TREE/SHRUB ESTABLISHMENT

PLANNER GUIDE

USDA, Natural Resources Conservation Service—Practice Code 612

TREE/SHRUB ESTABLISHMENT

Tree and shrub establishment is establishing woody plants by planting seedlings, cuttings, direct seeding or natural regeneration.

PRACTICE INFORMATION

The purposes of the practice include:

- Forest products
- Beautification
- Erosion control
- Energy conservation
- Chemical/nutrient sink for water quality improvement
- Wildlife habitat improvement
- Air quality improvement
- Wetland improvement

This practice is applicable on any site where woody plants are suited. Site adaptation is a major consideration for success in establishing trees and shrubs. Careful consideration should also be given to the suitability of the selected species for the planned purpose and available space for growth.

COMMON ASSOCIATED PRACTICES

Tree/Shrub Establishment is commonly applied as part of a Conservation Management System and most always with Tree/Shrub Site Preparation (490) preceding it. Other associated practices may include (but not limited to) Forest Stand Improvement (666), Forest Trails and Landings (655), Upland Wildlife Habitat (645), Critical Area Planting (342), Sediment Basin (350), Integrated Pest Management (595), Brush Management (314), Herbaceous Weed Control (315) and Access Control (472).

For further information, refer to the practice standard in the local Field Office Technical Guide and associated specifications and job sheets.

REGENERATION PRINCIPLES

There are two types of regeneration-natural and artificial. On forestland, there are regeneration harvest regimes (such as: seed tree, shelterwood, uneven aged or crop tree mgt single tree selective, variable density thinning &/or patch cuts/openings) designed to improve the success rate of natural reforestation and achieve specific forest structure and composition goals. Artificial regeneration is seeding or planting. The benefit of artificial regeneration is the opportunity to choose the distribution pattern, stocking and species composition to meet your manage objectives. Planting 1-3 year old seedlings that have been started in an nursery or green house, have proven to be a reliable method of regenerating trees and shrubs out on the landscape. For this practice, seeding is acceptable for specific sites and species. If seeding or natural regeneration is being use under 612 Tree/Shrub Establishment, contact your Area or State Forester for guidance.

A successful tree/shrub establishment requires: healthy seedling from the correct seed zone, which are adapted to the climate, soil and site (see Washington Seed Zone manual on WA DNR website); seedlings need to be handled and stored properly(see MT ForestryTechnical Note 15); seedlings need to be planted correctly in a favorable micro-site; and there needs to be very little competition from other vegetation in the first 3 to 5 years after planting.

Specification:

Complete the basic header information: client name, farm/ranch location, farm and tract numbers, fields in which the practice will be installed, proposed treatment acres (practice extent), program under which this practice is being installed, planned date for installation and if there is a contract associated with this practice, include the contract item number. Also, document the planner who wrote the specification in the space following the "Assisted by".

Existing (Benchmark) Conditions

Document the climatic and soil conditions for your site and compare the growth requirements of your chosen species (See USDA Plants database “Characteristics” data) with the site conditions. Climatic data can come from the local weather stations, Geodata layers or soils map unit descriptions. Soils information should come from the soil survey for the area and if possible with on-site verification. Also document the representative species and the site index for the site, and the base year, from the forest productivity soils report. If the soils report does not give you base year just choose “unknown”.

If there are acceptable healthy volunteer trees and/or shrubs then determine the most prevalent species(s) and estimate overall total number per acres.

Make an on-site assessment of the remaining existing vegetation and list the dominate species if you know them for tree, shrub, forb and grass layer or just describe the layers (i.e. no overstory with dense sod forming grass understory.)

Check the box for the type(s) of supporting data and/or check other and describe the documentation.

Purpose

Check all the purposes that apply and meet the landowner objectives.

Safety Considerations

The planner may comment on any safety issues that may affect the implementation of this practice.

Associated Practices

Check all the practices that are part of the conservation system that is treating the selected purposes and resource concerns.

