rework will not be allowed with the per person/per hour unit of measure.

When planting, shade, or ADC treatment quality is considered unacceptable for areas one acre or larger and the quality of work can be corrected, the Government may require the area to be reworked. If the Government does not require the area to be reworked or the quality remains below 80 percent, the area may be separated from the sub item and payment made in accordance with *Section 10.3* as applicable.

Any Government quality assurance assessment needed due to the Contractor reworking an area, either at the Contractor's request or because of unacceptable work, will be at the Contractor's expense. The Contractor may be assessed actual damages which include but are not limited to: wages of the COR and GTM(s) incurred due to the rework; costs of vehicles; and meals and lodging that are incurred during contract administration of the rework.

The Government shall document unacceptable work quality in the performance assessment.

10.5. Damages

10.5.1. Liquidated Damages

Liquidated damages will be assessed as described in *Section 10.3*.

The Contractor shall not be charged for liquidated damages when the unsatisfactory quality of planting arises out of causes beyond the control and without the fault or negligence of the Contractor.

Alternatively, if quality of planting or treatment quality falls below 80 percent and is not corrected, the Government may terminate a work item in whole or in part and, in that event, the Contractor will be liable for fixed and agreed liquidated damages on all subitems planted where the planting or treatment quality is less than acceptable. In addition to

liquidated damages charged for subunits planted or treated where the quality is less than acceptable, the Contractor may be assessed actual damages for the remaining subunits that have not been planted or treated on but that have been terminated.

10.5.2. Actual Damages

In addition to liquidated damages charged for subunits planted or treated where the quality is less than acceptable, the Contractor may be assessed actual damages for the remaining subunits that have not been planted or treated if the work item has been terminated.

If the Contractor wastes seedlings or materials at a rate that will not allow the planting or treatment of an entire subitem, the unplanted or untreated areas may be deleted from the work item through a partial default termination. In this event, the Contractor shall be liable for damages suffered by the Government to plant or treat the defaulted subitems whenever additional seedlings or materials become available. In addition, the estimated cost of damages may be withheld from the Contractor's earnings.

10.5.3. Excess Trees

Trees that are tallied on the Plot Inspection Sheet (*Exhibit 09*) that exceed the maximum allowable trees to be planted (Column 8) are considered wasted trees. If the Contractor's inspection has a planting quality within five percent of the Government's inspection and has a wasted tree total that is within 50% of the Government's total, the Contractor's inspection shall be used to calculate wasted trees. If the Contractor's inspection has a wasted tree total that is not within 50% of the Government's, the Government's inspection shall be used to calculate wasted trees. The total of all wasted trees on the payment unit (tallied by plot), will be used to determine the wasted tree charge for excess trees planted on the sub item based on the following formula:

$$\frac{\text{Sum of Wasted Trees on Plots (Column 8)}}{\text{Number of Plots Taken}} \; X \; \text{Reciprocal of Plot Size} \; X \; \text{Acres} \; X \; \text{Charge Rate Per Tree} = \text{Wasted Tree Charge}$$

The CO may waive the wasted tree charge for excess trees planted if it is minor in nature. In no case will a waiver be given if the total Planted Trees (Column 7) on all inspection plots for the subitem exceeds the Maximum Number Allowable Trees (Column 6) for the sub item.

10.5.4. Mishandled Trees

If the Contractor mishandles trees in such a way that it results in actual or potential damage to the tree(s) (reference *Section 4.2*), the trees will be considered wasted. This includes trees that are stashed, dropped, or damaged by the Contractor while the trees are in the Contractor's possession which may occur at the dipping site or the planting site. Charge for individual trees that are mishandled is as follows:

$$\text{Number of Wasted Trees} \; X \; \text{Charge Rate Per Tree} = \text{Wasted Tree Charge}$$

When wasted trees are found and the damage is considered minor in nature, the CO may waive the wasted tree charge.

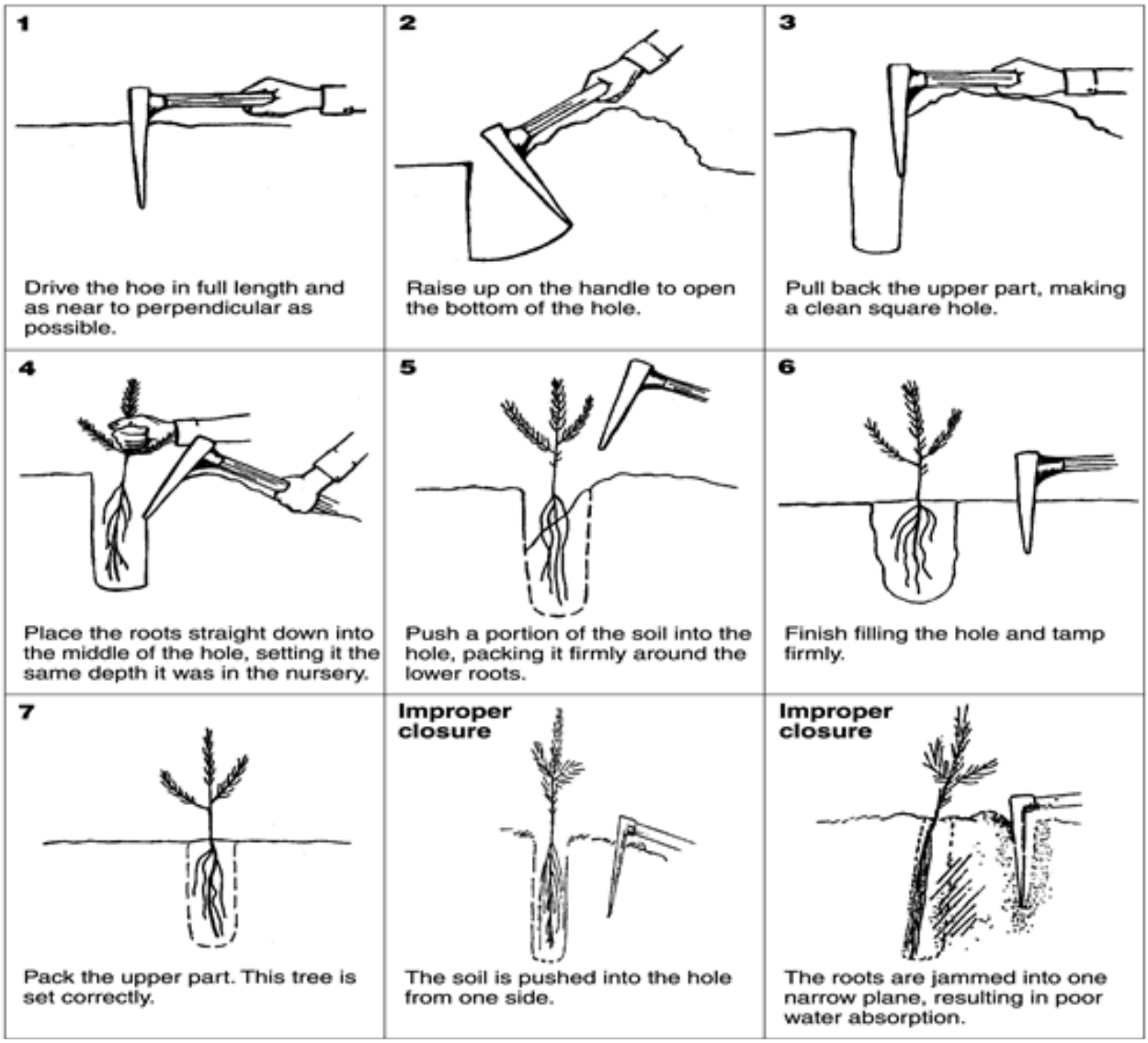
10.5.5. Charge Rates

The charge for wasted trees or materials and other Government-furnished property that is not returned, or returned in a non-usable condition, is listed in the following table:

