



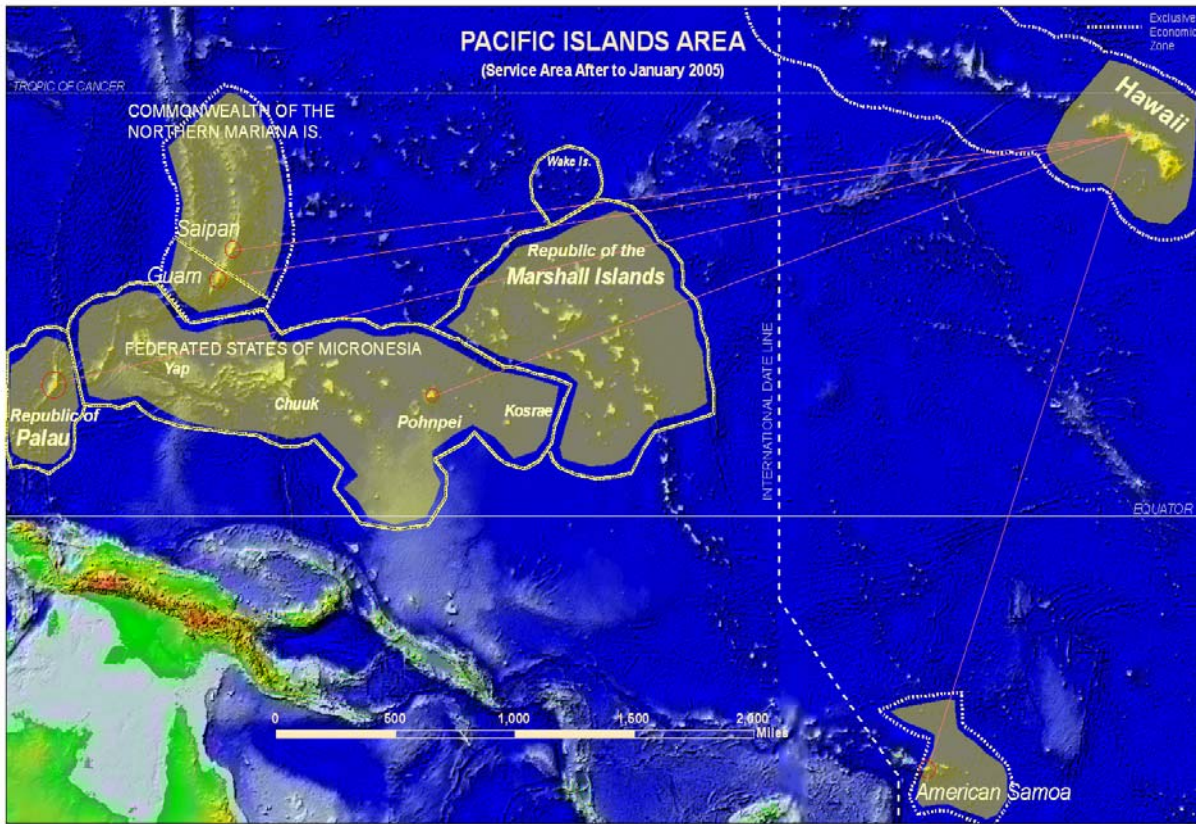
Pacific Islands Area Vegetative Guide

United States Department of Agriculture



Pacific Islands Area

March 2008



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Introduction

The Pacific Islands Area (PI) Vegetative Guide is a revision of the Pacific Islands Vegetative Guide and contains plant species information which corresponds to the information in the Conservation Practice Standards and Specifications in Section IV of the PI Field Office Technical Guide (FOTG). The Vegetative Guide was developed to serve as a ready reference for plants suitable for the various conservation practices in Section IV. Pictures of most of the species in the tables have been included to aid in plant selection and identification.

The March 2008 Pacific Islands Area Vegetative Guide includes generic plant establishment procedures including site preparation and planting for commonly used planting methods. Refer to the Conservation Practice tables in the Vegetative Guide for planting rate and spacing recommendations. Planners should also refer to individual conservation practice Standards for practice specific and/or additional criteria for plant establishment.

The species tables include the most recent information available. Since the nomenclature of many tropical plant groups is under constant taxonomic study, every effort was made to obtain the most current plant name information. As a result, there are a number of changes in scientific names. The primary taxonomic authorities used were the USDA, NRCS.2007. The PLANTS database (<http://plants.usda.gov>); USDA, ARS National Genetic Resources Program. *Genoplasm Resources Network – (GRIN)* (<http://www.ars-grin.gov/>); and the *Manual of the Flowering Plants of Hawaii* by Wagner, Herbst, and Sohmer, 1990 (Bishop Museum Press).

More species were added that are adapted to the PI-West Area (Territory of Guam, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Republic of Palau, and Republic of the Marshall Islands) and to American Samoa. Trees in the genus *Erythrina* have been deleted from the tables because of the damage they've sustained from the erythrina gall wasp. Always keep diversity in mind when planning a windbreak or other practice to guard against the complete loss of effectiveness due to a disease or insect attack.

It is recommended that native species be selected, when possible. They are indicated in the footnotes. Seed availability of natives is an ongoing problem. Some nurseries are producing a variety of containerized native plants. Native species are included in the tables when their range of adaptation, conservation use, performance, and cultural requirements are known.

Exercise good judgment when choosing introduced species. Always consider the proximity of native forests and other native areas when using non-native species. Consider the potential for introduced species to spread. When available, sterile cultivars are recommended and are listed in the tables. Certain plants are indicated in the footnotes as having a potential to become invasive. The source of this information is the Hawaiian Ecosystems at Risk project (HEAR) and the Pacific Island Ecosystems at Risk project (PIER). The information may be found at <http://www.hear.org/> and <http://www.hear.org/pier/>.

Seeding rates are presented as pounds of pure live seed (PLS). This means that the actual bulk field seeding rates will usually be higher than the recommended rates in the tables because the field seeding rates depend on the quality of the purchased seed. Calculate the percent PLS of the seed by multiplying the percent germination by the percent purity. Percent germination and purity of the seed should be listed on the seed container.

The actual field seeding rate is calculated by dividing the recommended seeding rate by the percent PLS of the seed. Refer to Vegetative Technical Note No. 3 – Pure Live Seed Worksheet.

All legumes should be inoculated with the proper bacteria before planting. Use only fresh, age-dated inoculants specifically labeled for the legume to be seeded.

If you have questions about the Guide, please contact Bob Joy, Plant Materials Specialist, via phone at: (808) 567-6868 extension 109 or via email at: Robert.J.Joy@hi.usda.gov.

If you have questions about individual conservation practice species information, please contact the appropriate NRCS Pacific Islands Area specialist.

Table A. Conservation Cover (327)
Suitable Species (Page 1 of 1)

Grasses Normally Seeded	Rainfal (inches)	Elevation (feet)	Recommended Seeding Rate (lbs. PLS/ac)
annual ryegrass ^{1/ 6/} (<i>Lolium multiflorum</i>)	40 -150	0 – 7,000	
mixed w/ other grasses			10
annual ryegrass alone			20
Bermudagrass ^{4/ 5/} (<i>Cynodon dactylon</i>)	20 – 100 (-170)	0 – 3,000	6
'emoloa, kawelu ^{3/} (<i>Eragrostis variabilis</i>)	20 - 80	0 – 3,500	6
green panicgrass ^{4/} (<i>Urochloa maxima</i>)	25 - 70	0 – 2,500	6
'Petrie'			
kikuyugrass ^{6/} (<i>Pennisetum clandestinum</i>) 'AZ-1', 'Whittet'	40 -120	0 – 6,000	6
narrowleaf carpetgrass ^{8/} (<i>Axonopus affinis</i>)	40 – 80 (-160)	0 – 5,000	40
oats ^{1/} (<i>Avena sativa</i>)	40 - 150	0 – 7,000	
Mixed w/ other grasses			35
oats alone			70
orchardgrass (<i>Dactylis glomerata</i>)	40 - 100	3,000 – 7,000	12
perennial ryegrass (<i>Lolium perenne</i>)	40 - 100	1,500 – 7,000	24
'Tetraploid'			
piligrass, tanglehead ^{3/ 7/} (<i>Heteropogon contortus</i>)	15 – 45 (-90)	0 – 2,000	6
Rhodesgrass ^{5/} (<i>Chloris gayana</i>) 'Bell', 'Katambora', 'Nemkat' ^{4/}	25 - 45	0 – 3,000	6
signalgrass ^{5/} (<i>Urochloa brizantha</i>)	50 - 120	0 – 3,000	9
Grasses Normally Established Vegetatively	Rainfall (inches)	Elevation (feet)	Recommended Planting Rate (bushels/ac ^{2/} disked in material)
Baron's grass, paddlegrass, reh padil ^{6/ 7/ 8/} ^{9/} (<i>Ischaemum polystachyum</i>)	50 - 200	0 – 3,000	40
broadleaf carpetgrass ^{8/} (<i>Axonopus compressus</i>)	40 – 160 (-200)	0 - 5000	40
digitgrass ^{4/ 8/} (<i>Digitaria eriantha</i>)	50 -160	0 – 3,500	40
'Mealani'			
'Pangola'			
paspalum (<i>paspalum hieronymii</i>)	50 - 150	0 – 3,000	40
'Tropic Lalo'			
St. Augustinegrass (<i>Stenotaphrum secundatum</i>)	40 - 80	0 – 3,000	40
zoysiagrass (<i>Zoysia japonica</i>) 'El Toro'	40 -100	0 – 4,000	40

