18130
Hawai'i Lowland Dry Forest

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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 ʻaʻā 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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