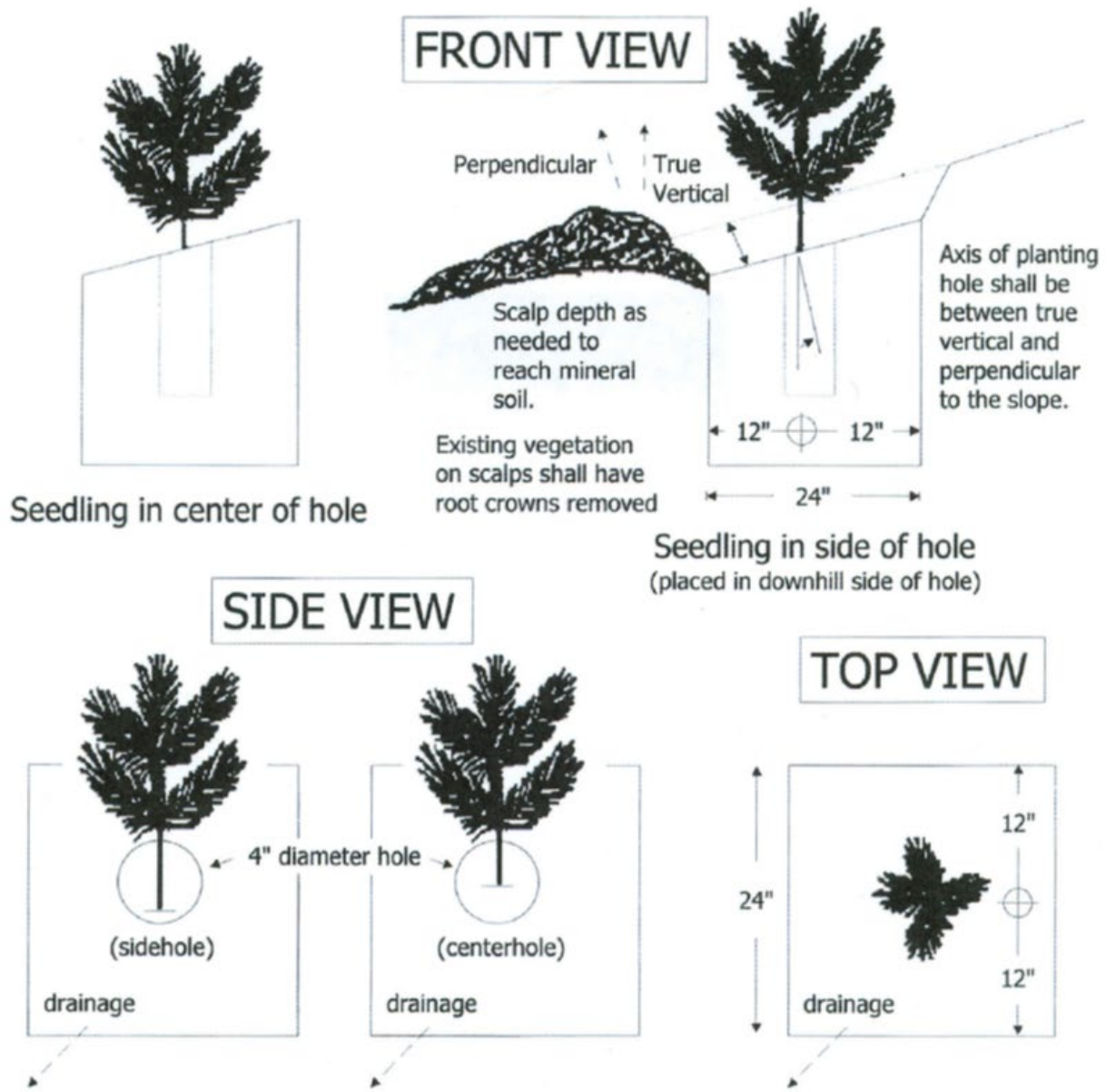
Item	Unit of Measure	Charge Rate ($)
Bareroot: 2-0	Each	$0.58
Container: 112	Each	$0.66
Container: 112L	Each	$0.76
Rigid Netting	Each	$0.29 - $0.71
Plastic Zipties	Each	$0.05
Bamboo Stakes	Each	$0.12 - $0.60
Shade Tubes	Each	$1.15 - $2.50
Flexible Netting	Each	$0.10