Legumes	Rainfall (inches)	Elevation (feet)	Recommended Seeding Rate
big trefoil (<i>Lotus pedunculatus</i>) 'Grasslands Maku'	50 -100	1,500 – 6,000	10
forage peanut (<i>Arachis pintoii</i>) 'Amarillo', 'Forrajero'	50 +	0 – 3,000	20
hetero ^{8/} (<i>Desmodium heterophyllum</i>)	60 - 160	0 – 2,500	10
intortum, desmodium (<i>Desmodium intortum</i>) 'Greenleaf', 'Kuiaha'	60 - 120	0 – 3,000	10
Spanish clover, kaimi clover, lattil pako ^{6/} ^{8/} (<i>Desmodium incanum</i>)	(40-) 60 - 120	0 -3,000	10
three-flowered beggarweed ^{8/} (<i>Desmodium triflorum</i>)	60 - 160	0 – 2,500	10
white clover (<i>Trifolium repens</i>) 'Haifa', 'Grasslands Huia'(NZ), common	35 - 80	1,500 – 7,000	10

Note: This list is not all-inclusive. Other species may be recommended by qualified NRCS technical specialists.

^{1/} Use annuals for rapid, temporary cover.

^{2/} A bushel equals 1.25 cubic feet.

^{3/} Native to Hawaii.

^{4/} Resistant to root-knot nematodes.

^{5/} Tolerant of soil salinity and wind-borne salt

^{6/} May have potential to become invasive.

^{7/} Native to PI-West Area.

^{8/} Tolerates acid, low fertility soils.

^{9/} Tolerates wet soil conditions.

**Table B. Cover Crop (340)
Suitable Species (Page 1 of 4)**

Species & Cultivars	Min. Broadcast Seeding Rates (Lbs.PLS/Ac.)	PH Range	Inoculant Group	Approx. Growing Time in Days	Approx. Dry Matter Yield (T/Ac.)	Approx. N Content (lbs/T Dry Matter)	Lbs. Of Actual N/T Dry Matter to Add at Plow Down	Optimum Planting Period & Elevation Range (ft.)
Legumes								
alfalfa (<i>Medicago sativa</i>) cv. CUF-101 Moapa 69 ^{1/} WL-605 WL-656 WL-711 WF ^{1/ 8/}	20	6.0 – 8.0	Alfalfa	90	1.5	85	0	Year round 0 – 4,000'
clover, sweet ^{5/} (<i>Melilotus alba</i> , <i>M. officinalis</i>) cv. Hubam	20	6.0 – 8.0	Clover	90	2.5	63	0	Year round 0 – 3,000'
cowpea (<i>Vigna unguiculata</i>) cv. Mississippi Pinkeye Purple Hull ^{1/}	60	5.5 – 8.3	Cowpea	90	2	59	0	Year round 0 – 1,000' spring/summer 0 – 2,500'
lablab, dolichos ^{4/} (<i>lablab purpureus</i>) cv. Rongai	60	4.5 – 6.5	Lablab specific	60	2.5	50	0	Year round 0 – 4,000'
mung bean (<i>Vigna radiata</i>)	80	5.4 – 8.3	Cowpea	60	1.5	60	0	Year round 0 – 1,000' spring/summer 0 – 2,500'
pigeonpea ^{1/} (<i>Cajanus cajan</i>)	40 – 60 ^{3/}	5.0 – 8.3	Cowpea	90	2.5	50	0	Year round 0 – 3,000'
soybean (<i>Glycine max</i>)	75	5.5 – 8.3	Soybean	90	1.5	65	0	Year Round 0 – 2,500'

**Table B. Cover Crop (340)
Suitable Species (Page 2 of 4)**

Species & Cultivars	Min. Broadcast Seeding Rates (Lbs. PLS/Ac.)	PH Range	Inoculant Group	Approx. Growing Time in Days	Approx. Dry Matter Yield (T/Ac.)	Approx. N Content (lbs/T Dry Matter)	Lbs. Of Actual N/T Dry Matter to Add at Plow Down	Optimum Planting Period & Elevation Range (ft.)
sunn hemp ^{1/} (<i>Crotalaria juncea</i>) cv. Tropic Sun	40 – 60 ^{3/}	5.0 – 7.0	Cowpea	60	2.5	65	0	Year Round 0 – 1,000' spring/summer 0 – 2,500'
vetch, common ^{4/} (<i>Vicia sativa</i>)	60	4.5 – 6.5	Pea/vetch	90	1.5	60	0	Year round 1,500' – 4,000'
vetch, purple ^{4/} (<i>Vicia benghalensis</i>)	50	4.5 – 6.5	Pea/vetch	90	1.5	73	0	Year round 1,500' – 4,000'
vetch, woollypod ^{4/ 5/} (<i>Vicia villosa</i> ssp. <i>varia</i>) cv. Lana Namoi	40 – 60 ^{3/}	4.5 – 7.0	Pea/vetch	90	1.5	73	0	Year round 1,500' – 4,000' fall/winter 0 – 4,000'
Non-Legumes								
annual ryegrass ^{5/} (<i>Lolium multiflorum</i>) ^{7/}	40	5.5 – 7.0		90	1	13	25	Year round 0 – 7,000'
barley ^{5/ 6/} (<i>Hordeum vulgare</i>)	70	5.0 – 8.3		90	1	18	20	Year round 0 – 4,000'
buckwheat ^{4/ 5/} (<i>Fagopyrum esculentum</i>) cv. Japanese, common	60	4.5 – 6.5		30	1.5	18	20	Year round 0 – 4,000'
millet, pearl millet (<i>Pennisetum glaucum</i>)	50	5.5 – 8.3		60	2	19	20	Year round 0 – 1,000' spring/summer 0 – 2,500'

**Table B. Cover Crop (340)
Suitable Species (Page 3 of 4)**

Species & Cultivars	Min. Broadcast Seeding Rates (Lbs. PLS/Ac.)	PH Range	Inoculant Group	Approx. Growing Time in Days	Approx. Dry Matter Yield (T/Ac.)	Approx. N Content (lbs/T Dry Matter)	Lbs. Of Actual N/T Dry Matter to Add at Plow Down	Optimum Planting Period & Elevation Range (ft.)
oats, black (<i>Avena strigosa</i>) cv. Soilsaver ^{1/5/}	70	5.5 – 7.0		60	1.5	16	20	Year round 0 – 7,000'
oats, common ^{5/} (<i>Avena sativa</i>) cv. Coker 234 ^{2/} , Walken ^{9/} Steele, Swan, TAM 397	70	5.5 – 7.0		60	1.5	16	20	Year round 0 – 7,000'
oats, red (<i>Avena bysantina</i>)	70	5.5 – 7.0		60	1.5	16	20	Year round 0 – 7,000'
rye, cereal ^{5/ 6/} (<i>Secale cereale</i>) cv. Danko, Elbon	70	5.5 – 7.0		90	1.5	18	20	Year round 0 – 7,000'
sorghum x sudangrass (<i>Sorghum</i> hybrids) ^{1/ 5/} sorghum, forage (<i>Sorghum bicolor</i>)	50	5.5 – 8.3		60	3	13	25	Year round 0 – 1,000' spring/summer 0 – 2,500'
sudangrass (<i>Sorghum bicolor</i> ssp. <i>drummondii</i>) ^{1/}	50	5.5 – 8.3		60	3	13	25	Year round 0 – 1,000' spring/summer 0 - 2,500'

**Table B. Cover Crop (340)
Suitable Species (Page 4 of 4)**

Species & Cultivars	Min. Broadcast Seeding Rates (Lbs. PLS/Ac.)	PH Range	Inoculant Group	Approx. Growing Time in Days	Approx. Dry Matter Yield (T/Ac.)	Approx. N Content (lbs/T Dry Matter)	Lbs. Of Actual N/T Dry Matter to Add at Plow Down	Optimum Planting Period & Elevation Range (ft.)
wheat ^{6/} (<i>Triticum aestivum</i>)	70	5.5 – 8.3		90	1.5	16	20	Year round 0 – 4,000'

Note: This list is not all-inclusive. Other species may be used based on recommendations by qualified NRCS technical specialists.

^{1/} Resistant to root-knot nematodes.

^{2/} Rust resistant.

^{3/} Increase seeding rate to 60 lbs/A if incorporating early, to produce finer stemmed material that is easier to till into the soil, or if severe weed competition is expected.

^{4/} Tolerates acid/low fertility soils.

^{5/} Suppresses weeds (allelopathic).

^{6/} Tolerant of soil salinity and wind-borne salt.

^{7/} May have potential to become invasive.

^{8/} Resistant to silverleaf whitefly.