Site Preparation

Is site preparation needed? If so refer to 490 Tree/Shrub Site Preparation standard and specifications. Document the type of site preparation (hand, chemical or mechanical) and the method. For example: hand scalping or chemical, hand spot spray. It could also be a combination of treatments like chemical, hand spot spray followed by hand scalping.

Planting Specifications

In this section, enter by species the stock type(if appropriate spec the minimum acceptable seedling height and stem caliper), planting rate and total number of plants to be planted for that species and stock type. See WA Forestry Technical Note 10: Stand density guidance for minimum planting rates for commercial species. See USDA Plants or WA Plant Material Technical Note 1 for minimum planting rates for conservation species.

Match the selected species to the climatic and soil site conditions. If you are selecting species that need more water than what the average annual precipitation will provide or is not as drought tolerant as the area might require, then discuss the supplemental watering or

mulch in the that section on page 5. If there is root or stem disease present on site. Try to identify the areas so resistant species may be chosen to be planted in those sites.

Stock types come in three basic categories: bareroot (B), container or plugs (Co or P) or cuttings (C). Bareroot (B) seedlings are grown in an outdoor seedling nursery subject to uncontrolled environmental factors. Container seedlings or plugs (P) are usually grown in the greenhouse under a more controlled environment. Outdoor nurseries take 1-3 years to grow a seedling. Greenhouses can grow a seedling in 1 year or less, depending on the species. In addition, stock types are also identified by the number of years it spends in the nursery. For information on the care and handling of hardwood cuttings see WA Plant Material Technical Note 10: Riparian Revegetation-Plants.

For conifer reforestation stock:

Bareroot 1+1 (sometimes shown as 1-1) represents a seedling that spent one year in the original seedbed where seedlings are planted at an approximate density of 25-30 seedlings per square foot. The seedlings are lifted and roots pruned and then trans planted into a transplant bed where seedlings are planted at approximately 6-8 seedling per square foot. The transplanting process results in larger stems and more fibrous root systems. These seedlings have potential to survive on infertile sites, some competition from other vegetation, and browse damage.

Bareroot 2+0 (sometimes shown as 2-0) stock type represents a seedling that has grown 2 years at approximately 25-30 seedlings per square foot. This will be a smaller stock type. This is an appropriate stock type for sites that do not have much competing vegetation or browse damage. **This stock type is commonly used for broadleaf shrubs for a variety of sites.**

Bareroot 2+1(sometimes shown as 2-1) stock type was grown for 2 years in the seedbed with 25-30 seedlings per square foot. Then the seedling is lifted, poor seedlings sorted out , root pruned, and planted in a transplant bed with a density of approximately 6-8 seedlings per square foot. This seedling has a large stem and root mass. Planner would recommend this seedling for areas that need a fast green up or areas with extreme browse issues.

For these three stock types 2+0 would be the cheapest, on average the smallest and least competitive conifer seedling stock and 2+1 would be the most expensive and on average the largest and most competitive conifer seedling stock to out-plant.

1+0 is a common commercial hardwood bareroot stock type. Hardwoods often grow fast enough to be competitive enough to out plant after one year in the nursery seedbed. For conifers, Larch or maybe Ponderosa pine are the only species that might be big enough to out plant as 1+0, but it is generally not recommended.

Container plugs are grown in a greenhouse. Styro-10 or 10 cubic inch containers are used if the trees will be out planted.

Container Plug +1 are grown in a green house for a year. Styro-2A or 2 cubic inch container are often used when the plug is going to be planted into a transplant bed (these are not big enough to out plant directly in the field). After a year in the green house, the seedlings is extracted from the container, root pruned and planted into the transplant bed with around 6-8 seedlings per square foot. It spends about a year in the transplant bed. This will create a larger stem and more root mass than standard plug. Cedar, hemlock, larch, some pines and true firs are commonly grown as Plug+1's for reforestation.