- Exhibit 03 – Planting Procedures
- Hoe planting Procedures

Procedure When Planting With a Hoe

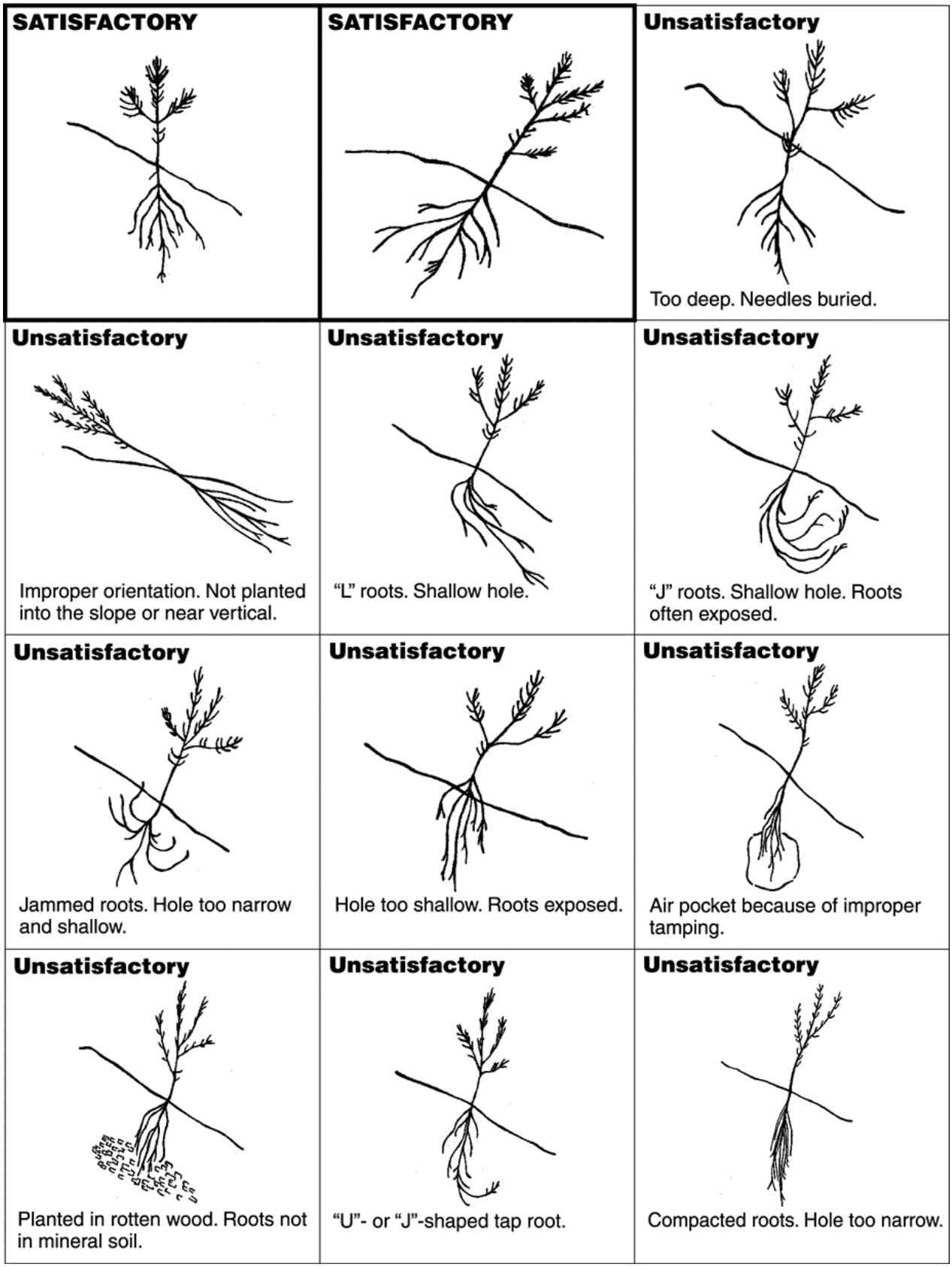


- Exhibit 04 - Hand Site Preparation Diagram

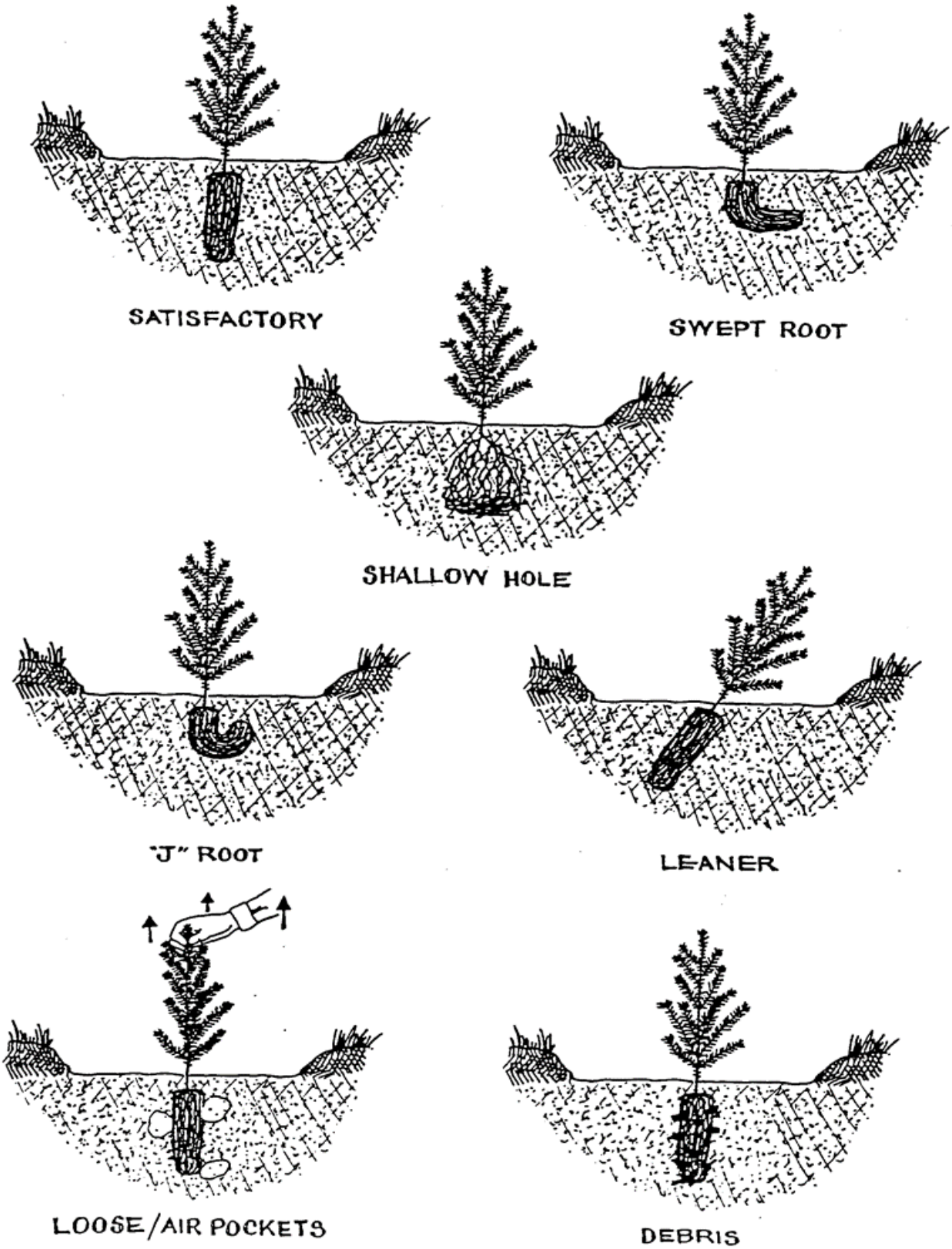


- Exhibit 05 – Satisfactory and Unsatisfactory Plantings

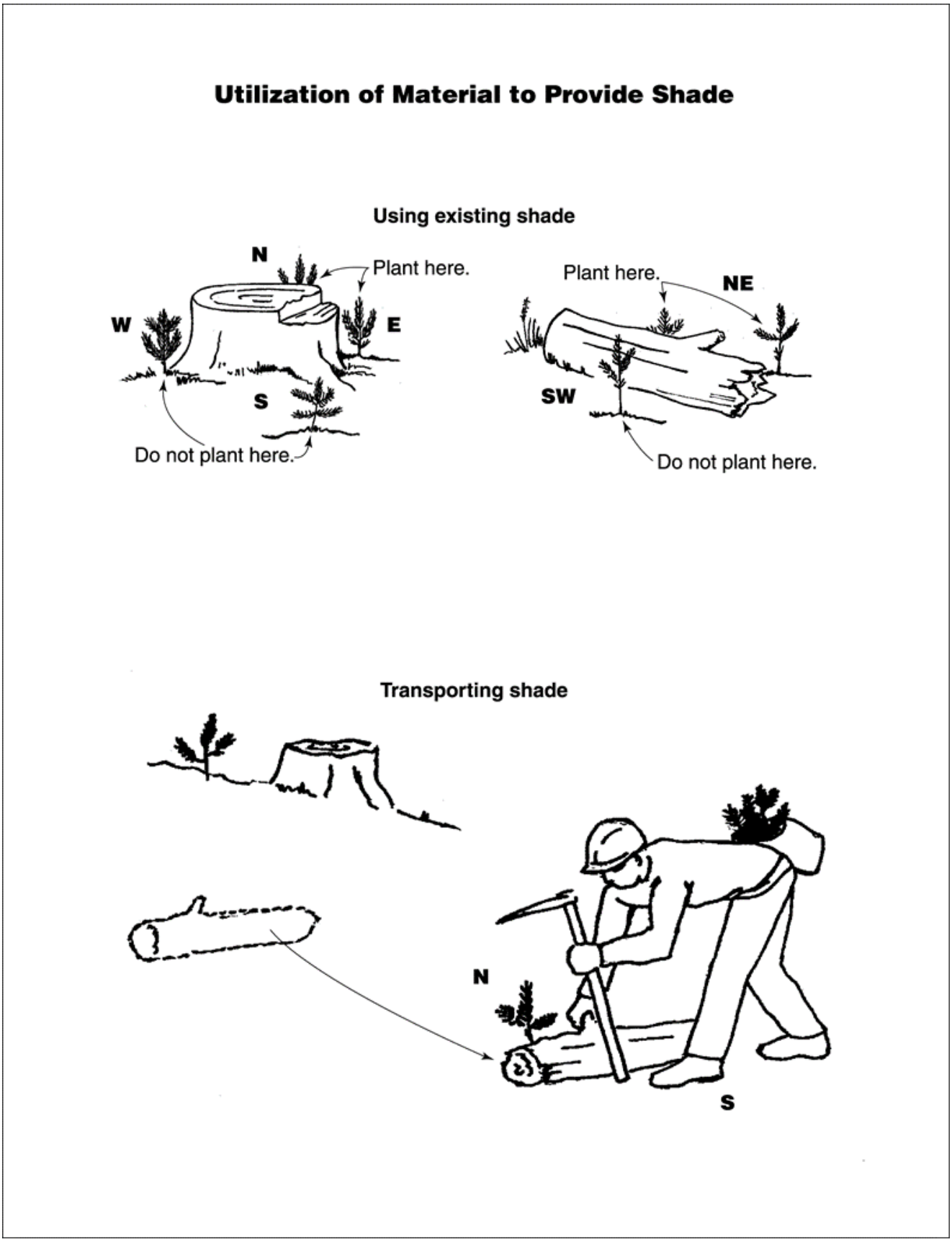
Satisfactory and Unsatisfactory Plantings



