18130

Hawai'i Lowland Dry Forest

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zones

79

Geographic Range

This lowland forest ecological system occurs on dry slopes of the main Hawaiian Islands.

Biophysical Site Description

This ecological system occurs on dry slopes of the main islands generally from 15-1,000m (50-3,280ft) elevation, but may extend to 1,500m (4,920ft) (Gagne and Cuddihy 1990). Stands typically occur on the leeward sides of islands where there is a strong rain shadow effect from high mountains that reduce precipitation from moisture laden trade winds. Annual rainfall is generally 500-1,500mm. Substrates include well-drained, sandy loam soils derived from volcanic ash or cinder and weathered ‘a‘ā or pāhoehoe basaltic lava.

Vegetation Description

Vegetation is characterized by an open-to-dense tree layer typically dominated or co-dominated by a variety of mostly evergreen trees and diverse shrubs, ferns, and lianas depending on location and age of stands. Lowland dry and mesic forest are exceptionally rich in tree species. Widespread species *Metrosideros polymorpha* is a constituent or may co-dominate in relatively young stands. Late seral stands are dominated by *Diospyros sandwicensis* and less commonly *Colubrina oppositifolia*. In driest settings supporting trees, summer deciduous *Erythrina sandwicensis* may dominate. Other characteristics trees include *Acacia koaia*, *Canthium odoratum*, *Alphitonia ponderosa*, *Reynoldsia sandwicensis*, *Gardenia brighamii*, *Nestegis sandwicensis*, *Nesoluma polynesica*, *Pleomele* spp., *Rauvolfia sandwichensis*, *Santalum* spp., *Sophora chrysophylla*, *Pouteria sandwicensis*, *Hibiscadelphus* spp., *Kokia* spp., and *Sapindus oahuensis*. Native shrubs include *Dodonaea*, *Styphelia*, *Osteomeles*, *Sida*, *Waltheria*, *Nothocestrum* spp., *Nototrichium*, *Achyranthes*, *Myrsine lanaiensis*, *Wikstroemia* spp., *Plumbago zeylanica*, *Senna gaudichaudii*, *Plectranthus australis*, *Lipochaeta* spp., *Tetramolopium* spp., and *Chamaesyce* spp. Native vines include *Ipomoea* spp., *Cocculus trilobus*, *Bonamia menziesii*, and *Canavalia* spp. Native ferns include *Doryopteris* and *Pellaea ternifolia*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| MEPO5 | *Metrosideros polymorpha* | 'ohi'a lehua |
| DISA10 | *Diospyros sandwicensis* | Lama |
| COOP | *Colubrina oppositifolia* | Kauila |
| ACKO2 | *Acacia koaia* | Koaoha |
| CAOD2 | *Canthium odoratum* | Alahe'e |
| SAEL2 | *Santalum ellipticum* | Coastal sandalwood |
| SAOA2 | *Sapindus oahuensis* | Lonomea |
| ERSA11 | *Erythrina sandwicensis* | Wili wili |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Severe weather (windthrow), drought, fire, landslides, Polynesian rat, all suppress reproduction or induce gaps, lowering tree cover; repeated fire results in forest conversion to shrubland and grassland. Wood harvested from dry forest for fuel leads to canopy breaks and subsequent opening of the closed forest structure.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 81 | 26 |  |  |
| Moderate (Mixed) | 28 | 74 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 21 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

This system was once widespread in dry settings.

Adjacency or Identification Concerns

This type can be adjacent to dry and mesic shrubland, forest and woodland; dry grassland.

Issues or Problems

Today, almost all native lowland dry forests have been degraded and include some invasive exotic woody species such as *Lantana camara*, *Leucaena leucocephala*, and *Schinus terebinthifolius*, and widespread exotic grasses such as *Andropogon virginicus*, *Pennisetum setaceum*, and *Schizachyrium condensatum*. Where substrate is rocky, lichens are often common.

Native Uncharacteristic Conditions

It is uncharacteristic within this type to have trees with <25% canopy cover.