These are common densities for seedbeds and transplant beds, however each nursery has its own protocol on the number of seedlings per square foot (density) will be in the seedbed and transplant bed.

Temporary Storage Instructions

There are some standard instructions provided on the jobsheet. Provide any site specific information, if needed. Refer to MT Forestry Technical Note 15: Transportation , Care and Storage of Seedlings; MT Plant Materials Technical Note 51: Temporary Storage and Handling of Seedlings; ID Plant Materials Technical Note 45: Temporary Storage and Handling of Container, Bareroot and Cutting Stock.

Treatment Technique

Check the type of planting technique that will be used (hand or mechanical). Some general specifications are provided. Under “Tools & Technique” provide the specific method of planting, for example: hand plant with shovel or hodad. Also address the need to keep the roots moist during the planting process. Proper seedling handling and planting techniques will go a long way in keeping roots moist but there are some products that can help in hot dry situations (jells, vermiculite,…).

In addition, provide the practice implementation period. In western Washington this is usually from January through March and in Eastern Washington, this is often in late fall or immediately after snow melt in the spring.

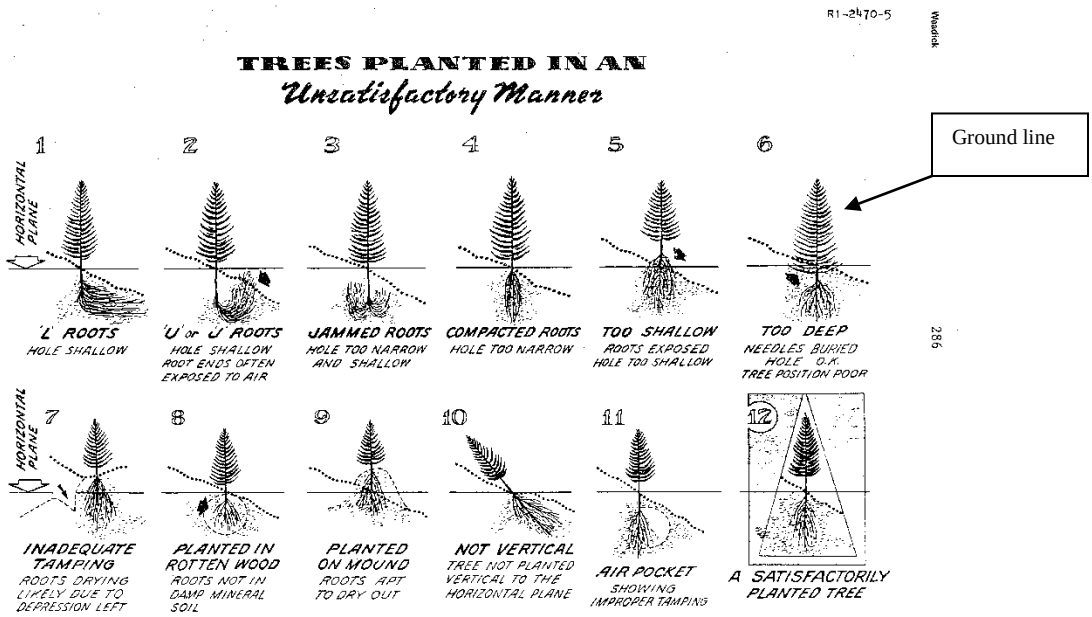


Figure 1: Tree Planting in the Inland Northwest Proceedings-- Idaho Department of Lands Contracting from 1976

Refer to ID Plant Materials Technical Note 43:Tree and Shrub Planting, Care and Management; WA Plant Materials Technical Note 10: Riparian Revegetation-Plants; WA Plant Materials Technical Note 2: Indigenous Uses, Management and Restoration of Oaks of the Far Western United States for discussions on tree and shrub planting and care. Also, WSU Extension's EB2000 Silviculture for Washington Family Forests is a good reference.