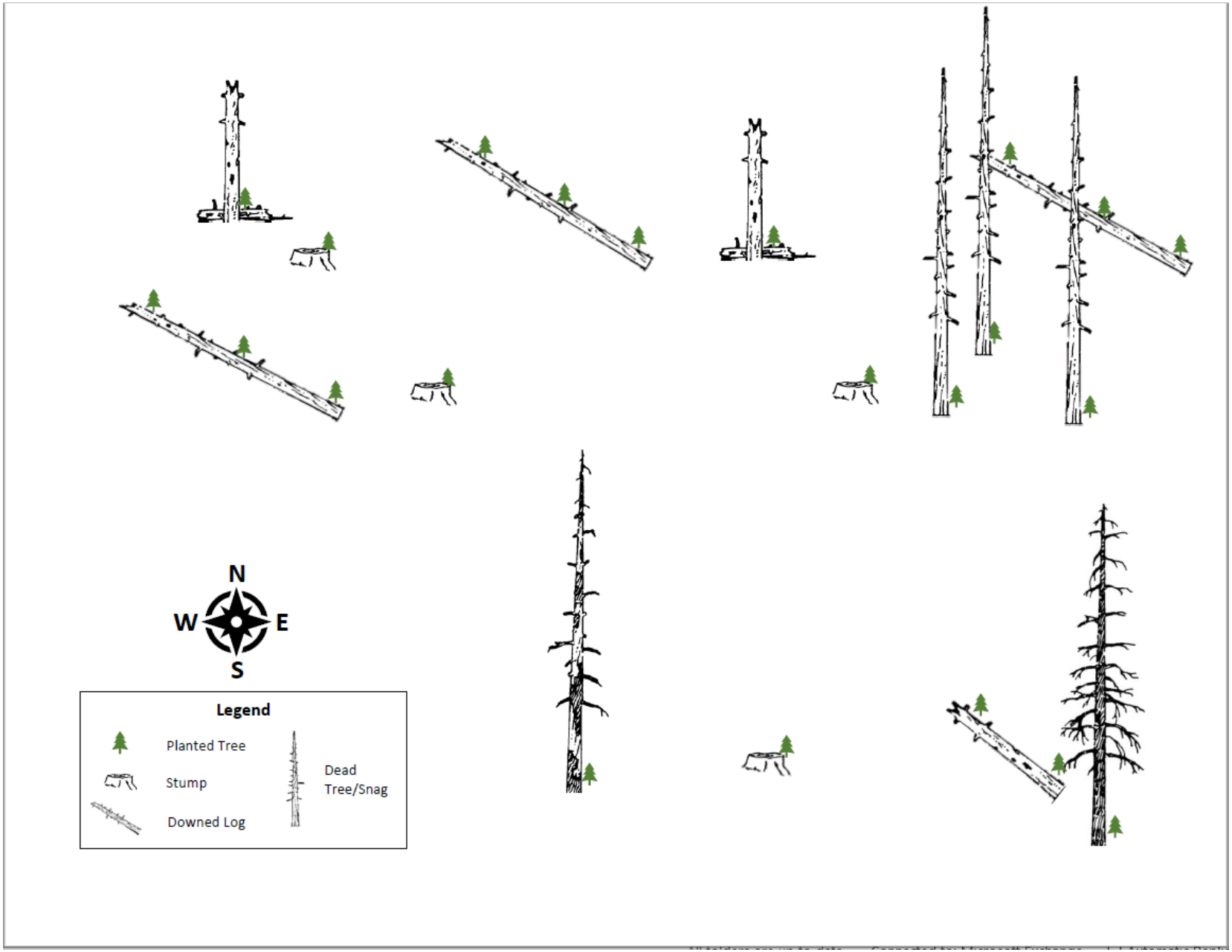
Container Seedling Placement



- Exhibit 06 - Utilization of Material to Provide Shade



- Exhibit 07 – Shade Requirements – Microsite Only Example



- Exhibit 08 – Netting Installation Examples
- Flexible Netting Example

Figure 1

1. Slip the length of netting over the hand as shown in Figure 1

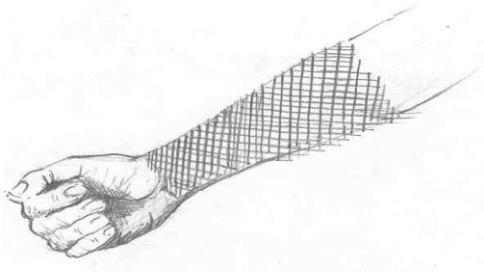


Figure 2

2. Gently enclose the top whorl(s) of lateral branches and the terminal leader of the tree be treated with the hand-off of the netted arm, as shown in Figure 2. Use free hand to slip the netting off of the arm and hand over the tree and hold in place while gently removing the other hand from the netting material.

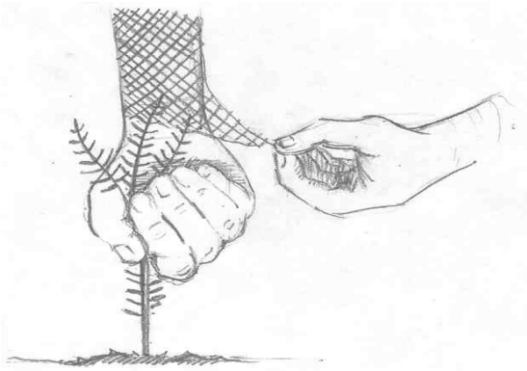
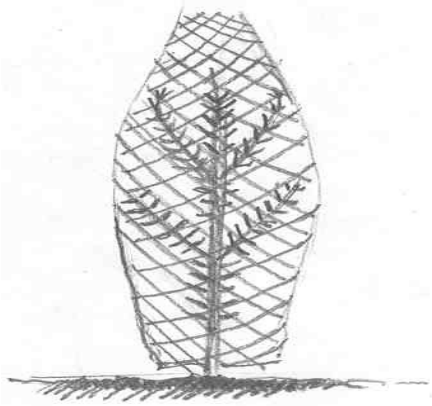


Figure 3

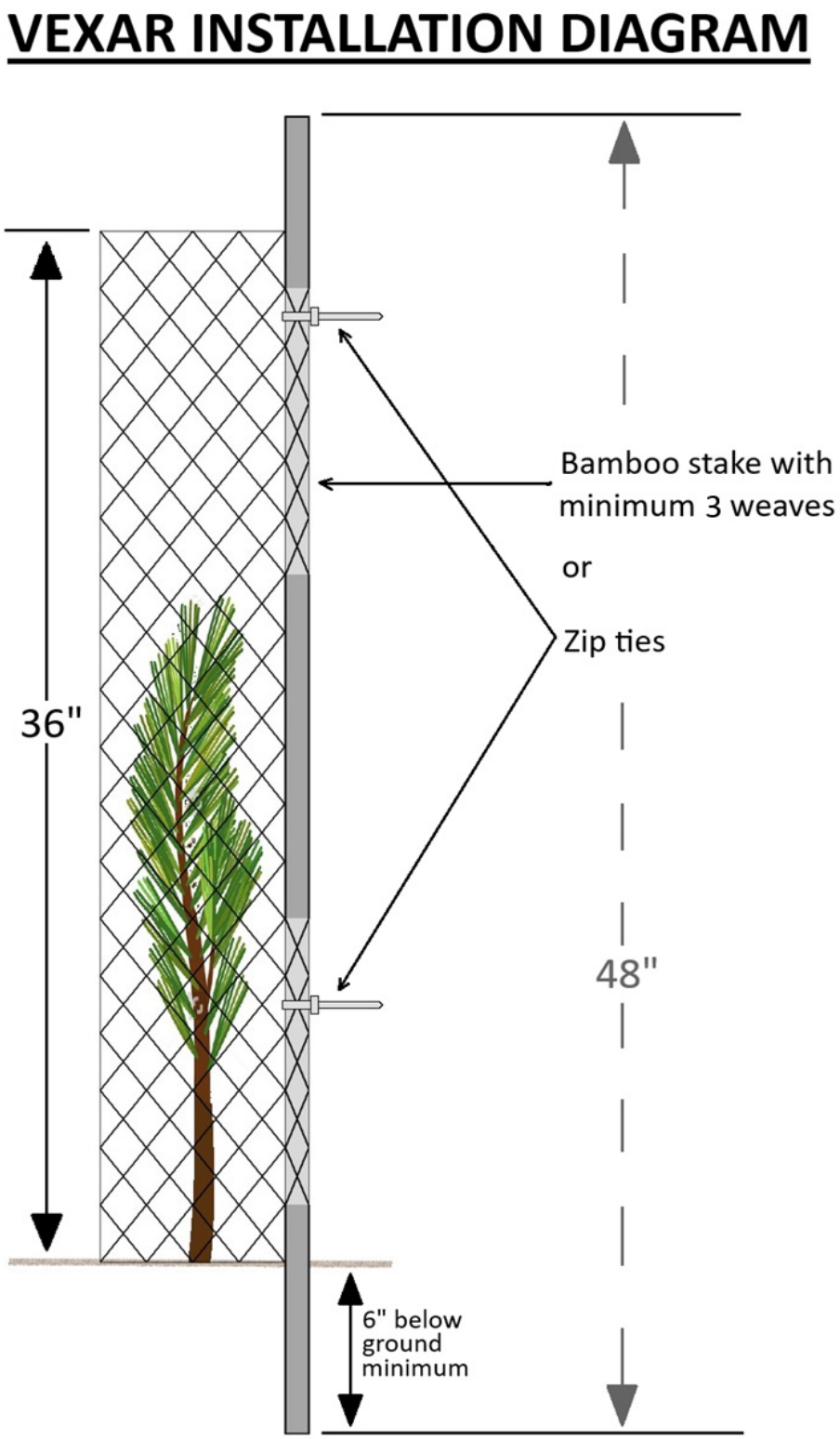
3. Pull the netting upward until 1 - 2 inches of the material is above the terminal bud as shown in Figure 3. Using care not to vertically move the installed tubing, spread the top of the tubing 3 or 4 inches to allow the terminal leader free growth without entanglement. Seat the tube on the tree by manually closing the tube around the base to ensure that the lateral branch needles will protrude through the tube and help anchor net to the tree. Needles of the terminal leader may also help anchor netting. It may be necessary to turn up long tubes from the bottom to keep final installation within the allowable variations.

