## Curl-leaf Mountain Mahogany (CMM)

### General Information

### Cover Type Overview

* 102 acres / 41 hectares
* Crosswalks
  + EVeg: Regional Dominance Type 1
    - Curl-leaf Mountain Mahogany
  + LandFire BpS Model
    - 0610620: Inter-Mountain Basins Curl-leaf Mountan Mahogany Woodland and Shrubland
  + Presettlement Fire Regime Type:
    - Curl-leaf Mountain Mahogany

### Vegetation Description

The CMM landcover type is characterized by the dominance or codominance of *Cercocarpus ledifolius*. Other shrubs such as *Artemisia, Arctostaphylos, Ceanothus,* and *Ephedra* may be present. *C. ledifolius* is both a primary early successional colonizer rapidly invading bare mineral soils after disturbance and the dominant long-lived species. Where *C. ledifolius* has reestablished quickly after fire, *Chrysothamnus nauseosus* may codominate. Litter and shading by woody plants inhibits the establishment of *C. ledifolius*. Reproduction often apears dependent upon geographic variables (slope, aspect, and elevation) more than biotic factors. *Artemisia arbuscula* and *Artemisia nova* are infrequently associated. *Symphoricarpos, Amelanchier,* and *Ribes* are present on cooler, moister sites. *Pinus monophylla, Juniperus, Pseudotsuga menziesii, Abies magnifica, Abies concolor,* and *Pinus jeffreyi* may have sporadic presence at very low densities. In older stands the understory may consist largely of *Leptodactylon pungens* (LandFire 2007).

### Distribution

*C. ledifolius* communities are usually found on upper slopes and ridges between 2130 and 3200 m (7000-10,500 ft), although northern stands may occur as low as 600 m (200 ft). It is more common on northwestern and northeastern aspects. Most stands occur on rocky, shallow soils and outcrops, with mature stand cover rom 10-55%. In the absence of fire, old stands may occur on somewhat deeper soils, with more than 55% cover (LandFire 2007).

**Disturbances**

### Wildfire

Wildfires tend to be high mortality, stand-replacing fires that initiate a process of post-fire forest succession. High mortality fires kill large as well as small trees, and may kill many of the shrubs and herbs as well, although below-ground organs of at least some individual shrubs and herbs survive and re-sprout.

*C. ledifolius* is easily killed by fire and does not resprout. However, it is a primary early successional colonizer, rapidly invading bare mineral soils after disturbance. Fires are not common in early seral stages, when there is little fuel, except in chaparral. Stand-replacing fires are more common in mid-seral stands, where herbs and smaller shrubs provide ladder fuels. When surface fire is relatively common, stands will adopt a savanna-like woodland structure with an understory characterized by *Ribes, L. pungens*, and various grasses. Trees can become very old and will rarely show fire scars. In late, closed stands, the absence of herbs and small forbs makes stand-replacing fire uncommon, requireing extreme winds and drought conditions.

Although it is not included in this iteration of the model, scientists have noted that *Bromus tectorum* has invaded most of these communities, altering successional pathways and disturbance regimes. It burns readily and is an early-season post-fire colonizer (Verner 1988).

Data on fire return intervals (FRIs) are available from a few review papers. Van de Water and Safford’s 2011 review paper aggregates hundreds of articles, conference proceedings, and LandFire data on fire return intervals, with an emphasis on Californian sources. They report a mean FRI of 52 years, median of 62 years, mean min of 30 years and mean max of 130 years. The LandFire model for this type (2007) predicted a mean replacement FRI of 285 years with a range of 100-500 years, a mean mixed severity FRI of 149 years with a range of 50-150 years, a mean surface FRI of 238 years, and an overall mean FRI of 69 years. We recalculated these numbers using condition-specific information and using only high and low mortality fire categories, which resulted in an interval of 226 years for high mortality fire, 114 years for low mortality fire, and 76 years for any fire.

Table 1. Fire return intervals (years) and percentage of high versus low mortality fires. Values were derived from BpS model 0610620 (LandFire 2007) and Van de Water and Safford (2011).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variant** | **Modifier** | **Fire Mortality** | **Mean** | **Min** | **Max** | **% of Fires** |
| LSG | None | High | 226 | – | – | 34 |
| Low | 114 | – | – | 66 |
| All Fires | 76 | 30 | 130 | 100 |

### Other Disturbance

Other disturbances are not currently modeled, but may, depending on the condition affected and mortality levels, reset patches to early development, maintain existing condition classes, or shift/accelerate succession to a more open condition.