^{9/} Reseeding unlikely at low elevation as plants require a cold period to produce viable seed.

**Table C. Critical Area Planting (342)
Suitable Species (Page 1 of 4)**

Common Name / Cultivar	Scientific Name	Elevation (ft.)	Rainfall (in.) ^{1/}	Seeding Rate (lbs/PLS/ac) ^{2/}
Grasses / Non-legumes				
'aki'aki, totoput, ^{4/ 8/}	<i>Sporobolus virginicus</i>	0 - 1,000	20+	^{3/}
annual ryegrass ^{5/ 10/}	<i>Lolium multiflorum</i>	0 - 7,000	40 - 150	40
Australian saltbush ^{8/} 'Corto'	<i>Atriplex semibaccata</i>	0 - 6,000	20 - 30	20
barley ^{5/ 8/}	<i>Hordeum vulgare</i>	0 - 4,000	40+	70
Baron's grass, paddlegrass, reh padil ^{4/ 9/ 10/}	<i>Ischemum polystachyum</i>	0 - 3,000	50 - 200	^{3/}
Bermudagrass ^{7/ 8/}	<i>Cynodon dactylon</i>	0 - 3,000	20 - 100 (-170)	35 ^{3/}
common				
'NK-37'(giant)				
buckwheat ^{5/}	<i>Fagopyrum esculentum</i>	0 - 4,000	40+	60
centipedegrass ^{10/}	<i>Eremochloa ophiuroides</i>	0 - 2,500	40+	20 ^{3/}
digitgrass ^{7/ 9/} 'Mealani' 'Pangola' 'Transvala'	<i>Digitaria eriantha</i>	0 - 3,500	50 - 160	^{3/}
'emoloo, kawelu ^{4/}	<i>Eragrostis variabilis</i>	0 - 3,500	20 - 80	10
green panicgrass ^{7/} 'Petrie'	<i>Urochloa maxima</i>	0 - 2,500	25 - 70	20
hairy chess	<i>Bromus catharticus</i>	3,000 - 7,000	40 - 100	20
kikuyugrass ^{10/} 'Whittet' 'AZ-1'	<i>Pennisetum clandestinum</i>	0 - 6,000	40 - 120	10 ^{3/}
Napiergrass 'Mott'	<i>Pennisetum purpureum</i>	0 - 3,000	40+	^{3/}
narrowleaf carpetgrass ^{9/}	<i>Axonopus affinis</i>	0 - 5,000	50 - 80 (-160)	40 ^{3/}
oats ^{5/}	<i>Avena sativa</i>	0 - 7,000	40 - 150	70
orchardgrass	<i>Dactylis glomerata</i>	3,000 - 7,000	40 - 100	20
paspalum 'Tropic Lalo'	<i>Paspalum hieronymii</i>	0 - 3,000	50 - 150	^{3/}
perennial ryegrass	<i>Lolium perenne</i>	1,500 - 7,000	40 - 100	40
piligrass ^{4/}	<i>Heteropogon contortus</i>	0 - 2,000	15 - 45 (-90)	10
Rhodesgrass ^{8/} 'Bell' 'Katambora' 'Nemkat' ^{7/}	<i>Chloris gayana</i>	0 - 3,000	25 - 45	20

**Table C. Critical Area Planting (342)
Suitable Species (Page 2 of 4)**

Common Name / Cultivar	Scientific Name	Elevation (ft.)	Rainfall (in.) ^{1/}	Seeding Rate (lbs/PLS/ac) ^{2/}
Grasses / Non-legumes (Continued)				
seashore paspalum ^{8/ 10/} 'Tropic Shore'	<i>Paspalum vaginatum</i>	0 - 1,000	40 - 200	3/
stargrass, Puerto Rican ^{8/} 'Florico'	<i>Cynodon nlemfuensis</i>	0 - 3,000	20 - 80	3/
stargrass, South Point ^{8/}	<i>Cynodon plectostachyus</i>	0 - 3,000	20 - 80	3/
St. Augustinegrass ^{8/ 10/}	<i>Stenotaphrum secundatum</i>	0 - 3,000	40 - 80	3/
vetivergrass ^{7/} 'Sunshine'	<i>Chrysopogon zizanioides</i>	0 - 3,000	35 - 200	3/
wheat ^{5/ 8/}	<i>Triticum aestivum</i>	0 - 4,000	40+	70
Legumes				
big trefoil 'Grasslands Maku'	<i>Lotus pedunculatus</i>	1,500 - 6,000	50 - 100	20
forage peanut ^{7/}	<i>Arachis glabrata</i>	0 - 3,000	50+	3/
forage peanut 'Amarillo' 'Forrajero'	<i>Arachis pintoi</i>	0 - 3,000	50+	40 ^{3/}
hetero ^{9/}	<i>Desmodium heterophyllum</i>	0 - 2,500	60 - 160	20 ^{3/}
intortum, desmodium 'Greenleaf' 'Kuiaha'	<i>Desmodium intortum</i>	0 - 3,000	60 - 120	20
lablab, dolichos 'Rongai'	<i>Lablab purpureus</i>	0 - 4,000	20 - 120	60
nanea, fue sina, beach vigna ^{4/}	<i>Vigna marina</i>	0 - 1,000	20+	20 ^{3/}
shrubby stylo, 'Seca'	<i>Stylosanthes scabra</i>	0 - 3,000	25 - 80	20
Spanish clover, kaimi clover, lattil pako ^{9/ 10/}	<i>Desmodium incanum</i>	0 - 3,000	(40-) 60 - 120	20
sunn hemp ^{5/ 6/ 7/} 'Tropic Sun'	<i>Crotalaria juncea</i>	0 - 2,500	20+	40
three-flowered ^{9/} beggarweed	<i>Desmodium triflorum</i>	0 - 2,500	60 - 160	3/
white clover 'Grasslands Huia' (NZ) 'Haifa'	<i>Trifolium repens</i>	1,500 - 7,000	35 - 80	20

**Table C. Critical Area Planting (342)
Suitable Species (Page 3 of 4)**

Common Name / Cultivar	Scientific Name	Elevation (ft.)	Rainfall (in.) ^{1/}	Seeding Rate (lbs/PLS/ac) ^{2/}
Ornamental Ground Covers				
'akia ^{4/}	<i>Wikstroemia uva-ursi</i>	0 - 1,000	20+	3/
cape marigold	<i>Dimorphotheca sinuata</i>	0 - 3,000	20+	3/
carpet bugle	<i>Ajuga reptans</i>	0 - 3,000	30+	3/
day lily	<i>Hemerocallis aurantiaca</i>	0 - 4,000	30+	3/
dichondra	<i>Dichondra repens</i>	0 - 4,000	30+	3/
'ilima & 'ilima papa ^{4/} (flat ilima)	<i>Sida fallax</i>	0 - 6,000	15+	3/
joyweed	<i>Alternanthera tenella</i>	0 - 3,000	40+	3/
lippia ^{8/}	<i>Lippia nodiflora</i>	0 - 2,500	40+	3/
'ohai ^{8/}	<i>Sesbania tomentosa</i>	0 - 1,000	20 - 40	3/
'ohelo papa ^{4/} (wild strawberry)	<i>Fragaria chiloensis</i>	0 - 6,000	40+	3/
oyster plant, rhoeo	<i>Tradescantia spathacea</i>	0 - 1,000	30+	3/
pa'uohi'iaka ^{4/ 8/}	<i>Jacquemontia ovalifolia</i>	0 - 1,000	20 - 45	3/
pohinahina, beach vitex ^{4/ 8/}	<i>Vitex rotundifolia</i>	0 - 1,000	20+	3/
pohuehue, beach morning glory) ^{4/ 8/}	<i>Ipomoea pes-caprae</i>	0 - 1,000	20+	3/
portulaca, moss rose ^{8/}	<i>Portulaca grandiflora</i>	0 - 4,000	20+	3/
trailing African daisy	<i>Osteospermum fruticosum</i>	0 - 4,000	40+	3/
'uhaloa, escobilla sabana ^{4/}	<i>Waltheria Indica</i>	0 - 3,500	15+	3/
Waipahu fig	<i>Ficus tikoua</i>	0 - 2,000	40+	3/
Common Name / Cultivar	Scientific Name	Elevation (ft.)	Rainfall (in.) ^{1/}	Spacing (ft.)
Woody Plants				
'a'ali'i, lampuye ^{4/}	<i>Dodonaea viscosa</i>	0 - 7,000	20+	10 x 10
alaha'e ^{4/}	<i>Canthium odoratum</i>	0 - 3,000	40+	10 x 10
'aweoweo ^{4/}	<i>Chenopodium oahuense</i>	0 - 6,000	20+	6 x 6
bamboo, clumping	<i>Bambusa spp.</i>	0 - 3,000	60+	6 x 6
Bermuda juniper	<i>Juniperus bermudiana</i>	0 - 3,500	40+	10 x 10
blue vitex, nanulega ^{8/}	<i>Vitex trifolia var. variegata</i>	0 - 4,000	30+	4 x 4
Bougainvillea, felila ^{8/}	<i>Bougainvillea spectabilis</i>	0 - 2,500	25+	10 x 10
Cook pine ^{8/}	<i>Araucaria columnaris</i>	0 - 3,000	40+	15 x 15
dracaena	<i>Dracaena fragrans</i>	0 - 2,000	50+	6 x 6
dracaena	<i>Dracaena dermensis</i>	0 - 2,000	50+	6 x 6
eucalyptus	<i>Eucalyptus spp.</i>	0 - 6,000	30+	10 x 10
gliricidia ^{6/ 9/}	<i>Gliricidia sepium</i>	0 - 3,000	25+	6 x 6
hala, kafu, fasa, ongor, ^{4/ 8/ 9/}	<i>Pandanus tectorius</i>	0 - 500	40+	15 x 15
hibiscus, Chinese, aute, flores rosa	<i>Hibiscus rosa-sinensis</i>	0 - 3,000	30+	6 x 6
hibiscus, Hawaiian white ^{4/}	<i>Hibiscus spp.</i>	0 - 3,000	30+	6 x 6

