

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE SPECIFICATION**  
**BRUSH MANAGEMENT**  
**(acre)**  
**CODE 314**

**SCOPE**

This document establishes the technical details, workmanship, and quality and extent of materials required to install the practice in accordance with the Conservation Practice Standard. The information shall be considered when preparing site-specific specifications for the practice.

The NRCS Pacific Islands Area Jobsheet for this practice shall be used to document the site-specific specifications for installing, operating, and maintaining the practice on a specific field or treatment unit. Other documents (transect data forms, worksheets, maps, drawings, and narrative statements in the conservation plan) may be used in addition to the Jobsheet to document site specifications or to plan, design or certify the practice.

**GENERAL**

If *brush eradication* is the primary goal, field operations to eliminate brush shall be carried out in dry weather whenever possible. The operation shall be completed before the seed of the target species matures. Eradication results in the death of target species, not merely a reduction in their size or stature.

If *brush manipulation* is the primary goal, field operations should be performed during the time when target species are likely to be most dormant, or their growth rate has slowed. An example of brush manipulation, rather than eradication, would be for an existing stand of *Leucaena* spp. (common names include haolekoa, tangantangan, or ekoa). When the *Leucaena* is used as forage for livestock or wildlife, it can be manipulated via cutting or pruning trees to a height within the reach of browsing or grazing animals.

Whenever possible, if the goal is to eradicate the target species, it is NOT advisable to leave irregular-shaped strips or patches of brush scattered over the treatment area. Doing so does not really benefit any native flora, fauna or avian species, and often results in continued reinfestation of brush into the treated areas. It is best to remove all the undesirable brush, and plant desired woody species in the future to enhance wildlife habitat or natural aesthetics. Refer to conservation practices designed for wildlife habitat management where preservation or enhancement of wildlife values are the planned objective.

When the treated area requires revegetation after brush treatment to protect resource integrity, it will be noted clearly on the Jobsheet. The most applicable of the following listed conservation practices will be designed by NRCS and implemented by the producer:

- 512 – Forage and Biomass Planting.
- 342 - Critical Area Planting.
- 562 - Recreation Area Improvement.
- 550 - Range Planting.

Revegetation operations that are needed will be carried out as soon as possible after brush clearing has been completed, provided that weather trends at the time indicate a favorable opportunity for success. Replanting is done with seed and/or vegetative material. Complete the brush clearing operation as close to the start of the rainy season as possible.

Livestock grazing, after brush management is completed, will be done in accordance with standards and specifications for 528-Prescribed Grazing, and a grazing plan will be followed. Mechanical, chemical and biological procedures may be used singly or in combination, depending on kind of land (site); topography; species of woody plants-whether they are root-sprouters or non-sprouters; size, abundance and

distribution of woody plants; hazards of treatment, if any; objectives of the land user; and costs in relation to expected benefits.

Where brush is removed that once provided shade or shelter to livestock, consider replanting with suitable brush or tree species, or constructing a fabricated livestock shelter.

Brush management shall not be utilized where loss of the woody plant cover would increase soil erosion, unless the area will be established in more erosion-retarding type of vegetation. Where brush removal will create a temporary erosion hazard, clearing will be done in alternating strips across the predominant slope, and brush will be windrowed across the slope prior to revegetation.

Response by vegetation is often the determining factor influencing the success of a brush management practice. If increased forage is the objective, inability of forage species to take quick advantage of improved growing conditions by species may limit success. If improvement of wildlife habitat is the objective, planning should include specified levels of cover for individual species. If fuel load reduction is the objective, acceptable levels of woody plant control should be specified. If water quality improvement is the objective, reasonable chances of improving herbaceous cover while reducing woody cover should exist. When improved recreation and aesthetic values through increased landscape diversity are the objectives, descriptions of desired vegetation type distribution should be provided.

**In all cases, density measurements of target species will be quantified before and after treatment.** Refer to the instructions and worksheets for the Belt Transect Method and Fixed Circular Plot Method.

