

PLANT ESTABLISHMENT PROCEDURES

This section of the Pacific Islands Area Vegetative Guide includes generic plant establishment procedures for herbaceous plants and trees and shrubs. There are many species of herbaceous plants and trees and shrubs which are planted for conservation purposes such as to stabilize eroding areas and establish habitat for wildlife. The most common types of herbaceous plants established for conservation purposes include: grasses, sedges, and forbs. Both native and non-native trees and shrubs may be established for conservation purposes. Refer to the Conservation Practice tables in the Vegetative Guide for plant species, planting rates and spacing recommendations. Planners should also refer to individual conservation practice Standards for practice specific and/or additional criteria for plant establishment.

Care in handling and planting the seed, cuttings, seedlings, or vegetative material will ensure an acceptable rate of survival. Only viable, high-quality, and adapted planting material will be used.

HERBACEOUS PLANTS

Types of Planting Material

Herbaceous plants are usually established by planting seeds or by planting vegetative material (stolons, sprigs, or rhizomes).

Certain types of herbaceous plants are also sometimes established by planting dibble tube seedlings or other container-grown stock such as potted seedlings or plants and cell pack seedlings or plugs.

It is somewhat unusual, but possible that bare-root stock (seedlings or plants) and unrooted stem cuttings are used.

Potting bare-root stock 3 to 4 months before planting will help produce more vigorous transplants. If bare-root stock is not planted immediately, it should be "heeled-in" in a V-shaped trench under shade or potted and kept moist.

Cuttings may be rooted in pots or beds, and then transplanted. Unrooted cuttings may be planted directly depending on the species, available moisture, and other conditions.

Site Preparation

Site preparation to clear and prepare the planting site should only be done if required in order to plant the new herbaceous species or for plant establishment. Site preparation is not needed if the planting site is already clear of vegetation and no tillage is needed or the new herbaceous species can be planted in the existing vegetation and successfully established.

Site preparation may include: 1) conventional tillage; 2) conventional tillage and the removal of unwanted plants; or 3) the removal of unwanted plants without tillage (no-till).

Conventional tillage: Conventional tillage site preparation may be used where soil conditions and topography permit the use of equipment, such as tractors. Conventional tillage site preparation usually consists of one primary tillage operation, such as plowing or ripping, followed by disking. Prepare a firm planting bed. If planting large areas of sloping land and no-till is not possible, establish new plantings in increments or in strips alternating with undisturbed areas to minimize erosion. All tillage will be on the contour or cross slope to minimize the erosion hazard, unless topography does not permit it and may cause safety concerns. Treat soil quality concerns, such as tillage pans, to prevent exacerbation of existing problems.

Removal of unwanted plants: Unwanted plants (existing weeds, grasses, trees, and shrubs, etc.) may be mechanically and/or or chemically removed or treated.

Existing weeds and grasses may be removed by mowing and/or spraying with herbicide. Existing trees and shrubs may be pruned back and kept or cut down, dug out or killed with chemicals.

Because of potential seed germination, root suckering or shoot persistence, removal of unwanted plants may need to be repeated two to three times prior to planting the desired species. Allow for a time lapse between each removal activity to ensure adequate control/eradication of unwanted plants.

TREES AND SHRUBS

Types of Planting Material

The most common and preferable planting material for trees and shrubs is dibble tube seedlings or other container-grown stock such as potted seedlings or plants and cell pack seedlings or plugs.

Less common and less preferable is the use of bare-root stock (seedlings or plants) and unrooted stem cuttings.

Potting bare-root stock 3 to 4 months before planting will help produce more vigorous transplants. If bare-root stock is not planted immediately, it should be "heeled-in" in a V-shaped trench under shade or potted and kept moist.

Cuttings may be rooted in pots or beds, and then transplanted. Unrooted cuttings may be planted directly depending on the species, available moisture, and other conditions. Consider using a rooting hormone to enhance rooting percentage.

Although less commonly practiced, it is possible to establish certain types of trees and shrubs by directly planting seeds. For example, koa and 'a'ali'i or lampuye are sometimes direct seeded.

Site Preparation

Site preparation to clear and prepare the planting site should only be done if required in order to plant new trees and shrubs or for plant establishment. Site preparation is not needed if the planting site is already clear of vegetation and no tillage is needed or new trees and shrubs can be planted in the existing vegetation and successfully established. If site preparation is needed, it must be conducted in accordance with the Tree/Shrub Site Preparation (490) practice and the client should consider implementing the 490 practice as part of his/her conservation plan or system.

The practice Tree/Shrub Site Preparation is used to treat areas to improve site conditions for establishing trees and/or shrubs. The purpose of this practice is to encourage natural regeneration of desirable woody plants or to permit artificial establishment of woody plants. Methods of site preparation include: scarification of the land to encourage the natural regeneration of trees and shrubs; mechanical methods such as disking, ripping, chopping, shearing, blading, mowing, or lopping to remove unwanted vegetation or break restrictive soil layers, and chemical (herbicide) application to kill undesirable vegetation.

PLANTING SEEDS

Planting of seeds to establish herbaceous plants or trees and shrubs may be accomplished by broadcasting, drilling, or hydroseeding.

Where seed is broadcast, dragging the area with a chain, light plank, or other suitable implement will help to ensure good soil-seed contact.

Large seeds are generally planted deeper than small seeds. A general recommendation is to plant at a depth equal to four times the diameter of the seed.

Hydroseeded plantings must not be allowed to dry out. Germination and seedling emergence may be low if the mulch/seed mixture is not kept moist.