**Table C. Critical Area Planting (342)
Suitable Species (Page 4 of 4)**

Common Name / Cultivar	Scientific Name	Elevation (ft.)	Rainfall (in.) ^{1/}	Spacing (ft.)
Woody Plants (Continued)				
ironwood, toa, gagu ^{6/ 8/ 10/ 11/}	<i>Casuarina equisetifolia</i>	0 – 2,500	30+	10 x 10
kamani, daok, fetau ^{4/ 8/}	<i>Calophyllum inophyllum</i>	0 – 500	20+	15 x 15
koa ^{4/ 6/}	<i>Acacia koa</i>	1,500 – 7,000	50+	15 x 15
koai'a ^{4/ 6/}	<i>Acacia koaia</i>	1,000 – 6,000	30+	10 x 10
kou, niyoron ^{4/ 8/}	<i>Cordia subcordata</i>	0 – 500	30+	10 x 10
kukui, lama, sakan, candlenut tree ^{4/ 10/}	<i>Aleurites moluccana</i>	0 – 2,000	50+	10 x 10
'kulu'i ^{4/}	<i>Nototrichium sandwicense</i>	0 – 6,000	20+	6 x 6
mamane ^{4/ 6/}	<i>Sophora chrysophylla</i>	1,500 – 8,000	30+	10 x 10
mane, soapberry ^{4/}	<i>Sapindus saponaria</i>	0 – 4,000	50+	15 x 15
ma'o, Hawaiian cotton ^{4/}	<i>Gossypium tomentosum</i>	0 – 1,000	20+	4 x 4
milo, binalo, rosewood, badirt, pone ^{4/ 8/ 10/}	<i>Thespesia populnea</i>	0 – 500	20+	10 x 10
naio ^{4/ 8/}	<i>Myoporum sandwicense</i>	0 – 7,500	30+	10 x 10
naupaka, nanaso ^{4/ 8/}	<i>Scaevola sericea</i>	0 – 500	30+	6 x 6
noni, lada, nonu, Indian mulberry, kesengel ^{4/ 8/}	<i>Morinda citrifolia</i>	0 – 1,500	30+	10 x 10
Norfolk Island pine ^{8/}	<i>Araucaria heterophylla</i>	0 – 3,000	30+	15 x 15
'ohai ^{4/ 6/ 8/}	<i>Sesbania tomentosa</i> f. <i>arborea</i>	0 – 1,000	20 - 40	6 x 6
'ohi'a lehua ^{4/}	<i>Metrosideros polymorpha</i>	0 – 8,000	60+	10 x 10
pago, fau, hao, ermall, kalau, lo, gaal, kilife ^{4/}	<i>Hibiscus tiliaceus</i>	0 - 500	30+	10 x 10
small cone ironwood ^{6/ 10/}	<i>Casuarina cunninghamiana</i>	0 – 3,000	30+	10 x 10
ti ^{4/}	<i>Cordyline fruticosa</i>	0 – 6,000	30+	4 x 4
'ulei ^{4/ 8/}	<i>Osteomeles anthyllidifolia</i>	0 – 6,000	50+	4 x 4

Note: This list is not all – inclusive. Other species may be prescribed by qualified NRCS technical specialists.

^{1/} Unless irrigated.

^{2/} Pure Live Seed (PLS): The amount of PLS is equal to the percent purity, multiplied by the percent germination.

Double the seeding rates indicated in the table when hydroseeding.

^{3/} Species are established with vegetative material. If the material is spread and disked in, use a minimum of 80 bushels of stolons or sprigs per acre. One bushel equals 1.25 cu. ft. For planting sprigs in holes or if using rooted cuttings or seedlings, spacing shall be a maximum of 36 inches apart.

^{4/} Native or aboriginal introduction.

^{5/} Use these annuals for rapid cover as a companion plant at one half the indicated per acre rate with a perennial. For rapid temporary cover after land clearing or other disturbance, seed at full rate indicated in table.

^{6/} Nitrogen fixing.

^{7/} Resistant to root-knot nematodes.

^{8/} Tolerant of soil salinity and wind-borne salt.

^{9/} Tolerates acid, low fertility soils.

^{10/} May have potential to become invasive.

^{11/} Native to PI West. Aboriginal introduction to American Samoa. Not recommended for Hawaii.

**Table D. Grassed Waterway (412)
Suitable Grass Species**

Common Name	Scientific Name/Cultivar	Elevation (ft.)	Rainfall (in.) *	Planting Rate
Bermudagrass ^{2/ 3/}	<i>Cynodon dactylon</i>	0 – 3,000	20 – 100 (-170)	35 lbs/PLS/ac ^{5/}
carpetgrass ^{1/}	<i>Axonopus affinis</i>	0 – 5,000	40 – 80 (-160)	40 lbs/PLS/ac
centipedegrass ^{4/}	<i>Eremochloa ophiuroides</i>	0 – 2,500	40+	20 lbs/PLS/ac
digitgrass ^{2/}	<i>Digitaria eriantha</i> , 'Pangola', 'Transvala'	0 – 3,500	50 - 160	80 bu/ac ^{6/}
kikuyugrass ^{4/}	<i>Pennisetum clandestinum</i> , 'AZ-1', 'Whittet'	0 – 6,000	40 - 120	10 lbs/PLS/ac
paspalum	<i>Paspalum hieronymii</i> , 'Tropic Lalo'	0 – 3,000	50 - 150	80 bu/ac
St. Augustinegrass ^{3/ 4/}	<i>Stenotaphrum secundatum</i>	0 – 3,000	40 - 80	80 bu/ac
zoysiagrass	<i>Zoysia japonica</i> , 'El Toro'	0 – 4,000	40 - 100	80 bu/ac

Note: This list is not all-inclusive. Other species may be used based on prescriptions by qualified NRCS technical specialists.

* Unless irrigated.

^{1/} Tolerant of acid, low fertility soils.

^{2/} Resistant to root-knot nematodes.

^{3/} Tolerant of soil salinity and wind-borne salt.

^{4/} May have potential to become invasive.

^{5/} Pure Live Seed (PLS): The amount of PLS is equal to the percent purity multiplied by the percent germination.

^{6/} One bushel equals 1.25 cu. ft.

For rapid temporary cover, seed ryegrass at 10 lbs/PLS/ac or oats at 35 lbs/PLS/ac with the above species.

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**Table E. Herbaceous Wind Barriers (603)
Suitable Species (Page 1 of 2)**

Common Name/Cultivar	Scientific Name	Adapted Elevation (feet)	Adapted to Annual Rainfall ^{1/}	Min-Max Plant Spacing (inches w/in row X row)	Planting Material (per 1,000 feet of single row barrier)	Notes
Perennials Effective Height 12- 15 feet						
banagrass	<i>Pennisetum purpureum</i>	0 – 3,000	40+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Produces viable seed. Control volunteers. A potential pest in other grass crops. An up-right, tall strain of Napiergrass.
dwarf Brazilian banana, 'Santa Catarina Prata'	<i>Musa</i> sp.	0 – 3,500	50+	(60) X (72-120)	corm --201 each	Check State and local regulations about diseases of banana and possible quarantine.
Napiergrass, 'Mott'	<i>Pennisetum purpureum</i>	0 – 3,000	40+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Will not volunteer.
Napier x pearl millet hybrid, 'PMN Hybrid'	<i>Pennisetum purpureum</i> x <i>Pennisetum glaucum</i>	0 – 3,000	40+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Sterile seeds. Will not volunteer.
wild cane hybrid	<i>Saccharum</i> hybrid clone <i>Moentai</i>	0 – 3,000	35+	(6-12) X (12-24)	canes--one node overlap Minimum of 2 internodes per cane.	Sterile seeds. Will not volunteer. Can require a lot of trimming on lee side. Irrigating minimum amount for effective wind barrier reduces maintenance.
Annuals Effective Height 6 - 8 feet						
corn	<i>Zea mays</i>	0 – 4,000	40+	(6-12) X (9-18)	approx. 10 ounces / 1000 ft	Produces viable seed. Control volunteer. Recommend double row.
forage sorghum hybrids	<i>Sorghum bicolor</i>					Recommend double row for all forage sorghum hybrids.
'Garrison Bale-all III'		0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.

