18220

Hawai'i Montane-Subalpine Dry Grassland

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Herbaceous

Map Zones

79

Geographic Range

This grassland ecological system is found in the drier saddle and upper slopes of Mauna Kea, Mauna Loa, Hualalai, Hawai'i.and Haleakalā on Maui.

Biophysical Site Description

This ecological system occurs on dry montane to subalpine areas, from near 1,615-2,300m (5,295-7,540ft) elevation. This montane to subalpine ecological system occurs within the arid, very dry, and moderately dry zones (zones 1, 2 and 3) of the seven moisture zones developed for the Hawai'ian Islands by Price et al. (2007). An inversion layer of warmer air forms 50-70% of the time between 1,600-3,000 that dramatically reduces precipitation at higher elevations (Gagne and Cuddihy 1990). This is because the wet trade winds generally do not rise above 1,900m (6,230ft), and are deflected around the mountains leaving upper slopes too dry to support rain forests (Mueller-Dombois and Fosberg 1998). Annual rainfall is generally 400-500mm. Substrates include well-drained, sandy loam soils derived from volcanic ash or cinder and weathered basaltic lava with little soil development. Edaphic properties tend to suppress woody life forms.

Vegetation Description

Vegetation is characterized by moderate to dense bunchgrass layer (<1m tall) dominated by *Eragrostis atropioides* and sometimes codominated by *Panicum tenuifolium* (Gagne and Cuddihy 1990), and *Deschampsia nubigena*. Other herbaceous species include *Eragrostis deflexa*, *E. leptophylla*, *Trisetum glomerata*, and *Agrostis sandwicensis*. Scattered shrubs may be present (<10% cover) such as by *Bidens menziesii*, *Chenopodium oahuense*, *Dodonaea viscosa*, *Dubautia linearis*, *Gnaphalium sandwichensium*, *Osteomeles anthyllidifolia*, *Myoporum sandwicense,* and *Sophora chrysophylla*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ERAT | *Eragrostis atropioides* | Hardstem lovegrass |
| PATE6 | *Panicum tenuifolium* | Parkland panicgrass |
| ERDE | *Eragrostis deflexa* | Pacific lovegrass |
| TRGL3 | *Trisetum glomeratum* | Pili uka |
| DENU6 | *Deschampsia nubigena* | Alpine hairgrass |
| AGSA3 | *Agrostis sandwicensis* | Hawai'i bentgrass |
| ERLE3 | *Eragrostis leptophylla* | Mountain lovegrass |
| PTAQ | *Pteridium aquilinum* | Western brackenfern |

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

Disturbance Description

Natural (e.g., lava ignited) fires very infrequent (ca 2,000yrs), Anthropogenic fires in pre-contact Hawaii also would have been very rare, grazing by non-native ungulates unimportant until post contact, conversion to pasture post 1800, Today, anthropogenic fire is much more frequent, but fire adapted exotic grass *Pennisetum setaceum* has not significantly invaded and is only occasionally present. Weedy exotic forbs are common, including *Heterotheca grandiflora*, *Verbescum thapsus*, and *Verbesina enceliodes* common in disturbed stands (Shaw and Castillo 1997). *Senecio madagascariensis* also a problem. Displacement by alien grasses can change fire regime.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement |  |  |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) | 103 | 100 |  |  |
| All Fires | 103 | 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 is similar to Hawai'i Montane-Subalpine Dry Shrubland and Hawai'i Montane-Subalpine Mesic Grassland.

Issues or Problems

Native Uncharacteristic Conditions

Shrubs in this system seldom if ever achieve more than 10% canopy closure.

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 | B | B | B | B | B | B | B | B |
| Herb | 0.5-1.0 | A | A | B | B | B | B | B | B | B | B |
| Herb | >1.0 | A | A | B | B | B | B | B | B | B | B |
| Shrub | 0-0.5 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | B | 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 3 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PTAQ | Pteridium aquilinum | Western brackenfern | Upper |
| DENU6 | Deschampsia nubigena | Alpine hairgrass | Upper |

Description

Bare cinder field, whether freshly laid by volcanic activity, alluvial deposit or aeolian processes, or de-vegetated by major fire. Rapidly colonized by *Pteridium aquilinum* and *Deschampsia nubigena*.

*Maximum Tree Size Class*  
None

Class B 97 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ERAT | Eragrostis atropioides | Hardstem lovegrass | Upper |
| PTAQ | Pteridium aquilinum | Western brackenfern | Upper |
| DENU6 | Deschampsia nubigena | Alpine hairgrass | Upper |
| TRGL3 | Trisetum glomeratum | Pili uka | Upper |

Description

Within 25-50yrs, the major constituents colonize and dominate, forming a closed grassland.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Late1:CLS | 30 |
| Late1:CLS | 31 | 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:OPN | Early1:OPN | 0.001 | 1000 | No | 0 |
| Optional 1 | Late1:CLS | Early1:OPN | 0.001 | 1000 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.01 | 100 | No | 0 |

Optional Disturbances

Optional 1: Ash Deposit

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