## TARGET SPECIES

Plant phenology and environmental constraints must be considered if initial treatments are to be successful. In addition, acceptable control levels shall be specified in the planning phase. Examples of major target species included under this practice are:

apple-of-Sodom	( <i>Solanum americanum</i> , syn. <i>S. linnaeanum</i> )
*black wattle	( <i>Acacia mearnsii</i> , syn. <i>A. decurrens</i> )
*catsclaw, mysore	( <i>Caesalpinia decapetala</i> , syn. <i>C. sepiaria</i> )
*christmasberry	( <i>Schinus terebinthifolius</i> )
*firetree	( <i>Morella faya</i> , or <i>Myrica faya</i> )
*Formosa koa	( <i>Acacia confusa</i> )
*gorse	( <i>Ulex europaeus</i> )
*guava	( <i>Psidium guajava</i> )
hamakua-pamakani	( <i>Ageratina riparia</i> )
hila hila, sensitive plant	( <i>Mimosa pudica</i> )
*java plum	( <i>Syzygium cumini</i> )
kiawe	( <i>Prosopis pallida</i> )
*klu, sweet acacia	( <i>Acacia farnesiana</i> )
koa haole, tangantangan	( <i>Leucaena leucocephala</i> )
*lantana	( <i>Lantana camara</i> )
maui-pamakani	( <i>Ageratina adenophora</i> )
*melastoma	( <i>Melastoma malabathricum</i> , <i>M. candidum</i> )
*miconia	( <i>Miconia calvescens</i> )
**panini, prickly pear cactus	( <i>Opuntia monacantha</i> )
*silkoak	( <i>Grevillea robusta</i> )
*sourbush	( <i>Pluchea carolinensis</i> , syn. <i>P. symphytifolia</i> , <i>P. odorata</i> )
*thimbleberry	( <i>Rubus rosaefolius</i> )
*waiawi, strawberry guava	( <i>Psidium cattleianum</i> )
*yellow Himalayan raspberry	( <i>Rubus ellipticus</i> )

\*These plants will require more than one treatment, or a combination of different treatments (eg, mechanical and chemical) to achieve eradication goals.

\*\*Do not use mechanical treatment (mowing, bulldozer, etc) on *Opuntia*. It will spread readily from any green tissue parts that are left behind.

## MECHANICAL TREATMENT METHODS

**Bulldozer.** A brush rake should be used in place of the standard dozer straight blade wherever feasible. This is an effective method to remove trees and heavy brush. Avoid unnecessary disturbance or removal of the topsoil. Bulldozing should not result in large amounts of soil mixed with brush.

**Brush Disk.** This method is recommended on low-growing brush where stones will not interfere with the disking operation. Large offset disks can effectively control light to moderate stands of sprouting brush. The disks should be set to cut brush roots just below the crown. Two passes are usually needed for brush control. Trash or brush is chopped up and incorporated with the soil.

**Rolling Chopper.** This method is recommended for use on brush species with stem or trunk diameters of up to 5 inches. The crushing and chopping effectively controls non-sprouting brush, small trees or slash.

**Rotary Brush Mower.** This method should be used on rock free areas with brush species and sprouts of up to 3 inches in diameter. Rotary cutters, shredders and rotobeaters cut brush near ground level and chop it into mulch. They are effective in controlling upright annuals and are useful for frequently repeated treatments of sprouting species.

**Grubber.** Grubbers remove individual trees or shrubs by cutting the roots below the soil surface and lifting the plants from the ground. They are effective in removing scattered stands of sprouting plants. Because this method is time consuming, it is not well suited for removing dense stands of brush.

**Root Plow or Undercutter.** This method is effective in killing all types of vegetation. Root plows or undercutters are blades (usually V-shaped) mounted between two shanks. The shanks are usually attached to a hydraulically operated toolbar. The blades are pulled laterally through the soil, cutting all roots at the desired depth. This method is not adapted to rocky soils.