**Table E. Herbaceous Wind Barriers (603)
Suitable Plant Species (Page 2 of 2)**

Common Name/Cultivar	Scientific Name	Adapted Elevation (feet)	Adapted to Annual Rainfall ^{1/}	Min-Max Plant Spacing (inches w/in row X row)	Planting Material (per 1,000 feet of single row barrier)	Notes
Annuals Effective Height 6 - 8 feet						
sorghum x sudan hybrids ^{2/}	<i>Sorghum bicolor</i> x <i>S. bicolor</i> var. <i>sudanese</i>					Recommend double row for all sorghum-sudan hybrids.
'DeKalb ST-6E'		0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.
'DeKalb SX-17+'	.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross pollination.
'Funk 83-F'	.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Produces viable seed. Control volunteers.
'Germain Bravo'		0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Produces viable seed. Control volunteers.
'Germain SS-222'		0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Produces viable seed. Control volunteers.
Taylor Evans 'T-E Goldmaker'	.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.
'T-E Haygrazer'	.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Produces viable seed. Control volunteers.
'Warner Sweet Bee Sterile II'	.	0 – 2,500	40+	(3-6) X (9-18)	approx. 1.5 pounds/ 1000 ft	Sterile – Separate from other Sorghum by ¼ mile to prevent cross-pollination.

Note: Cultivars listed have been successful, however others may also be satisfactory. List is not all-inclusive. Species not included on the list may be used, based on prescriptions by qualified NRCS technical specialists.

^{1/} May require irrigation for establishment and during dry season.

^{2/} Resistant to root-knot nematodes.

**Table F. Pasture and Hay Planting (512)
Suitable Grass and Legume Species (Page 1 of 2)**

Species	Rainfall Range (inches)	Elevation Range (feet)	Seeding Rate ^{1/} (lbs PLS/ac)
Grasses/Cultivars			
alfalfa (<i>Medicago sativa</i>) 'CUF-101', 'Moapa 69' ^{8/} , 'WL-605', 'WL-656', 'WL-711WF' ^{8/ 11/}	50 - 100+	0 - 4,000	20
Bermudagrass ^{8/ 9/} : 'NK-37' (giant) (<i>Cynodon dactylon</i>)	20 – 100 (-170)	0 - 3,000	5
buffelgrass ^{8/} : 'T-4464', 'Gayndah' (<i>Cenchrus ciliaris</i>)	12 - 35	0 - 1,000	5
'Biloela', 'Nueces'	12 - 35	0 - 1,500	5
'Molopo'	12 - 35	0 - 3,000	5
'emoloa, kawelu, lovegrass ^{13/} (<i>Eragrostis variabilis</i>)	20 - 80	0 - 3,500	5
green panicgrass ^{8/} : 'Petrie' (<i>Urochloa maxima</i>)	25 - 70	0 - 2,500	5
guineagrass ^{10/} : 'Natsukazi' (<i>Urochloa maxima</i>)	35 - 100+	0 - 2,500	5
kikuyugrass ^{10/} : 'Whittet' ^{2/} (<i>Pennisetum clandestinum</i>)	40 - 120	0 - 6,000	5
orchardgrass (<i>Dactylis glomerata</i>)	40 - 100	3,000 - 7,000	10
perennial ryegrass: 'Linn', 'Tetraploid' (<i>Lolium perenne</i>)	40 - 100	1,500 - 7,000	20
piligrass ^{3/} (<i>Heteropogon contortus</i>)	15 – 45 (-90)	0 - 2,000	5
Rhodesgrass ^{9/} : 'Bell', 'Katambora', 'Nemkat' ^{8/} (<i>Chloris gayana</i>)	25 - 45	0 - 3,000	5
signalgrass ^{9/} : 'Basilick', 'Mulato', 'Mulato II' (<i>Urochloa brizantha</i>) (<i>Urochloa</i> spp. hybrids)	50 - 120	0 - 3,000	8
Legumes/Cultivars ^{4/}			
big trefoil: 'Grasslands Maku' (<i>Lotus pedunculatus</i>)	50 - 100	1,500 - 6,000	5
Intortum, desmodium: 'Greenleaf', 'Kuiaha' (<i>Desmodium intortum</i>)	60 - 120	0 - 3,000	5
shrubby stylo ^{14/} : 'Seca'	25 - 80	0 – 3,000	5
Spanish clover, kaimi clover, lattil pako ^{10/ 14/} (<i>Desmodium incanum</i>)	(40-) 60 - 120	0 - 3,000	5
white clover ^{5/} : 'Haifa', 'Grasslands Huia' (<i>Trifolium repens</i>)	35 - 80	1,500 - 7,000	5

**Table F. Pasture and Hay Planting (512)
Suitable Grass and Legume Species (Page 2 of 2)**

Species	Rainfall Range (inches)	Elevation Range (feet)	Planting Rate
Grasses Normally Established Vegetatively			
Baron's grass, paddlegrass, reh padil ^{10/ 12/ 14/ 15/} (<i>Ischaemum polystachyum</i>)	50 - 200	0 - 3,000	*
digitgrass ^{8/ 14/} : 'Mealani', 'Pangola' (<i>Digitaria eriantha</i>)	50 - 160	0 - 3,500	*
kikuyugrass ^{10/} (<i>Pennisetum clandestinum</i>)	40 - 120	0 - 6,000	*
Limpograss ^{15/} : 'Bigalta' (<i>Hemarthria altissima</i>)	60+	0 - 4,000	*
Napiergrass: 'Mott' ^{7/} (<i>Pennisetum purpurem</i>)	40+	0 - 3,000	*
stargrass, Puerto Rican ^{9/} : 'Florico' (<i>Cynodon nlemfuensis</i>)	20 - 80	0 - 3,000	*
stargrass, South Point ^{9/} (<i>Cynodon plectostachyus</i>)	20 - 80	0 - 3,000	*

Note: Cultivars indicated have been tried successfully; however, others may be satisfactory. This list is not all-inclusive. Other species may be selected for this practice based on prescriptions by qualified NRCS technical specialists.

* For hand planting or planting in furrows, place stolons in ground at maximum spacing of 6'X6'.

* For disked-in plants, use 40 bushels ^{6/} of material per acre.

^{1/} Minimum seeding rate, PLS (Pure Live Seed).

^{2/} Seed commercially available with required federal permit. Permit forms are available from commercial seed suppliers.

^{3/} Native to PI. For trial only. Piligrass seeds and awns may be harmful to animal mouth parts.

^{4/} Legumes must be inoculated with the correct *Rhizobium* culture before seeding.

^{5/} Will not tolerate highly acid soils (stronger than pH 5.5).

^{6/} One bushel equals 1.25 cu.ft.

^{7/} Suitable for grazing, cut and carry and green chop. Not well suited to haying.

^{8/} Resistant to root-knot nematodes.

^{9/} Tolerant of soil salinity and wind-borne salt.

^{10/} May have potential to become invasive.

^{11/} Resistant to silverleaf whitefly.

^{12/} Native to PI- West Area.

^{13/} Endemic to Hawaii. For trial only.

^{14/} Tolerates acid, low-fertility soils.

^{15/} Tolerates wet soil conditions.

**Table G. Range Planting (550)
Suitable Grass and Legume Species (Page 1 of 2)**

Species	Rainfall Range (inches)	Elevation Range (feet)	Seeding Rate ^{1/} (lbs PLS/ac)
Grasses/Cultivars			
buffelgrass ^{2/} : 'T-4464', 'Gayndah' (<i>Cenchrus ciliaris</i>)	12 - 35	0 - 1,000	2
'Biloela', 'Nueces'	12 - 35	0 - 1,500	2
'Molopo'	12 - 35	0 - 3,000	2
'emoloa, kawelu, lovegrass ^{11/} (<i>Eragrostis variabilis</i>)	15 - 80	0 - 3,500	2
giant bermudagrass ^{2/ 8/} : 'NK-37' (<i>Cynodon dactylon</i>)	20 - 100 (-170)	0 - 3,000	2
green panicgrass ^{2/} : 'Petrie' (<i>Urochloa maxima</i>)	25 - 70	0 - 2,500	2
guineagrass ^{9/} : 'Natsukazi' (<i>Urochloa maxima</i>)	35 - 100+	0 - 2,500	2
kikuyugrass ^{9/} : 'Whittet' ^{2/} (<i>Pennisetum clandestinum</i>)	40 - 120	0 - 6,000	2
orchardgrass (<i>Dactylis glomerata</i>)	40 - 100	3,000 - 7,000	4
perennial ryegrass: 'Linn', 'Tetraploid' (<i>Lolium perenne</i>)	40 - 100	1,500 - 7,000	5
piligrass ^{3/} (<i>Heteropogon contortus</i>)	15 - 45 (-90)	0 - 2,000	2
Rhodesgrass ^{8/} : 'Bell', 'Katambora', 'Nemkat' ^{2/} (<i>Chloris gayana</i>)	25 - 45	0 - 3,000	2
signalgrass ^{9/} : 'Basilick', 'Mulato', 'Mulato II' (<i>Urochloa brizantha</i>) (<i>Urochloa</i> spp. hybrids)	50 - 120	0 - 3,000	3
Legumes/Cultivars^{4/}			
big trefoil: 'Grasslands Maku' (<i>Lotus pedunculatus</i>)	50 - 100	1,500 - 6,000	2
intortum, desmodium: 'Greenleaf', 'Kuiaha' (<i>Desmodium intortum</i>)	60 - 120	0 - 3,000	2
shrubby stylo ^{12/} : 'Seca'	25 - 80	0 - 3,000	2
Spanish clover, kaimi clover, lattil pako ^{9/ 12/} (<i>Desmodium incanum</i>)	(40-) 60 - 120	0 - 3,000	2
white clover ^{5/} : 'Haifa', 'Grasslands Huia' (<i>Trifolium repens</i>)	35 - 80	1,500 - 7,000	2