Additional Criteria for the purposes of Treating Waste, Improving or Restoring Natural Diversity, Storing Carbon in Biomass, Renewable Energy Systems or Reduce Energy Use:

Address any of the additional criteria required for the chosen purposes.

Damage Protection Needed?

Protection against heat and sun scald

Stay aware of aspect. In much of the state, the aspect of the site can affect species selection, planting densities, shading needs, microsite selection or even planting project site selection.

When in drier and warmer climates, such as we have in parts of Eastern Washington, shade is an important part of protecting seedlings from damage. Selecting planting spots that take advantage of shade opportunities is an important step for seedling survival and plantation success. Planting on the north and east side of stumps, logs and slash piles improves a seedlings chance of survival in the hotter sunnier climates. Allow up to 50% flexibility in spacing between individual trees in order to utilized shade opportunities. However, encourage an overall adherence to the specified stocking rate within ± 10% . That means if trees are tighter in one spot, they are wider in another. This will also create a more natural look for the plantation. When planting trees to provide shade to buildings or specialty areas, you would choose to plant on the south, and west sides of the object to be shaded first and the east side as a third option.

Protection against animal damage

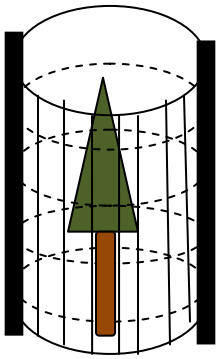
There are many types of tools and methods to protect seedlings against animal damage: fencing, physical barrier protectors, repellents, habitat manipulation, silvicultural modifications and depredation. There are several different types of physical barrier protectors such as: solid rigid plastic tubes, rigid plastic mesh tubes, netting, tree cages, bud caps and stem guards. Plus, there is a variety of chemical repellents. All these protection methods provide varying levels of protection against the different types of critters (damaging agents).

Figure 2:

Plastic mesh

Solid rigid plastic

Netting



Tree Cage

Bud Cap

Bud caps come in a variety of materials including paper , tiller netting and rigid plastic mesh leader tubes. Use bud caps for species that are not preferred forage and brows levels are from light to moderate. Do not use bud caps for Western Redcedar. Bud caps require regular maintenance to keep the caps covering the leader and terminal bud. Plus, bud caps often blow off the trees and require replacement. If it is an exposed site which gets a lot of wind, bud caps would not be the appropriate choice. Bud caps are appropriate for the very hottest driest sites. Bud caps are the least expensive of the barrier protection but last 6 to 18 months.

Netting comes in semi-rigid to very flexible material. Netting will protect most conifer seedlings from browse (not Western Redcedar). If it is installed properly and down to the ground it can even protect against small mammals. It is not particularly effective against Elk or Mt Beaver. Netting can have a higher rate of leader damage that the other barrier protectors. Avoid using netting on very hot dry sites, because mortality from heat can occur. Netting is designed to last only a 1-3 years. Netting costs about the same as bud caps or just a couple cents more per tree.

Rigid plastic mesh tubes are usually anchored by bamboo stakes. Use 1 to 2 stakes based on the stability needs of the site. If an even more stable anchor is needed then the use of a 1” wooden stake would be appropriate. Rigid plastic mesh tubes cost more than bud caps and netting, but provide superior protection against browse, by deer, elk, rabbit and mountain beavers. Research indicates that these mesh tubes can improve early growth rates, but this improvement does not carry long into the future. This improved growth does however, give it a slight edge on survival rate. If the tube is installed correctly then leader damage is not likely to occur. The planting may incur some increase in mortality due to heat on your hottest and driest sites. There will be some maintenance associated with this treatment, especially as the seedling grows, the client may want to raise the mesh tube up to continue protection and as the tree grows the mesh tube will likely need to be removed to avoid damage to the bole. These rigid plastic mesh tubes are design to provide 3-5 years worth of protection and are reusable.