## BIOLOGICAL TREATMENT

Biological controls have been introduced for various brush species such as firetree, gorse, hamakua-pamakani, lantana and panini cactus. Contact the Hawaii State Department of Agriculture, University of Hawaii and U.S. Forest Service regarding biological control of these and other species before attempting biological control to avoid injuring beneficials.

## CHEMICAL TREATMENT

When using herbicides, the recommendations of the University of Hawaii, College of Tropical Agriculture and Human Resources (CTAHR) and other qualified agronomic specialists shall be followed. A written copy of the herbicide recommendation shall be obtained and posted in the conservation plan folder, or documented by the planner on the Jobsheet. Refer to Table 1 for herbicides registered for pasture/range use in Hawaii. Herbicides will be applied according to the directions on the product label. Consideration must be given to the potential of contaminating surface and ground water. Refer to the 595-Integrated Pest Management Standard and the soil/pesticide interaction ratings. If a chemical treatment is applied, the conservationist shall complete the most current version of the NRCS-PIA Water Technical Note, No. 1, "Water Quality Risk Assessment".

Herbicide users should be cautioned as follows: If herbicides are handled or applied improperly, or if unused portions are not disposed of safely, they may injure humans, domestic animals, desirable plants, fish or other wildlife, and may contaminate water bodies, nearby crops or other vegetation. Follow the directions and heed all precautions on the container label. Landowners and applicators should be aware of and adhere to the provisions of state and federal laws and regulations concerning the use of agricultural chemicals.

Conformance with permits of all state and federal regulations for use of chemicals shall be the responsibility of the landuser. Permits for use of chemicals will specify legally required setbacks from watercourses, ponds, residences, etc.

## APPLICATION METHODS

**Foliar.** This method is the most common for applying herbicides. Applications can be made using hand sprayers, power sprayers or aircraft. In addition, wipe-on systems and very- and ultra-low volume applicators are available.

**Cut-surface (injection, notching, cut-stump, frilling).** The bark of brush and trees is mechanically penetrated and the herbicide placed directly into the sapwood (xylem). This is an effective method. Tree injectors are available that pierce the bark and deposit the herbicide. The bark may be notched with an ax or machete. Herbicide is then squirted into the wound. With the cut-stump method, herbicide is applied to the surface of the freshly cut stump that is at or near ground level. Frilling is where the trunk is girdled and herbicide applied to the wound-ring completely around the trunk.

**Basal Bark.** The trunk is wetted from the base to about 20 inches above the soil line with a mixture of an oil soluble herbicide and a light oil. The oil is used to penetrate the bark. The solution is either sprayed or brushed on the trunk. Complete coverage of the treated area is important as misses or skips could allow buds to sprout. This includes the base of the trunk to ensure that buds will not sprout from the root crown.

**Soil Application.** Granular or pelleted herbicides are applied by hand, with a mechanical spreader or by aircraft. The herbicide is taken up by the plant roots. This method is particularly suited for brush control in remote areas or areas with rough terrain where hauling of spraying equipment and water is difficult.

## RECORDKEEPING REQUIREMENTS

For all chemical treatments, the producer/client will maintain a written record, detailing each treatment application. They may use the “[Pesticide Recordkeeping Form](#)” at the end of this specification, or record the following information in a format of their preference. The elements that must be recorded *within 14 days* of each application are as follows:

- The brand or product name
- The EPA registration number
- The total amount applied
- The month, day, and year
- The location of the application
- The crop, commodity, stored product, or site
- The size of area treated
- The name of the certified applicator\*
- The certification number of the certified applicator\*

\*Only required if using a Restricted Use chemical.