**Table G. Range Planting (550)
Suitable Grass and Legume Species (Page 2 of 2)**

Species	Rainfall Range (inches)	Elevation Range (feet)	Planting Rate
Grasses Normally Established Vegetatively			
Baron's grass, paddlegrass, reh padil ^{9/ 10/ 12/ 13/} (<i>Ischaemum polystachyum</i>)	50 - 200	0 - 3,000	*
digitgrass ^{7/ 12/} : 'Mealani', 'Pangola' (<i>Digitaria eriantha</i>)	50 - 160	0 - 3,500	*
kikuyugrass ^{9/} (<i>Pennisetum clandestinum</i>)	40 - 120	0 - 6,000	*
limpograss ^{13/} : 'Bigalta' (<i>Hemarthria altissima</i>)	60+	0 - 4,000	*
Napiergrass: 'Mott' (<i>Pennisetum purpureum</i>)	40+	0 - 3,000	*
stargrass, Puerto Rican ^{8/} : 'Florico' (<i>Cynodon nlemfuensis</i>)	20 - 80	0 - 3,000	*
stargrass, South Point ^{8/} (<i>Cynodon plectostachyus</i>)	20 - 80	0 - 3,000	*

Note: Cultivars indicated have been tried successfully; however, others may be satisfactory. This list is not all-inclusive. Other species may be selected for this practice based on prescriptions by qualified NRCS technical specialists.*

* For hand planting or planting in furrows, place sprigs in ground at maximum spacing of 6'X6'.

* For disced-in plants, use 40 bushels ^{6/} of material per acre.

^{1/} Minimum seeding rate, PLS (Pure Live Seed).

^{2/} Seed commercially available with required federal permit. Permit forms are available from commercial seed suppliers.

^{3/} Native to PI. For trial only. Piligrass seeds and awns may be harmful to animal mouth parts.

^{4/} Legumes must be inoculated with the correct *Rhizobium* culture before seeding.

^{5/} Will not tolerate highly acid soils (stronger than pH 5.5).

^{6/} One bushel equals 1.25 cu.ft.

^{7/} Resistant to root-knot nematodes.

^{8/} Tolerant of soil salinity and wind-borne salt.

^{9/} May have potential to become invasive.

^{10/} Native to PI- West Area.

^{11/} Endemic to Hawaii. For trial only.

^{12/} Tolerates acid, low-fertility soils.

^{13/} Tolerates wet soil conditions.

**Table H. Recreation Area Improvement (562)
Suitable Grass Species (Page 1 of 1)**

Species/Cultivar	Shady Areas	Shoreline / Salty Areas	Normal Use Areas	Heavy Use Areas	Natural/ Unmowed Areas
'aki'aki, totopot ^{3/ 4/} (<i>Sporobolus virginicus</i>)		X	X		X
Bermudagrass ^{1/ 4/} (<i>Cynodon dactylon</i>)		X	X	X	
centipedegrass ^{2/} (<i>Eremochloa ophiuroides</i>)	X		X		
'emoloa, kawelu ^{5/} (<i>Eragrostis variabilis</i>)					X
kikuyugrass ^{2/} AZ-1 (<i>Pennisetum clandestinum</i>)			X		
paspalum 'Tropic Lalo' (<i>Paspalum hieronymii</i>)			X	X	
piligrass, tanglehead ^{3/} (<i>Heteropogon contortus</i>)					X
Rhodesgrass ^{4/} 'Bell', 'Katambora', 'Nemkat' ^{1/} (<i>Chloris gayana</i>)					X
seashore paspalum ^{2/ 4/} 'Tropic Shore' (<i>Paspalum vaginatum</i>)		X	X		X
St. Augustinegrass ^{2/ 4/} (<i>Stenotaphrum secundatum</i>)	X	X	X		
zoysiagrass ^{4/} 'El Toro' (<i>Zoysia japonica</i>)	X	X	X		

Note: Use planting rates recommended for Critical Area Planting. This list is not all-inclusive. Other species may be selected based on recommendations by a qualified NRCS technical specialist.

^{1/} Resistant to root-knot nematodes.

^{2/} May have potential to become invasive.

^{3/} Native to PI.

^{4/} Tolerant of soil salinity and wind-borne salt

^{5/} Endemic to Hawaii.

**Table I. Recreation Area Improvement (562)
Suitable Tree and Shrub Species (Page 1 of 1)**

Species	Scientific Name	Ornamental	Xeriscape	Shade	Hedge/Screen	Windbreak
'a'alii, lampuye ^{2/}	<i>Dodonaea viscosa</i>	X	X		X	X
'akia ^{2/}	<i>Wikstromia uva-ursi</i>	X	X			
alahe'e ^{2/}	<i>Canthium odoratum</i>	X	X		X	X
areca palm	<i>Chrysalidocarpus lutescens</i>	X			X	X
Bougainvillea ^{1/}	<i>Bougainvillea spectabilis</i>	X	X		X	
breadfruit, ulu ^{2/}	<i>Artocarpus communis</i>	X		X		X
Cook pine ^{1/}	<i>Araucara columnaris</i>	X				X
croton	<i>Codium variegatum</i>	X			X	X
eucalyptus	<i>Eucalyptus</i> spp.	X		X		X
false kamani, talie ^{2/}	<i>Terminalia catappa</i>	X		X		X
hala, ongor, fasa ^{1/ 2/}	<i>Pandanus tectorius</i>	X		X		X
hibiscus, aute ^{2/}	<i>Hibiscus</i> spp.	X			X	X
Ipil, ifilele, ifit, dort ^{2/}	<i>Intsia bijuga</i>	X		X		X
kamani, daok ^{1/ 2/}	<i>Calophyllum inophyllum</i>	X		X		X
koa ^{2/}	<i>Acacia koa</i>			X		X
koai'a ^{2/}	<i>Acacia koaia</i>		X	X		X
kou, niyoron ^{1/ 2/}	<i>Cordia subcordata</i>	X	X	X		X
kukui, lama ^{2/}	<i>Aleurites moluccana</i>	X		X		X
loulou palm ^{2/}	<i>Pritchardia</i> spp.	X	X			X
maneie, soapberry ^{2/}	<i>Sapindus saponaria</i>			X		X
ma'o ^{2/}	<i>Gossypium sandwicense</i>	X	X			
milo, binalo ^{1/ 2/}	<i>Thepesia populnea</i>	X	X	X		X
monkeypod	<i>Samanea saman</i>	X		X		
naio ^{1/ 2/}	<i>Myoporum sandwicense</i>	X	X		X	X
Naupaka, nanaso ^{1/ 2/}	<i>Scaevola sericea</i>	X	X		X	X
'ohi'a lehua ^{2/}	<i>Metrosideros polymorpha</i>	X		X		X
pink tecoma, trumpet	<i>Tabebuia</i> spp.	X		X		X
plumeria	<i>Plumeria</i> spp.	X		X		
shower tree	<i>Cassia</i> spp.	X		X		X
ti ^{2/}	<i>Cordyline fruticosa</i>	X			X	X
'ulei ^{1/ 2/}	<i>Osteomeles anthyllidifolia</i>	X	X			

Note: This list is not all-inclusive. Other species may be selected by qualified NRCS technical specialists.

^{1/} Tolerant of soil salinity and wind-borne salt.

^{2/} Native or aboriginal introduction.

Riparian Forest Buffer (391) Species Selection

To select suitable species for riparian forest buffer use the Riparian Restoration Plant Database, a management tool for habitat restoration in Hawaii. The program can be accessed via the internet at:

http://www.ctahr.hawaii.edu/rnre/Riparian_Restoration_Plant_Database.asp

To help ensure against loss of buffer due to fire, insects, diseases, and other destructive forces, and to ensure survival it is advisable to plant a variety of species with a variety of short and tall growth habits.

Species selected must be appropriate for the existing bank slope.

Species selected must also be appropriate for its intended purpose. If the sole purpose is to reduce sedimentation or nutrients, consider using an herbaceous planting practice if the existing cover is less than 75 percent.

Refer to the Riparian Forest Buffer Specification (Section IV FOTG) for information about buffer width and installation procedures.