Solid walled rigid plastic tubes (tree shelters) provides brows protection from deer, elk, mt. beavers, rabbits and girdling by small mammals. Solid walled tubes are usually anchored by wooden stakes. Solid walled tubes also provide protection against the wind but tend to fill with debris in the floodplain. The solid walled tubes act as little green houses and traps moisture for the seedling, improving the relative humidity, increases temperature, increase concentrations of CO_2 and can extend the growing season but they need to have vents so the tree will harden off properly in the fall. Furthermore, do not use these tubes on very hot dry sites. These tree shelters were originally created for hardwoods but will work on conifers as well. There are types of solid walled tubes that will split when the tree stem out grows it. Other types may need to be removed, to avoid damage to the tree stem. Because of their protection against mice and other small mammals, tree shelters are an appropriate choice for aforestation of old pastures. Some maintenance is required each year. These solid tubes provide 3-5 years worth of protections and are reusable. These are more expensive than the previous three treatments.

Tree cages are made of wire mesh fencing and fence posts. It usually requires 1-3+ fence posts to stabilize it. These are usually used for oak planting when they are on sites with livestock or elk pressure. Tree cages would also be appropriate for small riparian planting of Western Red cedar on sites with very heavy elk pressure. This is a very expensive protection method.

Tree stem guards can range from very costly to inexpensive for the product and installation. Use these for very specific sites and projects. Smaller planting projects where grasses and forbs are the main competing vegetation are the most likely to fit with this type of protection. This type of protection protects against girdling by small mammals and potentially sun scald.

Chemical big game repellents are commonly used for protection as well. I have found third party testing on two formulations—egg based (such as Deer Away) and blood meal based (such as Plantskydd) . Both have been shown to provide protection about the level of bud caps and maybe as good as netting. They cost about the same as bud caps or maybe a little less. This type of treatment requires a significant amount of maintenance in the form of reapplication every 6 weeks to 6 months depending on the repellent and the site factors. Because of the amount of maintenance required, it is recommended to limit their use to small plantings that are easily accessed. These repellents might be appropriate for very hot dry sites where the netting, rigid plastic mesh and solid plastic tubes may not be appropriate due to their increase risk of mortality.

Post-Plant Weed Control Needed?

If the site lends itself to fast growing highly competitive native or invasive species that will likely rob the seedling of moisture, nutrients, light and growing space then document the issue here and direct the client to see the specification under 314 Brush Management or 315 Herbaceous weed control either singularly or in combination. If you are using both of these practices then put the overall schedule here, especially if this is a wildlife planting and 645 is used for monitoring and management after the post plant weed control treatments.

Mulch may also be used, either in combination with other weed control practices or as a preventative action instead of other weed control practices. See Practice 484 Mulch specifications for defining the acceptable material, coverage of that material and required depth of material. For more information see WA Plant Materials Technical Note 8: Mulches and Mulching for Erosion Control.

Describe your use and scheduling of associated practices, for the purposes of post-plant weed control. These associated practices are part of the conservation system for treating the resource concerns, so describe how these practices support each other in treating that resource concern.

Mulch or Supplemental Water Needed?

Discuss whether or not mulch or supplemental watering will be needed to establish the trees & shrubs and how the participant should address this issue. Discuss associated practices, if they are needed. Practice 484 Mulch may also be used for soil moisture conservation. If supplemental water is needed for the successful establishment of this tree/shrub planting, then discuss whether or not, there is irrigation already on site. If not, what type of irrigation will be installed and what practices will be used or will the supplemental watering will be done by hand?

Practice Specifications Design Approval Certification

This section documents required Job Approval Authority (JAA) and TechReg Category Certification for the project area and practice's limiting factor. It also documents the planner (or Technical Service Provider (TSP) and their JAA or certification for the TechReg category. The Planner (or TSP) will sign and date this section, print their name and title.

If the planner does not have enough JAA to approve the specifications there is a Reviewer section that allows for someone who does have the appropriate JAA to document their JAA and to approve the design with their signature. Include the date, printed name, and title.