PLANTING VEGETATIVE MATERIAL (STOLONS, SPRIGS, AND RHIZOMES)

Where Soil Conditions and Topography PERMIT the Use of Equipment

Stolons, sprigs, and rhizomes should be evenly distributed on the prepared ground and disked in. For a more positive placement of the vegetative material, seedbed preparation may be followed by opening furrows at a maximum depth of 6 inches. Vegetative material is then placed in the furrows. Cover the material with soil by disking or other suitable means, leaving some leaves exposed, then compact lightly to ensure good plant-soil contact. A mechanical sprig planter may be used, soil conditions and terrain permitting.

Where Soil Conditions and Topography RESTRICT the Use of Equipment

Dig or open individual planting holes at least 6-inches deep. Sprigs should be inserted at least 5 inches in the hole. The sprigs should have a minimum of two nodes. The hole should then be filled with soil and compacted to ensure good plant-soil contact. Leave at least a 1-inch depression in the hole to trap rainwater and other moisture.

PLANTING OTHER MATERIALS (DIBBLE TUBE, CONTAINER, BARERoot, AND UN-ROOTED)

Planting

Dibble Tube seedlings: Open a hole and place the seedling in the hole at the same depth as grown in the container. Place moist soil around the seedling and pack. Firm up soil completely around plug.

Container-grown stock such as potted seedling or plants or cell pack seedlings or plugs: Dig a hole at least 50% wider than the container. Root-bound plants should have the root system slit and flared out over a mound of soil in the planting hole. Cut off any long roots before planting. If more than 20% of the root system is cut off, remove (proportionately) the same amount of leaf area. Plant the root ball top at or just below the natural ground level. Refill hole with soil and pack well to remove air-pockets. Prune off diseased or damaged leaves, branches, suckers, etc.

Bare-root stock (seedlings or plants): Open a hole or slit deeper than the root size to be planted to accommodate the root system with all roots pointing down (no "J" or "L" shaped roots). Place the plant slightly deeper than they grew in the nursery (indicated by a change in bark characteristics) with roots naturally positioned. Do not twist or bunch roots. In slit planting, push the plant down to the bottom of the slit, then with a shaking motion, raise it gently back to the correct level. While holding the plant in an upright position, at the correct depth, bring loose, moist soil in around the root system. Do not let dry soil or surface liter into the hole. When the slit or hole is filled, pack the most soil down firmly. No roots should be exposed or foliage covered.

Unrooted cuttings: Open a hole or slit deep enough to allow the cuttings to be inserted so at least $\frac{1}{2}$ to $\frac{2}{3}$ of the cutting length is below ground. Insert the cuttings vertically with the buds pointing up, insuring that one to three buds remain above ground. Consider using a rooting hormone to enhance rooting percentage. Firm the soil around the cutting so good contact with the soil is obtained.

OTHER MANAGEMENT ACTIONS TO ENSURE ADEQUATE STAND ESTABLISHMENT

This section includes other generic management actions which may be required to ensure an adequate stand establishment. Each site and planting should be evaluated to determine which actions are required. Some of the same or similar actions may already be included in individual conservation practice Standards and should be followed instead of these.

Care of Plants at Planting Time

Keep seedlings moist at all times. At the field site, store seedlings in the shade or under a reflective space blanket. Do not use canvas to protect seedlings from solar heating. Use a suitable container (bucket, bag, or plastic tray) for carrying the plants during the planting operation. Keep wet material around the roots to prevent their damage through exposure. Never carry a handful of plants exposed to the sun and wind. Take one plant from the container and plant it immediately.

Planting Dates

Planting dates shall be scheduled during approved dates for the species and to optimize soil moisture for germination and/or establishment.

In general, planting in sites without supplemental irrigation should be done as early in the wet season as possible. Avoid planting on hot, windy days.

Planting in sites with supplemental irrigation may be done at any time, provided that adequate moisture is provided immediately after planting.

Supplemental Water for Plant Establishment

Supplemental water via an irrigation system will be applied to establish the plants, if necessary. Irrigation systems must be in place prior to planting. Water immediately after planting, and provide supplemental water for establishment as needed.

Soil Amendments

If needed for stand establishment, apply soil amendments (e.g. lime, fertilizer, compost) according to soil test results. All soil amendment application shall follow the requirements in the Field Office Technical Guide (FOTG) Nutrient Management (590) Standard. Legume seeds should be treated with the correct legume inoculants before planting.

Protection of Plantings

Plantings shall be protected from weeds, insects, diseases, animals or other organisms (including invasive and non-invasive species) as necessary to ensure adequate stand establishment. All pest control shall follow the requirements in the Field Office Technical Guide (FOTG) Pest Management (595) Standard.

Mulching

Mulching around trees or shrubs will help to conserve moisture and control weeds. Organic mulches, cinders and plastic mulches are effective, but local site conditions must be considered. For example, planting seedlings or cuttings through black plastic mulch and irrigating each plant with a drip irrigation system works well for farm windbreak plantings, but may be inappropriate

for wildlife plantings as the plastic may be a hindrance to wildlife or natural regeneration. Consider applying the practice Mulching (484), if appropriate.

OPERATION AND MAINTENANCE

The Operation and Maintenance section of each conservation practice Standard includes required actions to be carried out after establishment that contribute to the longevity and functioning of the conservation practice throughout its expected life.

Actions may include inspections, reseeding or replanting, mowing, fertilization, and pest control or protection. This section may also include requirements for the timing of actions in consideration of wildlife habitat and nesting season and grazing rotations of livestock.