**When chemical treatments are used, this practice will not be certified without proof of recordkeeping provided by the client.**

**TABLE 1. HERBICIDES REGISTERED FOR PASTURE / RANGE USE IN HAWAII <sup>1/</sup>**

Active Ingredient	Brand Name (common)	Application Method(s)	Comments
Clopyralid	Transline	Foliar, Cut-Surface	Selective control of broadleaves. Especially effective on legumes, except gorse. Readily absorbed by foliage and roots. Readily translocates in plants. New herbicide. Unrestricted.
2, 4-D	<u>Amine salts</u> – Dacamine 4D, DMA4, Formula 40, Savage, Weedar 64; <u>Esters</u> -Clean Crop Low Vol 4, Esteron 6E	Foliar, Basal Bark (esters only), Cut-Surface	Selective control of broadleaves. Translocates in plant. Effective on guava and sourbush, Not persistent in soils, Restricted, drift hazard.
Dicamba	Banvel	Foliar, Cut-Surface	Selective control of broadleaves. Translocates in plant. Effective on guava, apple-of-Sodom, and christmasberry. Unrestricted.
Glyphosate	Roundup	Foliar, Cut-Surface	Non-Selective control of broadleaves and grasses. Spot spray for brush control, broadcast spray for pasture renovation. Waiawi, guava, christmasberry, koa haole and banyan are sensitive to cut-surface treatments. Lantana is very susceptible to foliar applications. Translocates readily in plants. Inactive in soil and not taken up by plant roots. Unrestricted.
Hexazinone	Velpar L	Soil	Nonselective. Absorbed by roots. Translocates in plant via xylem. Very soluble and sufficiently mobile in soil to have potential for groundwater contamination. Soil application is done with an exact delivery gun applicator to spots in soil around base of weeds within 3 feet of root crown. Unrestricted.
Metsulfuron	Escort	Foliar	Selective control of broadleaves and ginger. Somewhat effective on lantana and gorse. Translocates in plant. Readily absorbed by foliage and roots. Very low doses effective but care should be taken to avoid drift. Unrestricted.
Paraquat	Gramoxone, Ortho Paraquat CL	Foliar	Non-selective, contact herbicide. Not translocated in plant. Used primarily as a foliar spray for suppression of existing vegetation for pasture/range renovation. Rapidly absorbed by foliage. Inactive in soil. Restricted use. Special permit from Hawaii Department of Agriculture required.

**TABLE 1.**, continued...

Active Ingredient	Brand Name (common)	Application Method(s)	Comments
Picloram	Tordon 22K	Foliar	Selective control of broadleaves. Effective for control of hila hila, christmasberry, gorse, lantana, black wattle, cactus, catsclaw, firetree and koa haole. Translocated in plant. Readily absorbed by foliage and roots. Persistent and mobile in soils. Very soluble and has potential for ground-water contamination. Restricted use. Special permit from Hawaii Department of Agriculture required. Spot spraying only. Hazard to non-target plants.
Tebuthiuron	Spike 20P	Soil	Somewhat selective control of woody plants (grasses require higher rates). Translocated in xylem. Persistent in soil but not very mobile. Controls koa haole, guava, waiawi, thimbleberry, apple-of-Sodom, and christmasberry. Unrestricted.
Triclopyr	Redeem (amine salt), Remedy (ester), Crossbow (Triclopyr ester +2,4,D), Garlon 3A (amine salt), Garlon 4 (ester)	Foliar, Basal Bark (ester only), Cut-Surface	Selective control of broadleaves. Most grasses are tolerant. Effective on klu, fomosa koa, lantana, koa haole, melastroma, hila hila, waiawi, guava, gorse, blackberry, sourbush, and christmasberry. On guava, basal bark or cut-surface applications are very effective, foliar applications are moderately effective. On lantana, basal bark applications are effective, foliar applications result in poor control. On gorse, the amine salts are more effective than esters but require an effective surfactant such as Sylgard 309. On miconia, basal bark applications with Garlon 4 or Remedy are highly effective. Cut-surface, frill or girdle treatments with Garlon 3A are highly effective. Readily absorbed by foliage and roots. Translocates in plants. Mobile in soil. Unrestricted.

<sup>1/</sup> Philip S. Motooka, Extension Specialist in Weed Science, University of Hawaii. Personal communication to State Plant Materials Specialist. 1997. State Range Management Specialist. 2004.

Reference to a company or product name does not imply approval or recommendation of the product by the USDA-Natural Resources Conservation Service to the exclusion of others.