4. The final treatment should appear similar to Figure 3.



- Rigid Vexar Tubing Example

This example uses a four-inch diameter Vexar tube, 36” tall, with a minimum of three bamboo weaves through tubing or secured with zip ties. Task order Detailed Information Charts will provide tube sizes and specific installation requirements.



- Exhibit 09 - Planting Inspection Sheet

PLANTING INSPECTION SHEET (R-1 FS-2470-9)

FOREST	DISTRICT	INSPECTOR	CONTRACT/TASK ORDER NUMBERS

COR	PLOT SIZE	STAND NUMBER	CONTRACTOR	SUB ITEM NUMBER
ACRES	AVERAGE SPACING	MAX TREES/ PLOT		SHEET NUMBER _____OF _____

DATE	Plot No.	(2) Examine & Tally Planted Trees*											(3) Desired No. of Plantable Spots	(4) No. Unplantable Spots	(5) Actual No. Plantable Spots	(6) Maximum No. Allowable Trees	(7) No. Planted Trees	(8) No. Wasted Trees	(9) No. Trees Statis. Above Ground	(10) No. Trees Dug	(11) No. Trees Statis. Below Ground	Remarks
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)										

- ## Exhibit 10 – Planting Inspection Instructions

Instructions (Side 2 of Planting Inspection Sheet)

1. Locate and mark the plot center on the ground.
2. Locate and examine planted trees for above ground criteria. Record results in top row of Column 2 of Inspection Sheet.

Above Ground

Ö	Satisfactory tree	C	Scalping, clearing, or planting spot preparation violation
S	Spacing violation	W	Wrong species
P	Planting spot selection violation	T	Cull tree
X	Shade violation or protection violation	H	Auxiliary/Attempted planting hole
D	Planting depth or exposed root violation	Z	Missed planting hole violation (Auger Planting)
A	Stem position violation (improper angle) or stem damage	E	Existing acceptable seedling/tree violation
F	Firmness violation (tree improperly tamped or loose)		

3. Determine from Table 1 the average number of desired plantable spots for the plot based on the specified average spacing. Record results in Column 3.
4. Determine and record in Column 4 the number of spots void of planted trees that are unplantable due to acceptable existing natural regeneration or on-the-ground conditions.
5. Subtract Column 4 from the average number of desired planting spots (Column 3) and record the difference as the actual number of plantable spots on which trees should be planted on the plot in Column 5.
6. Determine the maximum number of allowable trees from Table 2 and record in Column 6.
7. Record the number of trees planted on the plot from Column 2 in Column 7.
8. Determine wasted trees by subtracting the maximum number of allowable trees (Column 6) from those planted (Column 7) and if more than zero, record in Column 8.
9. Record the number of planted trees meeting the above-ground contract specifications from Column 2 in Column 9. The maximum number of satisfactory trees to be credited shall not exceed the maximum number allowable recorded in Column 6.
10. Determine and dig at least the minimum number of trees from those determined satisfactory above ground in accordance with Table 3 and record in Column 10. Dig trees starting with those closest to the plot center and progressing outwards.
11. Tabulate below-ground results in the bottom row of Column 2 and record the number of trees meeting below-ground contract specifications in Column 11.

Below Ground

Ö	Satisfactory tree	F	Firmness violation (air pockets, tree improperly tamped, loose)
R	Root configuration violation	L	Altered root length violation or Damaged roots
M	Foreign material in planting hole	O	Planting hole orientation violation

12. After all plots have been taken and recorded, record the sum of each column at bottom of sheet and calculate the planting quality using the following formula. Record the final quality percentage, and complete the form with your signature, title, and date of final inspection results.

Planting Quality Percent

$$\frac{\text{Number of Satisfactory Trees Above Ground (Column 9)}}{\text{Number of Plantable Spots (Column 5)}} \times \frac{\text{Number of Satisfactory Trees Below Ground (Column 11)}}{\text{Number of Dug Trees (Column 10)}} \times 100$$

Tables: *Portion of Relevant Tables from Planting Inspection Method. For complete Tables, see Planting Inspection Method.*

Table 1: Avg. No. Plantable Spots

Spacing	1/50th ac	1/100th ac
10x10	9	4
11x11	7	4
12x12	6	3
13x13	5	3
14x14	4	2

Table 2: Max. Allowable Trees

# Plantable Spots	Max. Trees	# Plantable Spots	Max. Trees
1	2	6	7
2	3	7	8
3	4	8	10
4	5	9	11

Table 3: Min. Trees to Dig

No. of Satis. Trees	Min. No. of Trees to Dig
1	1
2-6	2
7-9	3

15x15	4	2	5	6	10	12

- ## Exhibit 11 – Planting Inspection Method

Planting contracts require intensive inspection. The quality control plan shall be consistent with the following procedures. There are two phases of contract inspection: (1) observing tree handling, dipping procedures, wasting of trees, and planting technique while planting is in progress, and (2) plot inspection where the inspector checks quality of planting using systematically placed plots.

Inspecting for Planting Quality. The primary factor in determining the contractor's payment is the plot inspection. Use the following process and standard inspection form (R-1 FS-2470-9; *Exhibit 09*). Variations to this may be done only with the approval of the Contracting Officer's Representative (COR). The inspector shall sign the inspection form and initial any changes. All inspectors should fully understand the inspection forms and procedures for completing the inspection.

- ### Suggested Equipment
  - Clipboard, pencils, and permanent marker
  - Inspection sheets
  - Full contract (with exhibits) and task orders, or knowledge of unit requirements
  - Fifty-foot logger's tape.
  - Plot pole or shovel with swivel on handle to attach the tape.
  - Flagging
  - Screwdriver, ice-pick, or garden trowels that aid in below ground inspection
  - Tile spade, hog nose spade, planting hoe for hoe planting
  - Slope correction table (see *Plot Design* section below)
  - Clinometer or Abney.
- ### Plot Design

Install a series of 1/20th, 1/50th, or 1/100th-acre inspection plots, with plot size dependent on task order Detailed Information Chart specifications. In general, narrower spacings should use the 1/50th or 1/100th acre plot. Wider spacings should use the 1/20th or 1/50th acre plots.

Sampling intensity and plot distributions are described in *PWS Section 08.*

Plot radius will vary depending on slope. After determining slope percent and adjusting for slope using the slope correction table below, determine the plot radii to provide the necessary plot size. Use this radius for the full plot. Do not compensate by changing radii or raising or lowering the tape when going around the plot. Such adjustments have already been compensated for.