Comments

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | D | D | D | D | D | D | D | D |
| Shrub | 0.5-1.0 | A | A | D | D | D | D | D | D | D | D |
| Shrub | 1.0-3.0 | A | A | D | D | D | D | D | D | D | D |
| Shrub | >3.0 | A | A | D | D | D | D | D | D | D | D |
| Tree | 0-5 | UN | UN | B | B | B | B | D | D | D | D |
| Tree | 5-10 | UN | UN | E | E | E | E | C | C | C | C |
| Tree | 10-25 | UN | UN | E | E | E | E | C | C | C | C |
| Tree | 25-50 | UN | UN | E | E | E | E | C | C | C | C |
| Tree | >50 | UN | UN | E | E | E | E | C | C | C | C |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 3 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| MEPO5 | Metrosideros polymorpha | 'ohi'a lehua | Upper |
| WAIN | Waltheria indica | Uhaloa | Lower |
| DORYO | Doryopteris | Doryopteris | Lower |
| POPE5 | Polypodium pellucidum | Dotted polypody | Lower |

Description

This class consists of bare substrate, early succession of ferns, shrubs, and sapling trees, cryptogams.

*Maximum Tree Size Class*  
None

Class B 21 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| MEPO5 | Metrosideros polymorpha | 'ohi'a lehua | Upper |
| DOVI | Dodonaea viscosa | Florida hopbush | Middle |
| HECO10 | Heteropogon contortus | Tanglehead | Lower |
| OSAN | Osteomeles anthyllidifolia | Hawai'i hawthorn | Low-Mid |

Description

This class is representative of open woodland over mixed shrubs, grasses, and ferns.

*Maximum Tree Size Class*  
None

Class C 16 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| MEPO5 | Metrosideros polymorpha | 'ohi'a lehua | Upper |
| DISA10 | Diospyros sandwicensis | Lama | Upper |
| MYLA3 | Myrsine lanaiensis | Lanai colicwood | Upper |
| ERSA11 | Erythrina sandwicensis | Wili wili | Upper |

Description

This class is representative of open-to-closed forest with good mix of dry tree species over mixed shrubs, ferns, grasses.

*Maximum Tree Size Class*  
None

Class D 35 Late Development 2 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| HECO10 | Heteropogon contortus | Tanglehead | Upper |
| DOVI | Dodonaea viscosa | Florida hopbush | Upper |
| WAIN | Waltheria indica | Uhaloa | Lower |
| SIFA | Sida fallax | Yellow llima | Middle |

Description

Fire-disturbed grassland; trees, and shrubs killed or suppressed.

*Maximum Tree Size Class*  
None

Class E 25 Late Development 3 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| MEPO5 | Metrosideros polymorpha | 'ohi'a lehua | Upper |
| DISA10 | Diospyros sandwicensis | Lama | Upper |
| MYLA3 | Myrsine lanaiensis | Lanai colicwood | Upper |
| ERSA11 | Erythrina sandwicensis | Wili wili | Upper |

Description

Forests in this successional stage have typically been opened by harvesting and in-forest agriculture.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Mid1:OPN | 30 |
| Late2:OPN | 1 | Mid1:OPN | 30 |
| Mid1:OPN | 31 | Late1:CLS | 50 |
| Late1:CLS | 51 | Late1:CLS | 999 |
| Late3:OPN | 51 | Late1:CLS | 300 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Optional 1 | Early1:OPN | Early1:OPN | 0.001 | 1000 | No | 0 |
| Optional 1 | Mid1:OPN | Early1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Late2:OPN | 0.02 | 50 | Yes | 0 |
| Optional 1 | Late1:CLS | Early1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Late1:CLS | Late2:OPN | 0.02 | 50 | Yes | 0 |
| Optional 2 | Late1:CLS | Late3:OPN | 0.0333 | 30 | Yes | 0 |
| Optional 1 | Late2:OPN | Early1:OPN | 0.001 | 1000 | Yes | 0 |
| Mixed Fire | Late2:OPN | Late2:OPN | 0.1 | 10 | No | 0 |
| Optional 1 | Late3:OPN | Early1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Late3:OPN | Late2:OPN | 0.02 | 50 | Yes | 0 |

Optional Disturbances

Optional 1: Lava Flows

Optional 2: Harvesting & Agriculture

References

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