**Table J. Tree/Shrub Establishment (612)
Suitable Tree and Shrub Species (Page 1 of 1)**

Species	Scientific Name	Elevation (1000')	Rainfall ^{1/} (inches)	Spacing in Feet	
				Minimum	Maximum
Height Class < 35'					
koai'a ^{2/ 3/}	<i>Acacia koaia</i>	0 – 2.5	20	6 x 6	12 x 12
kou, tauanave, galu, niyoron, koa, kalau, ikoik, ikoak, anau ^{2/}	<i>Cordia subcordata</i>	0 - .5	20+	10 x 10	20 x 20
mamane ^{2/ 3/}	<i>Sophora chrysophylla</i>	1.5 - 8	30+	6 x 6	12 x 12
milo, binalo, banalo, bang-beng, kilulo, rosewood, badrirt, panu, polo, pone ^{2/ 4/}	<i>Thespesia populnea</i>	0 - .5	20+	10 x 10	20 x 20
noni, nonu, lada, i, kesengel, nen, mangal'wag, Indian mulberry ^{2/ 4/}	<i>Morinda citrifolia</i>	0 – 1.5	30+	6 x 6	12 x 12
Height Class > 35'					
Cook pine ^{4/}	<i>Araucaria columnaris</i>	0 - 3	30+	10 x 10	20 x 20
ifit, ifil, ipil, ifilele, choyo, dort, kubok, kuren ^{2/ 5/}	<i>Intsia bijuga</i>	0 – 1.5	60+	10 x 10	20 x 20
kamani, daok, fetau, btaches, biyuch, eet, isou, lueg, rakich ^{2/ 4/}	<i>Calophyllum inophyllum</i>	0 – .5	20+	8 x 8	20 x 20
koa ^{2/ 3/}	<i>Acacia koa</i>	1.5 - 7	60+	8 x 8	20 x 20
mahogany	<i>Swietenia mahagoni</i> , <i>Swietenia macrophylla</i>	0 - 1	40+	10 x 10	20 x 20
monkeypod, filinganga, gumorni, tamalini ^{3/}	<i>Samanea saman</i>	0 - 1	40+	8 x 8	20 x 20
neem	<i>Azadirachta indica</i>	0 - 1	30+	10 x 10	20 x 20
Norfolk Island pine ^{4/}	<i>Araucaria heterophylla</i>	0 - 3	30+	10 x 10	20 x 20
'ohi'a lehua ^{2/}	<i>Metrosideros polymorpha</i>	0 - 8	60+	8 x 8	20 x 20
poumuli ^{6/}	<i>Flueggea flexuosa</i>	0 - 1	60+	10 x 10	20 x 20

NOTE: This table contains only examples of suitable species and is not all-inclusive. Many other species will be suitable. Consult a Forester or other qualified professional.

^{1/} Unless irrigated.

^{2/} Native or aboriginal introduction

^{3/} Nitrogen fixing tree.

^{4/} Tolerant of soil salinity and wind-borne salt.

^{5/} For PI- West Area and American Samoa.

^{6/} For American Samoa.

Table K. Upland Wildlife Habitat Management (645)
Typical Vegetation Used for Food, Nesting Cover, and Escape Cover
(Page 1 of 1)

Common Name	Scientific Name
bromegrass	<i>Bromus catharticus</i>
bristly foxtail	<i>Setaria verticillata</i>
piligrass ^{1/}	<i>Heteropogon contortus</i>
alfalfa	<i>Medicago sativa</i>
burclover	<i>Medicago polymorpha, M. hispida</i>
Australian saltbush	<i>Atriplex semibaccata</i>
Japanese tea	<i>Cassia leschenaultiana</i>
panini, prickly pear cactus	<i>Opuntia ficus-indica</i>
pigeon pea	<i>Cajanus cajan</i>
sheep sorrel	<i>Rumex acetosella</i>
white clover	<i>Trifolium repens</i>
'a'ali'i, lampuye	<i>Dodonaea viscosa</i>
'akia ^{1/}	<i>Wikstroemia</i> sp.
'ilima ^{1/}	<i>Sida fallax</i>
mamani ^{1/}	<i>Sophora chrysophylla</i>
'ohelo ^{1/}	<i>Vaccinium reticulatum</i>
popolo ^{1/}	<i>Solanum americanum</i>
pukiawe ^{1/}	<i>Styphelia tameiameia</i>
'uhaloa, escobilla sabana ^{1/}	<i>Waltheria indica</i>
Vasey's grass	<i>Paspalum urvillei</i>

Not all-inclusive. Other grains and noninvasive species can be used, with the concurrence of NRCS PI Biologists or local Division of Forestry and Wildlife staff.

^{1/} Native.

**Table L. Vegetative Barrier (601)
Suitable Species (Page 1 of 1)**

Common Name/Cultivar	Scientific Name	Approximate Stem Diameter (in.)	Approximate Mature Height (ft.)	Adapted Elevation (ft.)	Adapted to Annual Rainfall ^{1/}
banagrass ^{2/}	<i>Pennisetum purpureum</i>	0.83	15	0 - 3,000	40+
greenpanicgrass ^{2/ 5/}	<i>Urochloa maxima</i>	0.19	5	0 - 2,500	25 - 70
lemongrass	<i>Cymbopogon citratus</i>	0.19	4	0 - 4,000	50+
Napiergrass 'Mott' ^{4/}	<i>Pennisetum purpureum</i>	0.55	12	0 - 3,000	40+
Napier x pearl millet hybrid ^{4/} 'PMN Hybrid'	<i>Pennisetum purpureum</i> x <i>Pennisetum glaucum</i>	0.53	12 - 15	0 - 3,000	40+
piligrass ^{2/ 3/}	<i>Heteropogon contortus</i>	0.18	5	0 - 2,000	15 - 45
Rhodesgrass ^{2/ 6/} 'Bell', 'Katambora', 'Nemkat' ^{5/}	<i>Chloris gayana</i>	0.19	5	0 - 3,000	25 - 45
vetivergrass ^{5/ 6/} 'Sunshine' ^{4/}	<i>Chrysopogon zizanioides</i>	0.36	8	0 - 3,000	35+
wild cane hybrid ^{4/}	<i>Saccharum</i> hybrid clone <i>Moentai</i>	0.70	15	0 - 3,000	35+

Note: This list is not all-inclusive. Other species may be used for this practice based on prescriptions by qualified NRCS technical specialists.

^{1/} Irrigation required if average annual precipitation is below specified amount or as needed for normal growth.

^{2/} Spreads by windblown seed. Control measures may be needed on cropland if plants are allowed to produce viable seed.

^{3/} Native.

^{4/} Sterile seeds. Will not volunteer.

^{5/} Resistant to root-knot nematodes.

^{6/} Tolerant of soil salinity and wind-borne salt.

**Table M. Wetland Wildlife Habitat Management (644)
Wetland Species Preferred by Water and Migratory Birds (Page 1 of 1)**

Plant Species	Edible Parts	Habitat
<i>Cyperus javanicus</i> (marsh cyperus)	Nuts	Coastal marshes, taro lo'i
<i>Cyperus polystachyos</i>	Nuts	Freshwater to brackish
<i>Echinochloa crus-galli</i> (barnyardgrass)	Inflorescence, leaves	Freshwater, taro lo'i
<i>Echinochloa colona</i> (jungle rice)	Inflorescence, leaves	Freshwater
<i>Eleocharis geniculata</i> (spike rush)	Nuts	Freshwater
<i>Eragrostis</i> spp.	Inflorescence	Freshwater to brackish
<i>Fimbristylis</i> sp.	Nuts	Freshwater to brackish
<i>Juncus effuses</i> (soft rush)	Inflorescence	Freshwater
<i>Oryza sativa</i> (rice)	Inflorescence, leaves	Freshwater
<i>Paspalum orbiculare</i> (ricegrass)	Inflorescence	Freshwater to brackish
<i>Polygonum</i> spp.	Inflorescence	Freshwater
<i>Scirpus</i> sp.	Nuts, stems	Most species are freshwater
<i>Scleria</i> spp.	Nuts	Freshwater to brackish

(NOT ALL-INCLUSIVE)

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**Table N. Windbreak/Shelterbelt Establishment (380)
Suitable Species (Page 1 of 3)**