Slope Correction Table

	Plot Size in Acres				Plot Size in Acres				Plot Size in Acres		
Slope %	**1/100**	**1/50**	**1/20**	**Slope %**	**1/100**	**1/50**	**1/20**	**Slope %**	**1/100**	**1/50**	**1/20**
0	11.8	16.7	26.3	56	12.6	17.8	28.2	88	13.6	19.2	30.4
5	11.8	16.7	26.3	58	12.7	17.9	28.4	90	13.7	19.3	30.6
10	11.8	16.7	26.5	60	12.7	18.0	28.5	92	13.7	19.4	30.7
15	11.8	16.7	26.5	62	12.8	18.1	28.6	94	13.8	19.5	30.8
20	11.9	16.8	26.6	64	12.8	18.1	28.7	96	13.9	19.6	31.0
25	12.0	16.9	26.7	66	12.9	18.2	28.8	98	13.9	19.7	31.2
30	12.1	17.0	26.9	68	12.9	18.3	29.0	100	14.0	19.8	31.3
35	12.1	17.1	27.1	70	13.0	18.4	29.1	102	14.1	19.9	31.5
40	12.2	17.3	27.4	72	13.1	18.6	29.2	104	14.1	20.0	31.6
42	12.3	17.3	27.4	74	13.1	18.6	29.3	106	14.2	20.1	31.8
44	12.3	17.4	27.5	76	13.2	18.7	29.6	108	14.3	20.2	31.9
46	12.4	17.5	27.6	78	13.3	18.8	29.7	110	14.4	20.3	32.1

Slope Correction Table

	Plot Size in Acres				Plot Size in Acres				Plot Size in Acres		
Slope %	**1/100**	**1/50**	**1/20**	**Slope %**	**1/100**	**1/50**	**1/20**	**Slope %**	**1/100**	**1/50**	**1/20**
48	12.4	17.5	27.7	80	13.3	18.8	29.8	112	14.4	20.4	32.2
50	12.5	17.6	27.9	82	13.4	18.9	29.9	114	14.5	20.5	32.5
52	12.5	17.7	28.0	84	13.5	19.1	30.1	116	14.6	20.6	32.6
54	12.6	17.8	28.1	86	13.5	19.1	30.3	118	14.6	20.7	32.7

- Above Ground Inspection

Inspect and record the ***above ground*** condition of each tree. Working in a clockwise direction from true north, locate, examine, and record the condition of planted trees in spaces under Column 2 of the inspection form. Use codes listed below. A poorly planted tree may have more than one violation; however, only one code may be listed. Identify the most severe. Refer to *PWS Section 4.4* for reference specifications.

√ Satisfactory tree above ground.

- **S** - Spacing violation. A tree that has been planted closer than one-half the distance to the next plantable spot is a violation unless otherwise stated in the contract or task order. For example, if the spacing is 10 feet by 10 feet and there is a 50% variance to select the best planting spot, and a planted tree is closer than 5 feet to another planted tree, one tree is in violation for spacing. If one of the trees is improperly planted due to another reason, charge the spacing violation to the improperly planted tree and check the remaining good tree as properly planted.
- **P** - Planting spot violation. Tree planted in debris, loose soil, duff, ashes, or similar material. Improper planting spot selection based on microsite or shade preference.
- **X** - Shade or protection violation. Shade or seedling protection is not consistent with specifications for the unit.
- **D** - Planting depth or exposed root violation**.** Tree planted too deep or shallow.
- **A** - Stem position (improper angle) or stem damage violation. The stem should be oriented between vertical and 90 degrees with the slope plane. Improper angle may result from improper hole opening with hoes. If the tree looks erect above ground but is slanted below ground, then a below ground violation instead should be cited. Any planter-caused stem damage that could cause tree mortality should be recorded here.
- **F** – Firmness violation. Trees should be tamped as firmly as soil conditions allow. Trees should not pull easily from soil. The inspector may gently tug on the stem. If tree comes up to expose roots (below the root collar), then the tree was not firmed up and is in violation. This test must be used with caution in very light or sandy soils.
- **C** - Scalping, clearing, or planting spot preparation violation. Scalp or cleared area is too small or too shallow. Spot was not properly prepared.
- **W** - Wrong (incorrect) species. Species planted in area of unit where it is not supposed to be.
- **T** - Cull trees. Cull tree is planted. Use when the contract specifies that the contractor shall not plant trees that do not meet specific size ranges or tree quality.
- **H** – Auxiliary/Attempted hole violation. Additional hole or auxiliary hole is not filled in or collapsed.
- **Z** – Missed planting hole violation (Auger Planting). Tree not planted in plantable spots when a satisfactory hole was dug.
- **E -** Existing acceptable seedling/tree violation. Tree planted too close to existing acceptable seedlings or trees.

Determine the average number of planting spots from Table 1 and record results in Column 3 of the inspection form.

Table 1 – Average Number of Plantable Spots

Spacing	1/20th Acre Plot	1/50th Acre Plot	1/100th Acre Plot
5 x 5	87	35	17
6 x 6	61	24	12
7 x 7	44	18	9
8 x 8	34	14	7
9 x 9	27	11	5
10 x 10	22	9	4
11 x 11	18	7	4
12 x 12	15	6	3
13 x 13	13	5	3
14 x 14	11	4	2
15 x 15	10	4	2
16 x 16	9	3	2
17 x 17	8	3	2
18 x 18	7	3	1
19 x 19	6	2	1
20 x 20	5	2	1

Determine the number of unplantable spots. After determining the average number of planting spots on the plot, scan the plot for areas void of planted trees. Look for voids the planters missed. Then check the voids to see if it is an unplantable spot due to ground conditions or acceptable established seedlings or trees. Record the number of unplantable spots in Column 4.

An unplantable spot as defined by the contract is an area within the specified spacing limits in which it is not possible to plant a tree according to specifications, and no tree has been planted (refer to *PWS Sections 2.0 – Definitions and 4.4.2*). For example, if a single unplantable area of 64 square feet exists on an 8-by 8 foot spacing, one unplantable spot is recognized. When a tree has been planted, the contractor, by default, has determined it to be a plantable spot. In terms of the inspection, the spot with a planted tree is a plantable spot no matter what the inspector finds after the fact.

Determine the number of planting spots by subtracting Column 4 from the average number of planting spots (Column 3). Record the result in Column 5 of the inspection form.

Determine the maximum number of allowable trees from Table 2, and record in Column 6 of the inspection form.

Table 2 - Maximum Allowable Trees Based on Number of Plantable Spots (as determined from Table 1)

Plantable Spots	Maximum Trees	Plantable Spots	Maximum Trees	Plantable Spots	Maximum Trees
1	2	9	11	16	19
2	3	10	12	17	20
3	4	11	13	18	22
4	5	12	14	19	23
5	6	13	16	20	24
6	7	14	17	21	25
7	8	15	18	22	26
8	10				

Record the number of trees planted on the plot (also listed in Column 2) in Column 7 of the inspection form.

Determine wasted trees by subtracting the maximum number of allowable trees in Column 6 from those planted (Column 7). If more than 0, record in Column 8.

Record in Column 9 the number of planted trees meeting above ground specifications from Column 2, only up to the maximum listed in Column 6 of the inspection form.

- Below Ground Inspection

Determine the minimum number of trees to be inspected below ground utilizing Table 3, based on number of trees that are satisfactory above ground (Column 9). Record the result in Column 10 of the inspection form. To avoid bias, dig trees nearest plot center first and progress outward. Do not dig any trees that were unsatisfactory in the above ground inspection. Correctly replant sampled trees immediately. Use moist mineral soil to pack roots.

Table 3 - Minimum Number of Trees to Dig

Number of Above-Ground Satis. Planted Trees (Column 9)	Minimum Number of Trees to Dig*
1	1
2-6	2
7-9	3
10-12	4
13-16	5
17 +	6

**Note: This is a minimum. The inspector may dig more trees than the minimum needed per plot.*

Inspect and record the below-ground condition of each planted tree in spaces in bottom row of Column 2 on the inspection form using appropriate codes listed below. Record the number of trees meeting below-ground specification in Column 11. Refer to *PWS Section 4.4* for reference specifications.

√ **Satisfactory** Tree Below Ground.

