

18090

Hawai'i Montane Cloud Forest

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Modelers		Reviewers	
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Vegetation Type

Forest and Woodland

Map Zones

79

Geographic Range

This system is found from 1,065-1,830m (3,500-6,000ft) elevation on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i.

Biophysical Site Description

Hawai'i Montane Cloud Forest occurs between 1,065-1,830m (3,500-6,000ft) elevation as a large-patch mosaic on windward aspects of all high islands that receive evenly distributed orographically derived rainfall exceeding 2,500mm (99in) annually. Montane cloud forests are defined by the regular presence of clouds, low stature of the tree canopy, the abundance of epiphytes, and the significant proportion by which those passing clouds contribute fog water (fog drip) to total annual precipitation (up to 1,073mm [42in]). Regular fog drip sustains relatively constant streamflow and shallow groundwater hydrology in montane forests, particularly during dry seasons. Hawai'i cloud forests occur on older volcanic substrates that are nutrient-poor and lateritic due to leaching. They generally have a gley layer 10-70cm (4-28in) thick with an organic overlay that vary from 10-30cm (4-12in) deep.

Vegetation Description

This ecological system is rich in species, with multiple species represented in each of several genera of shrubs and ferns. Vegetation is dominated by low stature *Metrosideros polymorpha* and *Cheirodendron* spp. (specifically *C. platyphylla* on O'ahu and *C. dominii* on Kaua'i), which form a low to medium-height canopy from 3-40m high. Subdominant tree species include *Ilex anomala*, *Alyxia oliviformis*, and shrubs: *Clermontia* spp., *Cyanea* spp., *Dubautia platyphylla*, *Korthalsella* spp., *Myrsine* spp., *Trematolobelia* spp., *Smilax melastomifolia*, *Stenogyne* spp., *Phyllostegia* spp., and *Vaccinium* spp. This system supports an abundance of epiphytic shrubs, ferns, mosses and bryophytes. Species that act as epiphytes include *Astelia menziesiana*, *Peperomia* spp., and thick mats of bryophytes. Ferns include *Dicranopteris linearis*, *Cibotium* spp., *Astelia*, *Adenophorum*, and *Elaphoglossum* spp. Cloud forests are distinguished from montane rainforests by the low stature of the tree canopy and the presence of ground-level clouds for a portion of nearly every day. Cloud forests generally support more epiphytes than montane rainforests.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
MEPO5	<i>Metrosideros polymorpha</i>	'ohi'a lehua
CHEIR	<i>Cheirodendron</i>	Cheirodendron
ILAN	<i>Ilex anomala</i>	Hawai'i holly
ALOL2	<i>Alyxia oliviformis</i>	Maile
NEGR2	<i>Nertera granadensis</i>	Makole
ASME4	<i>Astelia menziesiana</i>	Pua'akuhinia
DILI	<i>Dicranopteris linearis</i>	Old world forkedfern
TREMA 2	<i>Trematolobelia</i>	False lobelia

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

Disturbance Description

The major disturbance factors in this system are from climatic factors, particularly hurricanes and drought.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement				
Moderate (Mixed)				
Low (Surface)				
All Fires				

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

Adjacency or Identification Concerns

Hawai'i Montane Cloud Forest is similar to Hawaiian Montane Wet Forest, but this community is generally found only on wet wind-exposed upper slopes of the major Hawaiian Islands, and is characterized by a low-stature tree canopy and thick mats of bryophytes and epiphytes.

Issues or Problems

Native Uncharacteristic Conditions

Comments

Additional modelers include: Wayne Ching (wayne.f.ching@hawaii.gov); Andrew Beavers (Andrew.Beavers@ColoState.EDU); Richard Nezelek (rnezelek@pdc.org); Glenn Shishido (Glenn.N.Shishido@hawaii.gov); Ron Cannarella (Ronald.J.Cannarella@hawaii.gov); Dawn Greenlee (Dawn_Greenlee@fws.gov); and Keith Schulz (keith_schulz@naturereserve.org)

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	A	A	A	A	A	A	A	A
Shrub	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Shrub	1.0-3.0	A	A	A	A	A	A	A	A	A	A
Shrub	>3.0	A	A	A	A	A	A	A	A	A	A
Tree	0-5	A	A	A	A	A	A	A	A	A	A
Tree	5-10	B	B	B	B	B	B	C	C	C	C
Tree	10-25	D	D	D	D	D	D	E	E	E	E
Tree	25-50	D	D	D	D	D	D	E	E	E	E
Tree	>50	D	D	D	D	D	D	E	E	E	E

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leaf form 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 5 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
MEPO5	<i>Metrosideros polymorpha</i>	'ohi'a lehua	Upper
CHEIR	<i>Cheirodendron</i>	Cheirodendron	Upper
DILI	<i>Dicranopteris linearis</i>	Old world forkedfern	Mid-Upper
TREMA2	<i>Trematolobelia</i>	False lobelia	Low-Mid

Description

This system is found from 1,065-1,830m (3,500-6,000ft) elevation on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. This ecological system is rich in species, with multiple species represented in each of several genera of shrubs and ferns. Vegetation is dominated by low stature *Metrosideros polymorpha* and *Cheirodendron* spp. (specifically *C. platyphylla* on O'ahu and *C. dominii* on Kaua'i), which form a low to medium-height canopy from 3-40m high. Subdominant tree species include *Ilex anomala*, *Alyxia oliviformis*, and shrubs: *Clermontia* spp., *Cyanea* spp., *Dubautia platyphylla*, *Korthalsella* spp., *Myrsine* spp., *Trematolobelia* spp., *Smilax melastomifolia*, *Stenogyne* spp., *Phyllostegia* spp., and *Vaccinium* spp. This system supports an abundance of epiphytic shrubs, ferns, mosses and bryophytes. Species that act as epiphytes include *Astelia menziesiana*, *Peperomia* spp., and thick mats of bryophytes. Ferns include *Dicranopteris linearis*, *Cibotium* spp., *Astelia*, *Adenophorum*, and *Elaphoglossum* spp. Cloud forests are distinguished from montane rainforests by the low stature of the tree canopy and the presence of ground-level clouds for a portion of nearly every day. Cloud forests generally support more epiphytes than montane rainforests. Cloud forests in the Kohala section of the island of Hawai'i

Maximum Tree Size Class
Medium 9-21"DBH

Symbol	Scientific Name	Common Name	Canopy Position
MEPO5	<i>Metrosideros polymorpha</i>	'ohi'a lehua	Upper
VIMA6	<i>Viola maviensis</i>	Hawaii'i bog violet	Lower

					Age After Disturbance?	
Optional 2	Early1:ALL	Early1:ALL	0.001	1000	No	0
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.004	250	No	0
Optional 2	Mid1:OPN	Early1:ALL	0.001	1000	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.004	250	No	0
Optional 2	Mid1:CLS	Early1:ALL	0.001	1000	Yes	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.004	250	Yes	0
Optional 2	Late1:OPN	Early1:ALL	0.001	1000	Yes	0
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.004	250	No	0
Optional 2	Late1:CLS	Early1:ALL	0.001	1000	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.004	250	Yes	0

Optional Disturbances

Optional 1: Landslides

References

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