Common Name	Scientific Name	Relative Growth Rate	Approx. 20-year Height (feet)	Adaptation	
				Elevation (feet)	Rainfall ^{1/} (inches)
Height Class Short (S)= height to 20 feet (spacing between plants within row: 2 to 6 feet)					
'a'ali'i, lampuye ^{8/}	<i>Dodonaea viscosa</i>	Moderate	10	0 - 7,000	20+
alaha'e ^{8/}	<i>Canthium odoratum</i>	Moderate	15	0 - 3,000	40+
beach heliotrope, hunig ^{10/}	<i>Tournefortia argentea</i>	Moderate	20	0 - 1,000	30+
beefsteak	<i>Acalypha wilkensis</i> var. <i>marginata</i>	Rapid	15	0 - 4,000	30+
blue vitex, nanulega ^{10/}	<i>Vitex trifolia</i> var. <i>variegata</i>	Rapid	15	0 - 4,000	30+
croton	<i>Codium variegatum</i>	Slow	15	0 - 2,500	40+
dracaena	<i>Dracaena fragrans</i> or <i>D. dermensis</i>	Moderate	15	0 - 2,000	50+
dwarf brassaia	<i>Schefflera arboricola</i>	Rapid	20	0 - 1,000	30+
heen naran (sdy. tangerine)	<i>Citrus lycopersicaeformis</i>	Slow	15	0 - 1,500	30+
hibiscus, Chinese, aute	<i>Hibiscus rosa-sinensis</i>	Moderate	15	0 - 3,000	30+
hibiscus, Hawaiian white ^{5/}	<i>Hibiscus</i> spp.	Moderate	15	0 - 3,000	30+
naio ^{8/ 10/}	<i>Myoporum sandwicense</i>	Slow	15	0 - 7,500	30+
naupaka, nanaso ^{8/ 10/}	<i>Scaevola sericea</i>	Moderate	10	0 - 1,000	30+
noni, nonu, lada, Indian mulberry, kesengel ^{8/ 10/ 11/}	<i>Morinda citrifolia</i>	Moderate	20	0 - 1,500	30+
oleander, oliana ^{2/ 10/}	<i>Nerium oleander</i>	Rapid	15	0 - 3,000	30+
shell ginger	<i>Alpinia zerumbet</i>	Moderate	10	0 - 2,500	40+
ti ^{8/}	<i>Cordyline fruticosa</i>	Moderate	10	0 - 6,000	30+
Height Class Medium (M)= height 20 to 40 feet (spacing between plants within row: 3 to 10 feet)					
ahgao, aloalo, topwuk, fienkack, nior, false elder ^{8/}	<i>Premna obtusifolia</i>	Moderate	25	0 - 1,000	50+
Australian brush-cherry	<i>Syzygium paniculatum</i>	Moderate	25	0 - 3,000	50+
areca palm	<i>Chrysalidocarpus lutescens</i>	Slow	25	0 - 2,000	40+
avocado ^{3/}	<i>Persea americana</i>	Moderate	30	0 - 2,000	30+
breadfruit, ulu, lemai ^{8/}	<i>Artocarpus altilis</i>	Slow	40	0 - 1,000	40+
copalchi croton	<i>Croton reflexifolius</i>	Moderate	30	0 - 2,500	40+
dwarf coconut palm, niu, nu lius, iru, lu, ni, niyog, nizok	<i>Cocos nucifera</i>	Slow	30	0 - 1,500	20+
fishtail palm	<i>Caryota mitis</i>	Moderate	40	0 - 1,000	60+
gliricidia, madre de cacao ^{7/}	<i>Gliricidia sepium</i>	Rapid	30	0 - 3,000	25+
hala, ongor, fasa ^{8/ 10/}	<i>Pandanus tectorius</i>	Moderate	30	0 - 500	40+
koai'a ^{7/ 8/}	<i>Acacia koaia</i>	Moderate	25	0 - 2,500	20+
kou, tauanave, niyoron ^{8/ 10/}	<i>Cordia subcordata</i>	Moderate	35	0 - 500	20+
Macarthur palm	<i>Ptychosperma macarthurii</i>	Slow	30	0 - 2,000	20+
mamane ^{5/ 7/}	<i>Sophora chrysophylla</i>	Moderate	40	1,500 - 8,000	30+

**Table N. Windbreak/Shelterbelt Establishment (380)
Suitable Species (Page 2 of 3)**

Common Name	Scientific Name	Relative Growth Rate	Approx. 20-year Height (feet)	Adaptation	
				Elevation (feet)	Rainfall ^{1/} (inches)
milo, binalo, rosewood, badrirt, banalo, kilulo, panu, polo, pone, bang-beng ^{8/ 10/ 11/}	<i>Thespesia populnea</i>	Moderate	35	0 - 500	20+
panax, tanitani ^{9/}	<i>Polyscias guilfoylei</i>	Moderate	25	0 - 2,000	30+
podocarpus fern pine ^{3/}	<i>Podocarpus gracilior</i>	Moderate	40	0 - 1,500	60+
seagrape ^{10/}	<i>Coccoloba uvifera</i>	Moderate	25	0 - 1,000	30+
Height Class Tall (T)= height greater than 40 feet (spacing between plants within row: 6 to 15 feet)					
brushbox	<i>Lophostemon confertus</i>	Rapid	60	0 - 3000	40+
callitris	<i>Callitris</i> spp.	Slow	100	100 - 2000	50+
Chinese fir	<i>Cunninghamia lanceolata</i>	Moderate	80	2,000 - 6,000	40+
coconut palm, niu, lius, iru, lu, ni, niyog, nizok, nu ^{8/ 10/}	<i>Cocos nucifera</i>	Slow	60	0 - 1,500	20+
Cook pine ^{10/}	<i>Araucaria columnaris</i>	Moderate	100	0 - 3,000	30+
false kamani, talie, talisai, miich, tropical almond ^{8/ 10/}	<i>Terminalia catappa</i>	Moderate	85	0 - 1,000	40+
ferntree	<i>Filicium decipiens</i>	Moderate	45	0 - 1,000	60+
ifit, ifil, ipil, ifilele, choyo, dort, kubok, kuren ^{8/ 13/}	<i>Intsia bijuga</i>	Moderate	50	0 - 1,500	60+
ironwood, toa, gagu, laash, ngas, mejinoki, weeku ^{7/ 10/ 11/ 12/}	<i>Casuarina equisetifolia</i>	Rapid	70	0 - 2,500	30+
Italian cypress	<i>Cupressus sempervirens</i>	Slow	60	0 - 4,000	30+
jackfruit	<i>Artocarpus heterophyllum</i>	Moderate	50	0 - 3,000	60+
Japanese sugi pine	<i>Cryptomaria japonica</i>	Moderate	70	1,500 - 6,000	50+
kamani, daok, btaches, fetau, biyuch, eet, isou, lueg, rakich ^{8/ 10/}	<i>Calophyllum inophyllum</i>	Slow	60	0 - 500	20+
koa ^{5/ 7/}	<i>Acacia koa</i>	Slow	75	1,500 - 7,000	50+
kukui, lama, lumbang, sakan, raguar, candlenut tree ^{4/ 8/ 11/}	<i>Aleurites moluccana</i>	Moderate	50	0 - 2,000	30+
Lawson's cypress	<i>Chamaecyparis lawsoniana</i>	Moderate	50	2,500 - 6,000	40+
mahogany ^{10/}	<i>Swietenia mahagoni</i>	Slow	60	0 - 1,000	40+
mahogany (broad-leaved)	<i>Swietenia macrophylla</i>	Moderate	60	0 - 1,000	40+
maneie, soapberry ^{8/}	<i>Sapindus saponaria</i>	Moderate	60	0 - 4,000	50+
mango, kangit, idele, mago, mangueira	<i>Magnifera indica</i>	Slow	60	0 - 2,000	40+
Monterey cypress ^{6/}	<i>Cupressus macrocarpa</i>	Slow	70	1,500 - 5,000	40+
Norfolk Island pine ^{10/}	<i>Araucaria heterophylla</i>	Moderate	100	1,500 - 3,000	30+

**Table N. Windbreak/Shelterbelt Establishment (380)
Suitable Species (Page 3 of 3)**

Common Name	Scientific Name	Relative Growth Rate	Approx. 20-year Height (feet)	Adaptation	
				Elevation (feet)	Rainfall ^{1/} (inches)
'ohi'a lehua ^{8/}	<i>Metrosideros polymorpha</i>	Slow	80	0 - 8,000	60+
pink tecoma	<i>Tabebuia heterophylla</i>	Moderate	45	0 - 500	20+
Portuguese (Mexican) cypress	<i>Cupressus lusitanica</i>	Moderate	45	0 - 3,000	40+
poumuli ^{14/}	<i>Flueggea flexuosa</i>	Moderate	45	0 - 1,000	60+
small cone ironwood ^{7/ 11/}	<i>Casuarina cunninghamiana</i>	Rapid	70	0 - 3,000	30+
tamarind ^{7/ 10/}	<i>Tamarindus indica</i>	Slow	75	0 - 1,000	30+
turpentine tree	<i>Syncarpia glomulifera</i>	Moderate	70	0 - 2,000	40+

Note: This list is not all-inclusive. Species other than those listed may be selected for this practice based on prescriptions by qualified technical specialists.

^{1/} Minimum moisture requirement.

^{2/} Sap is poisonous.

^{3/} Must be grown from seed for windbreak use. May need staking the first year.

^{4/} May break branches during high winds.

^{5/} Endemic to Hawaii

^{6/} Use in deeper soils only.

^{7/} Nitrogen fixing tree.

^{8/} Native or aboriginal introduction.

^{9/} Ground termites can get into the dead wood portion of the stem.

^{10/} Tolerant of soil salinity and wind-borne salt.

^{11/} May have potential to become invasive.

^{12/} Native to PI- West Area. Aboriginal introduction to American Samoa. Not recommended for Hawaii.

^{13/} For PI- West Area and American Samoa.

^{14/} For American Samoa.

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