- **R** - Root Configuration Violation. Root systems must not be twisted, jammed in one plane, or curved in the shape of the letters U, J, or L. Individual lateral roots may be slightly bent like the letters J or U but the primary vertical root system cannot be distorted. Container plug must not be jammed from the top (accordion effect) or the side (flattened).
  To inspect for this violation, dig a rectangular shaped hole on one side of the tree. Start the hole far enough away from the tree stem (5 - 10 inches away) so that roots are not disturbed in the process of inserting the spade. This is best done with a tool like a tile spade. Once the primary hole is dug, probe toward the root system with a pointed instrument such as a screwdriver, ice pick, or similar tool to explore the seedling roots for orientation.
- **M** - Foreign Material in Planting Hole Violation. Holes must not contain large rocks, sticks, litter, cones, or other foreign debris. Inspect the same as described for root configuration. In hoe planting, if rocks, roots, and pieces of wood are present in soil prior to opening the hole, they are not considered foreign material to the hole.
- **F** - Firmness Violation. Firmness, as determined from below ground, is done while probing the root system as described under root configuration. Soil should be nearly as firm as the undisturbed surrounding soil. There should be no air pockets where the soil is not firm. Firmness may be a problem in the bottom of auger holes if planters have not firmed soil progressively upward.
- **L** - Altered Root Length Violation or Damaged Roots. If the dug tree has an obviously shortened root system, consider it as an improperly planted tree below ground. The contract shall state a minimum root length; trees with substandard roots should not be planted and considered a violation if they are planted.
  Fresh root cuts can often be distinguished from roots cut at the nursery or during tree preparation. Living inner tissue of roots cut in advance of planting should be brown at the cut. The brown color may extend up the root

under the bark for a short distance. Freshly cut roots will be white under the bark unless roots are dead when cut. Root shortening violations can also be detected during inspection while work is in progress.

- **O** - Planting Hole Orientation Violation. This violation is seldom observed in absence of above ground stem angle or root configuration violations. Occasionally, trees with small root systems can be propped up following slit planting. Roots may not be distorted and angle looks okay from above ground, but hole is not properly opened. Examples would be a V-shaped hole or a hole not vertical with slope plane.

- Planting Quality Percent

After all plots have been taken and recorded for the pay or sub item, calculate the planting quality using the following formula:

$$\frac{\text{Number of Satisfactory Trees Above Ground (Column 9)}}{\text{Number of Plantable Spots (Column 5)}} \times \frac{\text{Number of Satisfactory Trees Below Ground (Column 11)}}{\text{Number of Dug Trees (Column 10)}} \times 100$$

Record the final planting quality percent on the inspection form and sign with signature, title, and date of the final inspection results.

- Exhibit 12 - Sample Planting Inspection and Explanatory Notes

Sample Planting Inspection Sheet

FOREST	DISTRICT	INSPECTOR	CONTRACT/TASK ORDER NUMBERS
Kootenai	**Cascade**	**R. Needles**	**1284LL21D0001/12363N24F4059**

COR	PLOT SIZE	STAND NUMBER	CONTRACTOR	SUB ITEM NUMBER
P. Greenup	**1/50th ac**	**20003001**	**TreesRUs, Inc**	**3.1**

ACRES	AVERAGE SPACING	MAX TREES/ PLOT		SHEET NUMBER
20	**12x12**	**7**		**1 OF 1**

DATE	Plot No.	(2) Examine & Tally Planted Trees* (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(3) Desired No. of Plantable Spots	(4) No. Unplantable Spots	(5) Actual No. Plantable Spots	(6) Maximum No. Allowable Trees	(7) No. Planted Trees	(8) No. Wasted Trees	(9) No. Trees Statis. AboveGround	(10) No. Trees Dug	(11) No.Trees Statis. Below Ground	Remarks
5/1	1	C	√	√	√	√	√						6	0	6	7	6	0	5			Small scalp
			√		√															2	2	
	2	√	√	√	√	√	√	√					6	1	5	6	7	1	6			Unplantable: Rock
		√			M															2	1	Rotten wood in hole
	3	√	X	√	√	√							6	0	6	7	5	0	4			Did not shade by stump
				√	√															2	2	
	4	√	√	√	√	√	S	√					6	2	4	5	7	2	5			Seedlings too close, natural WL
		√	√																	2	2	
	5	√	√	√	√	√	√	√					6	0	6	7	7	0	7			
			√		F		√													3	2	Air pocket
	6	√	√	X	√	√	D						6	0	6	7	6	0	4			No shade; shallow planted tree
			√		√															2	2	
	7	√	√	√	√	√	√	√					6	0	6	7	7	0	7			
		√		√		√														3	3	
	8	√	√	√	√	√	√	√					6	1	5	6	7	1	6			Standing water
			√			√														2	2	
	9	√	√	√	√	√	√	√	√				6	0	6	7	8	1	7			
				√		L	√													3	2	Roots were trimmed
	10	√	√	√	√								6	3	3	4	4	0	4			Acceptable established trees on plot
			√		√															2	2	
*First line for above ground. Second line for below ground.							TOTALS						60	7	53	63	64	5	55	23	20	**FINAL %** = 90%

Calculation*: Col 9 / Col. 5 x Col. 11 / Col. 10 x 100 = 55 / 53 x 20 / 23 x 100 = 90.235 Wasted trees on plots = 5*

Submitted by Rob Needles, Inspector. 5/2/2003 All information is correct and complete.

SAMPLE PLANTING INSPECTION SHEET EXPLANATORY NOTES

Note that the Contractor filled out the Inspection Sheet header completely. The Forest, District, Contract Number, COR, Stand Number, Sub Item, Acres, and Avg. spacing are information provided by the Government either directly or within the contract.

The Contractor provided the name of the (Contractor) Inspector, plot size, max trees/plot (based on contract tables), sheet number, and calculated the final quality. The Contractor assured that all columns and math were correctly done. The Contractor's inspector signed and dated the inspection records and certified that the information was correct and accurate.

Based on the sample Inspection Sheet, the plot information was completed based on these observations:

Plot 1: Six trees were planted on the plot. The first tree did not have the required scalp width and received a C for scalping/clearing violation. Other trees were satisfactory above ground. There were no voids on the plot greater than 144 sq. feet (12 x 12 spacing), so "0" unplantable spots are recorded. The inspector dug two trees, which is the minimum number based on 5 satisfactory trees in the above ground inspection. Both were properly planted.

Plot 2: There were seven planted trees on the plot, all satisfactory above ground. The inspector found a void on the plot with no trees that was larger than 144 sq. ft. The inspector checked for plantability and it was unplantable due to rock. One unplantable spot was recorded. This caused one wasted tree in column 8. Note that the satisfactory trees recorded in column 9 is six (not seven- cannot exceed the maximum allowable trees, col. 6). In the below ground inspection, a piece of rotten wood was found in the hole, which is a foreign material violation (F).

Plot 3: There were five planted trees. One tree was not planted by a stump, which was a shade violation (X) since the contract required that all trees be planted by stationary shade when it is available. There were no voids on the plot of 144 sq. ft that were unplantable. The two sample trees that were dug were satisfactorily planted based on below ground requirements.

Plot 4: There were seven planted trees. Two trees were planted five feet apart (minimum spacing was 50% of 12 feet or 6 ft). A spacing violation (S) is recorded for one of the trees. The other trees were satisfactory. The inspector found two voids on the plot that were unplantable due the presence of acceptable established WL seedlings, each at least 144 sq. ft (approximate square or circle) and recorded two unplantable spots in column 4. Based on only four planting spots, the maximum allowable trees is five. Since seven trees were planted, two trees are wasted. Only five trees are recorded in column 9. Two trees were dug and both were properly planted.

Plot 5: Seven trees were planted and all were satisfactorily planted above ground. There were no unplantable voids equal to 144 sq. ft. The below ground inspection revealed an air pocket in the lower part of the hole which is a Firmness violation (F).

Plot 6: There were six trees planted. One tree was not shaded which is a shade violation (X) since the contract required shade when it was available. Another tree was planted high with the root collar above the ground surface so a depth violation (D) was recorded. Four trees are identified as satisfactory. Based on this, two trees were dug from the four that were satisfactory above ground; and found to be planted properly.

Plot 7: There were seven trees planted all of which were satisfactory. No unplantable voids existed. Three trees were dug based on seven satisfactory trees; they were satisfactory.