There is a section for the client to sign and date. With their signature the client is accepting the specifications, indicate the planner reviewed the specifications with them, agrees to install according to the specifications and that they are responsible for the permits and notifying the appropriate, governmental agencies or utilities prior to implementation of practice.

Documentation Requirement

This form is used for quality control of the practice design and checkout of practice installation for practice certification. It provides a list of documentation required in order for the plan to include this practice and for designing this practice.

Complete the basic header information: client name, farm/ranch location, farm and tract numbers, fields in which the practice will be installed, treated acres (extent installed), program under which this practice is being installed, planned date for installation and if there is a contract associated with this practice, include the contract item number. Also, include the name of the planner(s) that reviewed the file and checked-out the practice on the ground. This may or may not be the person who has JAA.

Mandatory Documentation within the Plan

Check box of each item that is present within the file and properly completed.

The following additional data/documentation needed for this practice

Check the box of each inventory and analysis documentation that supports the presence of the resource concern and landowner objective and is in the file or discussed on P&I notes. Feel free to hand write notes clarifying the check or lack of check.

Additional Notes on Practice documentation, installation or comments on associated Practices
Planner should include any additional information they deem necessary to support the completion certification of the practice.

Practice Completion Certification
Person with appropriate JAA will sign this form for the certification that this practice was installed according to NRCS standards and specifications.

References

Baumgartner, Hanley & McCarter. 2005. Silviculture for Washington's Family Forests. EB 2000. WSU Extension

Elefritz, Atkinson & Fitzgerald. 2006. The Care and Planting of Tree Seedlings on your Woodland. EC1504. Oregon State University Extension Service.

Dumroese, Mahoney and Wenny. 1992. Choosing Nursery Stock for Landscaping, Conservation and Reforestation. Current Information Series No. 923. University of Idaho Cooperative Extension System.

Cleary, Greaves and Hermann. 1978. Regenerating Oregon's Forests. Oregon State University Extension Service.

Baumgartner & Boyd. 1976. Tree Planting in the Inland Northwest, Proceeding of a conference at Washington State University. WSU Extension.

Schapp, and DeYoe. 1985. Seedling Protectors for Preventing Deer Browse. Forest Research Laboratory, Oregon State University, Corvallis. Research Bulletin 54.

Campbell , Evans & Hartman. 1988. Evaluation of Seedling Protection Materials in Western Oregon. USDI Bureau of Land Management. Technical Note. T/N OR-5

WA Forestry Technical Note 10: Stand Density Guidelines

WA Plant Materials Technical Note 2: Indigenous Uses, Management and Restoration of Oaks of the Far Western United States for discussions on tree and shrub planting and care.

WA Plant Materials Technical Note 8: Mulch and Mulching for Erosion Control

WA Plant Materials Technical Note 10: Riparian Revegetation-Plants

ID Plant Materials Technical Note 43: Tree and Shrub Planting, Care and Management

ID Plant Materials Technical Note 45: Temporary Storage and Handling of Container, Bareroot and Cutting Stock.

ID Department of Lands, 1976 Planting contract.

MT-Plant Materials Technical Note 15: Transportation, Care and Storage of Seedlings.

MT Plant Materials Technical Note 45: Seedling Protectors.

MT –Plant Materials Technical Note 51: Temporary Storage and Handling of Container, Bareroot, and Cutting Stock.

Tree/Shrub Establishment and Tree/Shrub Site Preparation

(NOTE: These practices are typically planned concurrently)