### Vegetation Condition Classes

We recognize five separate condition classes for CMM. The condition classes described below are based on the classes described in the pertinent LandFire Biophysical Setting model descriptions, which in turn were based on a “5-box” state and transition models describing major successional stages related to fire regime condition classification. According to the Fire Regime Condition Class guidebook, up to five successional classes may be utilized to describe age, size, canopy cover, and vegetation composition, ranging from early seral (post-disturbance) to late seral (such as old growth) (Barrett et al. 2010). The CMM variant is assigned to the following condition classes: Early Development (ED), Mid Development – Open (MDO), Mid Development – Closed (MDC), Late Development – Open (LDO), and Late Development – Closed (LDC).

### Early Development (ED)

### Description *C. ledifolius* rapidly invades bare mineral soils after fire. Litter and shading by woody plants inhibits establishment. Bunchgrasses and disturbance-tolerant forbs and resprouting shrubs, such as *Symphoricarpos*, may be present. *Ericameria* and *Artemisia* seedlings are likely present. Vegetation composition will affect fire behavior, especially if chaparral species like *Arctostaphylos* or *Ceanothus* are present (LandFire 2007).

**Succession Transition** In the absence of disturbance, this class will transition to MDO after 20 years.

**Wildfire Transition** High mortality wildfire (100% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire is not modeled for this condition class.

**Mid Development – Open (MDO)**

**Description** *C. ledifolius* may codominate with mature *Artemisia, Purshia, Symphoricarpos,* or *Ericameria.* Few *C. ledifolius* seedlings are present. Canopy cover is less than 30% (LandFire 2007).

**Succession Transition** After 40 years without disturbance, stands in this condition will transition to MDC. After 120 years since entering an MD condition, stands transition to LDO.

**Wildfire Transition** High mortality wildfire (25% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire (75%) maintains the MDO condition.

**Mid Development – Closed (MDC)**

**Description** Young *C. ledifolius* are common, although shrub diversity is very high. Common shrubs include *Artemisia, Purshia,* and *Symphoricarpos*. Canopy cover is over 30% (LandFire 2007).

**Succession Transition** After 120 years since entering an MD condition, stands in this condition will transition to LDC.

**Wildfire Transition** High mortality wildfire (27.6% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire (72.4%) opens the stand up to MDO 28.6% of the time; otherwise, the patch remains in MDC.

**Late Development – Open (LDO)**

**Description** Moderate cover of *C. ledifolius*. This condition describes late-successional CMM that is maintained by frequent, low mortality fire. Evidence of infrequent fire scars on older trees and presence of open savanna-like woodlands with herbaceous-dominated understory are evidence for this condition. Other shrub species may be abundant, but decadent. Canopy cover is less than 30%. *C. ledifolius* trees reach very old age in the absence of stand-replacing fire (LandFire 2007).

**Succession Transition** After 150 years without disturbance, this class will transition to LDC.

**Wildfire Transition** High mortality wildfire (14.3% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire (85.7%) maintains the LDO condition.

**Late Development – Closed (LDC)**

**Description** High cover of large shrub- or tree-like *C. ledifolius*. Very few other shrubs are present, and herb cover is low. Duff may be very deep. Scattered trees may occur in this condition. Canopy cover over 30%. *C. ledifolius* will become old-growth with trees reported to reach over 1000 years old (LandFire 2007).

**Succession Transition** In the absence of disturbance, this class will maintain.

**Wildfire Transition** High mortality wildfire (100% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire is not modeled for this condition class.

**Condition Classification**

Polygons will be randomly assigned to the other condition classes based on a \_\_:\_\_:\_\_ distribution for the various condition classes.

**Draft Model**

(See PDF) Disturbance-Succession model for CMM.

**References**

Barrett, S., D. Havlina, J. Jones, W. Hann, C. Frame, D. Hamilton, K. Schon, T. Demeo, L. Hutter, and J. Menakis. *Interagency Fire Regime Condition Class Guidebook*. Version 3.0. USDA Forest Service, US Department of the Interior, and The Nature Conservancy, 2010. <http://www.frcc.gov>. Accessed 5 June 2013.

LandFire. “Biophysical Setting Models.” Biophysical Setting 0610790: Great Basin Xeric Mixed Sagebrush Shrubland. 2007. LANDFIRE Project, U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior. <http://www.landfire.gov/national\_veg\_models\_op2.php>. Accessed 9 November 2012.

Van de Water, Kip M. and Hugh D. Safford. “A Summary of Fire Frequency Estimates for California Vegetation Before Euro-American Settlement.” *Fire Ecology* 7.3 (2011): 26-57. doi: 10.4996/fireecology.0703026.