Plot 8: Seven trees were planted, all of which were satisfactory. Although they tended to be closer than 12 feet apart, they were not closer than 6 feet apart, so no violation occurred. There was a void on the plot about 14x14 in size with no trees and was found to be unplantable due to standing water. One unplantable spot was noted. Since seven trees were planted but the maximum number of allowable trees is six (due to one unplantable spot), there is one wasted tree in column 8. Only six trees count as satisfactorily planted above ground (cannot exceed col. 6), thus two trees were dug and were satisfactory.

Plot 9: Eight trees were planted. They tended to be closer than 12 feet apart but were not closer than 6 feet, thus no violation. There were no unplantable voids on the plot. The maximum allowable trees is seven, thus one wasted tree is recorded in col. 8. Three trees were dug based on seven satisfactory planted trees (cannot exceed col. 6). The roots on one of the trees had

been stripped either during planting or before planting, (if before planting, the planter should not have planted the tree) resulting in a violation for altered root length (L).

Plot 10: Four trees were planted, and each was satisfactorily planted. Almost half of the plot could not be planted because there were small trees that met the requirements for acceptable established trees. This accounted for about three areas of 12x12 feet in size that were taken up with the residuals accounting for three unplantable spots. Two trees were dug and found to be satisfactory.

Following the inspection, all numbers were checked and totaled. The final quality is calculated based on the equation provided on the backside of the inspection sheet.

Evaluation: It should be noted that as a final inspection, the Contractor failed to meet the required 93% quality for acceptable work. He would receive a 10% reduction of the bid price for this unit or pay item according to *PWS Section 10.3*. Although the Contractor over-planted, it helped to compensate for the above ground errors. It was the below ground errors that caused work to be unacceptable.

The over-plant also resulted in 5 wasted trees on the plots, which computes to 25 trees per acre that are excess. The Contractor should be assessed the wasted tree charges.

- Exhibit 13 – Planting Inspection Sheet, Spanish Version

HOJA DE INSPECCIÓN DE PLANTACIÓN – ESPAÑOL (R-1 FS-2470-9)

BOSQUE	DISTRITO	INSPECTOR	NÚMERO DE CONTRATO

COR	TAMAÑO DE PLOTO	NÚMERO DE PARCELA	CONTRATISTO	NÚMERO DE SUBARTÍCULO
ACRES DE PARCELA	ESPACIADO PROMEDIO	MÁXIMO ARBOLES		NÚMERO DE PÁGINA _____ DE _____

FECHA	Numero de Ploto	(2) Examinar y contar los árboles plantados*											(3) Número deseado de lugares plantables	(4) Número de lugares no plantables	(5) Número real de lugares plantables	(6) Número máximo de árboles permitidos	(7) Número de árboles plantados	(8) Número de árboles desperdiciados	(9) Número de árboles satisfactorios	(10) Bajo Tierra Número de árboles excavados	(11) Bajo Tierra Número de árboles satisfactorios	Observaciones
													Sobre el Suelo									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)										

- Exhibit 14 – Planting Inspection Instructions, Spanish Version

HOJA DE INSPECCIÓN DE PLANTACIÓN – ESPAÑOL (Continuado)

Instrucciones (pagia 2 de la Hoja de inspección de plantación)

1. Localice y marque el centro del ploto en el suelo.
2. Localice y examine los árboles plantados para determinar los criterios sobre el suelo. Anote los resultados en la columna 2 de la hoja de inspección.

Sobre el Suelo

√	Arbol satisfactorio	C	Violación del desbroce o la preparación del lugar de plantación
S	Violación del espacio	W	Especies equivocadas
P	Selección fallida del lugar de plantación o micrositio	T	Árbol de sacrificio: muerto, debil, pequeño
X	Violación de la sombra o violación de la protección	H	Agujero auxiliar
D	Violación de la profundidad de plantación	Z	Violación del hoyo de plantación omitido (Barrena)
A	Violación de la posición del tallo del árbol: ángulo incorrecto	E	Violación de árbol aceptable existente
F	Violación de firmeza: árbol suelto, árbol mal apisonado		

3. Determine a partir de la tabla 1 el número promedio de lugares plantables deseados para el ploto según el espaciamiento promedio especificado. Anote los resultados en la columna 3.
4. Determine y anote en la columna 4 el número de lugares sin árboles plantados que no se pueden plantar debido a una regeneración natural existente o a condiciones del terreno.
5. Reste la columna 4 del número promedio de lugares plantables y anote la diferencia en la columna 5. Este es el número real de lugares plantables donde se deben plantar árboles.
6. Determine el número máximo de árboles permitidos a partir de la tabla 2 y anote en la columna 6.
7. Anote el número de árboles plantados en el ploto de la columna 2 en la columna 7.
8. Determine los árboles desperdiciados: reste el número máximo de árboles permitidos en la columna 6 de los plantados (en la columna 7) y, si es mayor que cero, anote en la columna 8.
9. Anote el número de árboles plantados que cumplen con las especificaciones del contrato para sobre el suelo de la columna 2 en la columna 9. La cantidad máxima de árboles satisfactorios que se acreditarán no excederá la cantidad máxima registrada en la columna 6.
10. Determine y excave al menos el número mínimo de árboles satisfactorios sobre el suelo a partir de la tabla 3 y anote en la columna 10. Los árboles se excavarán comenzando por los más cercanos al centro del ploto y avanzando hacia afuera.
11. Marque los resultados subterráneos en la columna 2 y anote el número de árboles que cumplen con las especificaciones de contacto para subterráneos en la columna 11.

Bajo Tierra

√	Satisfactorio	F	Firmeza: bolsas de aire, árbol mal apisonado, suelto
R	Violación de la configuración de las raíces de árbol	L	Violación de la longitud de la raíces de árbol, alterada
M	Material extraño en el agujero de plantación	O	Violación de la orientación del agujero de plantación

12. Después de completar y registrar todas los plotos, registre la suma de cada columna en la parte inferior de la hoja y calcule la calidad de plantado usando la siguiente fórmula. Registre el porcentaje de calidad final, su firma, su título y fecha de los resultados de la inspección final.

Porcentaje de Calidad de Plantado

$$\frac{\text{Número de árboles plantados satisfactorios sobre el suelo (de la columna 9)}}{\text{Número real de lugares plantables donde se deben plantar árboles (de la columna 5)}} \times \frac{\text{Número de árboles bajo tierra satisfactorios (de la columna 11)}}{\text{Número de árboles excavados (de la columna 10)}} \times 100 = \textit{Porcentaje de Calidad (\%)}$$

Tablas: Porción de tablas relevantes del Método de Inspección de Plantacion. C*onsulte Método de Inspección de Plantación para tablas completas*.

Tabla 1: promedio de lugares plantables

Espaciado	1/50th ac	1/100th ac
10x10	9	4
11x11	7	4
12x12	6	3
13x13	5	3

Tabla 2: máximo de árboles permitidos

lugares plantables	árboles máximos	lugares plantables	árboles máximos
1	2	6	7
2	3	7	8
3	4	8	10

Tabla 3: mínimo de árboles para excavar

árboles satisfactorio	árboles para excavar
1	1
2-6	2
7-9	3

14x14	4	2
15x15	4	2

4	5	9	11
5	6	10	12

- Exhibit 15 - Shade/ADC Inspection Sheet

FLEXIBLE NETTING or RIGID NETTING/TUBING INSPECTION FORM			Sheet____OF_____
FOREST	DISTRICT	COR	INSPECTOR
CONTRACT NUMBER		CONTRACTOR REP	
DATE	PLOT SIZE	STAND NUMBER/NAME	ACRES

UNSATISFACTORY TREE CODES:			
NETTING	TUBING	NETTING_____	INSTALLATION _____TPA
T = TOP LENGTH	M = MISSED TREE		
B = BOTTOM LENGTH	A = IMPROPER ANCHORING	TUBING _____	MAINTENANCE _____TPA
M = MISSED TREE			**QUALITY _____%**

PLOT NO.	SATISFACTORY TREATED TREES	UNSATISFACTORY TREATED TREES	TREES REQUIRING TREATMENT	OTHER TREES ON THE PLOT	TOTAL TREES ON PLOT	REMARKS (Codes, Dead Trees, etc.)

QUALITY = _____SATISFACTORY TREES_____ = _____ = _____%
TOTAL TREES REQUIRING TREATMENT