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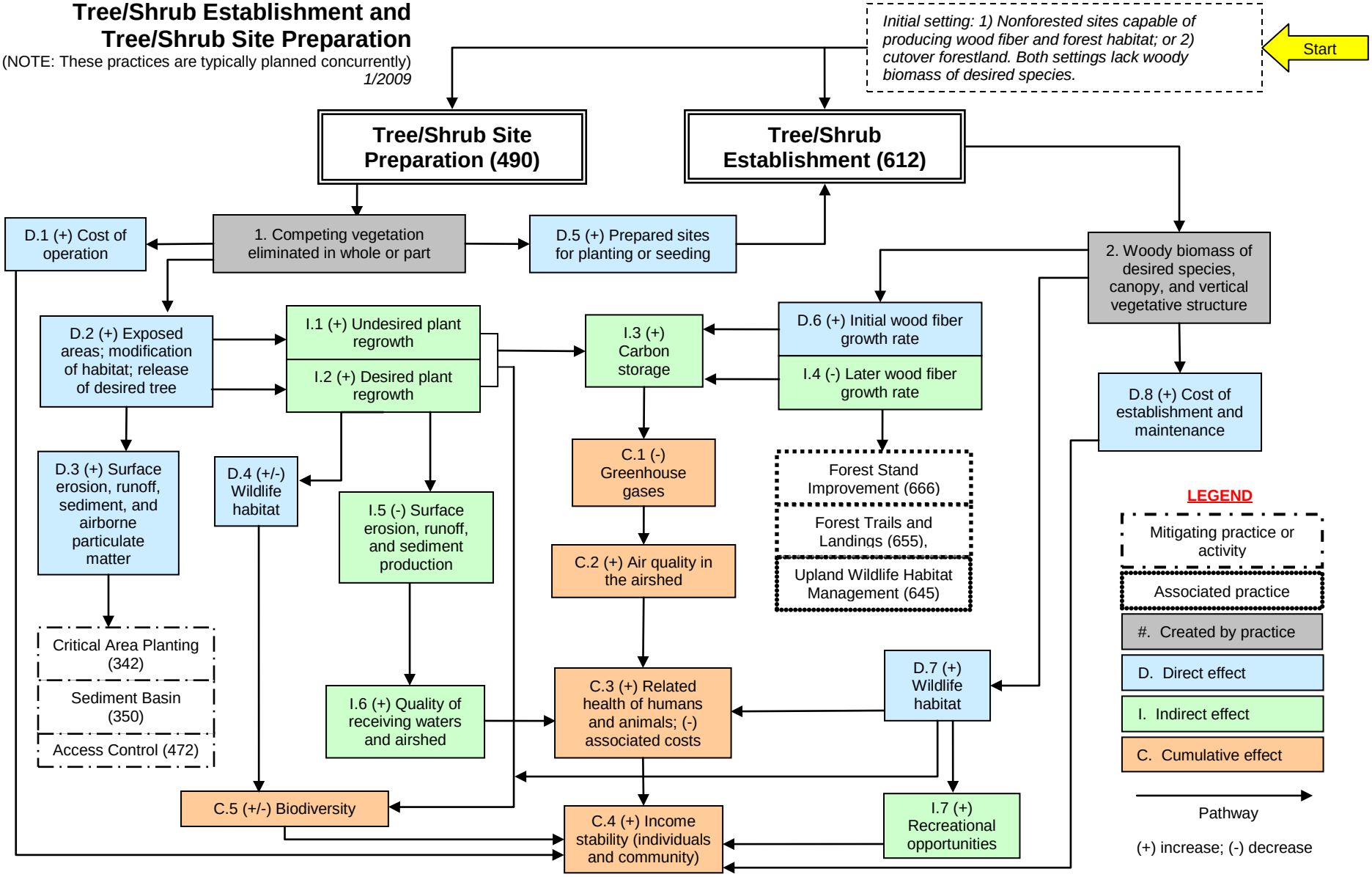

Note: Effects are qualified with a plus (+) or minus (-). These symbols indicate only an increase (+) or a decrease (-) in the effect upon the resource, not whether the effect is beneficial or adverse.

are subjective and somewhat dependent on variables such as climate, terrain, soil, etc. All appropriate local, State, Tribal, and Federal permits and approvals are the responsibility of the landowner and are presumed to have been obtained. All income changes are partially dependent upon market fluctuations which are independent of the conservation practices. Users are cautioned that these effects are estimates that may or may not apply to a specific site.