18280

Hawai'i Subalpine Mesic Shrubland

BpS Model/Description Version: Aug. 2020

Update: 6/5/2018

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Jim Jacobi | jim\_jacobi@usgs.gov |  |  |
| Dawn Greenlee | Dawn\_Greenlee@fws.gov |  |  |
| Sam Gon III | sgon@tnc.org |  |  |

Vegetation Type

Shrubland

Map Zones

79

Geographic Range

These mesic shrublands have a narrow range and are found in a relative narrow subalpine band on mesic slopes of the windward side of Haleakala on eastern Maui, Hawai'i. This ecological system can also be found on the outer north slopes of Haleakala Crater, from 1,950-2,300m elevation. Sites include ridges and upper slopes that are dissected.

Biophysical Site Description

This montane to subalpine ecological system occurs within the seasonal mesic zone (zone 4) of the seven moisture zones developed for the Hawai'ian Islands by Price et al. (2007). This ecological system occurs on mesic, windward slopes of eastern Maui and outer north slopes of Haleakala Crater, from 1,950-2,300m elevation. Sites include ridges and upper slopes that are dissected. The thin cinder-derived soil has many rock outcrops. Annual precipitation is 1,300-1,900mm with rain distributed fairly evenly throughout the year. The thin cinder-derived soil has many rock outcrops (Gagne and Cuddihy 1990, J. Jacobi pers. comm.).

Vegetation Description

Vegetation is a closed shrubland dominated by *Sadleria cyatheoides* and *Vaccinium calycinum*. At higher elevations and on ridges, there is a single shrub layer 1-1.2m tall; at lower elevation, stands often have two shrub layers: a tall *Vaccinium*-dominated shrub layer (2 m tall) emergent over a 1-m tall dense shrub layer dominated by other shrubs. Other characteristic shrubs include *Coprosma ernodeoides*, *Geranium multiflorum*, *Rubus hawaiensis*, *Rubus macraei*, and *Vaccinium reticulatum*. *Lycopodium venustulum* is important in the Kipahulu Valley stands. Herbaceous species are generally sparse, e.g., *Deschampsia nubigena* and *Fragaria chiloensis* ssp. *sandwicensis*. Ferns include *Dryopteris wallichiana* and *Pteridium aquilinum*. Diagnostic species for this system are *Vaccinium calycinum*, *Geranium multiflorum, Rubus hawaiensis*, and *Rubus macraei*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ARGR5 | *Argyroxiphium grayanum* | Hana forest silversword |
| SACY3 | *Sadleria cyatheoides* | Amaumau fern |
| GEMU | *Geranium multiflorum* | Manyflower geranium |
| RUMA6 | *Rubus macraei* | 'akala |
| RUHA | *Rubus hawaiensis* | Hawai'i blackberry |
| VARE | *Vaccinium reticulatum* | Ohelo 'ai |
| LUHA2 | *Luzula hawaiiensis* | Hawai'i woodrush |
| FRCHS2 | *Fragaria chiloensis ssp. sandwicensis* | Sandwich beach strawberry |

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

Disturbance Description

Primary disturbances include landslides, mixed-severity fire, and storms. Storms, however, do not have enough of an impact to change the vegetation because these are dense sheltered shrublands and as a result windthrow is not a factor. Lava flows are probably not as important as in other systems. Fires are lightning initiated, or carried from adjacent dry or mesic types.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement |  |  |  |  |
| Moderate (Mixed) | 51 | 100 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 51 | 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

Adjacency or Identification Concerns

This system can be found adjacent to montane mesic forest and, in some cases, cliff systems. Located below this system are mesic or lowland rainforest ecosystems and above it are subalpine dry shrublands.

Issues or Problems

Native Uncharacteristic Conditions

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 | 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 | B | B | B | B | B | B | C | C | C | C |
| Shrub | >3.0 | B | B | B | B | B | B | C | C | C | C |
| Tree | 0-5 | C | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | C | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | C | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | C | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | C | UN | UN | UN | UN | UN | UN | UN | UN | UN |

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 2 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SACY3 | Sadleria cyatheoides | Amaumau fern | Upper |
| VARE | Vaccinium reticulatum | Ohelo 'ai | Upper |

Description

Cinder and rock outcrops, early successional.

*Maximum Tree Size Class*  
None

Class B 8 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SACY3 | Sadleria cyatheoides | Amaumau fern | Upper |
| VARE | Vaccinium reticulatum | Ohelo 'ai | Upper |
| LUHA2 | Luzula hawaiiensis | Hawai'i woodrush | Lower |
| GEMU | Geranium multiflorum | Manyflower geranium | Upper |

Description

Open mix of shrubs and some grasses/ferns/forbs.

*Maximum Tree Size Class*  
None

Class C 90 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| RUMA6 | Rubus macraei | 'akala | Upper |
| ARGR5 | Argyroxiphium grayanum | Hana forest silversword | Mid-Upper |
| FRCHS2 | Fragaria chiloensis ssp. sandwicensis | Sandwich beach strawberry | Lower |
| LUHA2 | Luzula hawaiiensis | Hawai'i woodrush | Lower |

Description

Closed, dense shrubland. This seral stage persists indefinitely.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 10 |
| Mid1:OPN | 11 | Late1:CLS | 15 |
| Late1:CLS | 16 | Late1:CLS | 999 |

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:ALL | Early1:ALL | 0.5 | 2 | No | 0 |
| Optional 1 | Mid1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.02 | 50 | No | 0 |
| Optional 1 | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:CLS | Mid1:OPN | 0.02 | 50 | Yes | 0 |

Optional Disturbances

Optional 1: Landslides

References

Gagne, W.C., and L.W. Cuddihy. 1990. Vegetation. Pages 45-114 in: W.L. Wagner, D.R. Herbst, and S.H. Sohmer, editors. Manual of the Flowering Plants of Hawaii. 2 Volumes. University of Hawaii Press, Honolulu.

Jacobi, Dr. James D. Personal communication. Research Botanist, Kilauea Field Station, Pacific Island Ecosystems, U.S. Geological Survey, Honolulu, HI.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: September 3, 2008 ).

Price, J.P., S.M. Gon III, J.D. Jacobi, and D. Matsuwaki. 2007. Mapping plant species ranges in the Hawaiian Islands: Developing a methodology and associated GIS layers. Hawai'I Cooperative Studies Unit. Technical Report HCSU-008. Pacific Aquaculture and Coastal Resources Center (PACRC), University of Hawai'I, Hilo. 58 pp., includes 16 figures and 6 tables.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the flowering plants of Hawaii. Revised edition. Volumes 1 and 2. University of Hawaii Press and Bishop Museum Press, Honolulu. 1919 pp.

Western Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe, Boulder, CO.