Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R2MTMA **Curlleaf Mountain Mahogany**

General Information

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Vegetation Type

Shrubland

Dominant Species*

CELE3
ARTRV
PUTR2
SYMPH

General Model Sources

- [x] Literature
- [ ] Local Data
- [x] Expert Estimate

LANDFIRE Mapping Zones

12 17
13 18
16

Rapid Assessment Model Zones

- [ ] California
- [x] Great Basin
- [ ] Great Lakes
- [ ] Northeast
- [ ] Northern Plains
- [ ] N-Cent.Rockies
- [ ] Pacific Northwest
- [ ] South Central
- [ ] Southeast
- [ ] S. Appalachians
- [ ] Southwest

Geographic Range

The Curlleaf mountain mahogany (Cercocarpus ledifolius var. intermontanus) community type occurs in the Sierra Nevada and Cascade Range to Rocky Mountains from Montana to northern Arizona, and in Baja California, and Mexico (Marshall 1995).

Biophysical Site Description

Curlleaf mountain mahogany (Cercocarpus ledifolius var. intermontanus) communities are usually found on upper slopes and ridges between 7,000 to 10,500 ft. elevations (NRCS 2003), although northern stands may occur as low as 2,000 ft (Marshall 1995). In western Nevada, curlleaf mountain mahogany may occur down to 5,000 ft or lower and restricted to northwestern and especially northeastern aspects at drier, lower edge of range. Most stands occur on rocky shallow soils and outcrops, with mature stand cover between 10-55%. In fire absence, old stands may occur on somewhat deeper soils, with more than 55% cover.

Vegetation Description

Mountain big sagebrush is the most common codominant with curlleaf mountain mahogany, although chaparral species such as manzanita (Arctostaphylos patula), tobaccobrush (Ceanothus velutinus), and green ephedra (Ephedra viridis) often codominate on some sites. Curlleaf mountain mahogany is both a primary early succssesional colonizer rapidly invading bare mineral soils after disturbance and the dominant long-lived species. Where curlleaf mountain mahogany has reestablished quickly after fire, rabbitbrush (Chrysothamnus nauseosus) may co-dominate. Litter and shading by woody plants inhibits establishment of curlleaf mountain mahogany. Reproduction often appears dependent upon geographic variables (slope, aspect, and elevation) more than biotic factors. Low sagebrush and black sagebrush are infrequently associated. Snowberry, Utah serviceberry, and currant are present on cooler sites, with more moisture. Singleleaf pinyon, western juniper, Douglas fir, red fire, white fir, Rocky Mountain juniper, Jeffrey pine, and limber pine may be present, with less than 10% total cover. In old, closed canopy stands,

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

understory may consist largely of prickly phlox (Leptodactylon pungens).

Disturbance Description

Fire: Curlleaf mountain mahogany does not resprout, and is killed easily by fire (Marshall 1995). Curlleaf mountain mahogany is a primary early succssesional colonizer rapidly invading bare mineral soils after disturbance. Fires are not common in early seral stages, when there is little fuel. Replacement fires (mean FRI of 100-500 yrs) become more common in mid-seral stands, where herbs and smaller shrubs provide ladder fuels. By late succession, two classes and fire regimes are possible depending on the history of rare surface fires. In the presence of surface fire (FRI of 100 yrs) and past mixed severity fires in younger classes, the stand will adopt a savanna-like woodland structure with a grassy understory. Trees can become very old and will show fire scars. In late, closed stands, the absence of herbs and small forbs makes replacement fires uncommon (FRI of 500 yrs), requiring extreme winds and drought, because thick duff provides fuel for more intense fires. Mixed fires (mean FRI of 50-100 yrs) are present in all classes, except the late closed one, and more frequent in the mid-development classes.

Ungulate herbivory: Heavy browsing by native medium-sized and large mammals reduces mountain mahogany productivity and reproduction (NRCS 2003). This is an important disturbance in early, especially, and mid-seral stages, when mountain mahogany seedlings are becoming established. Browsing by small mammals has been documented (Marshall 1995), but is relatively unimportant and was incorporated as a minor component of native herbivory mortality.

Avian-caused mortality: In western Nevada for ranges in close proximity to the Sierra Nevada, sapsuckers drilling of curlleaf mountain mahogany has been observed to cause stand replacement mortality (personal communication, Christopher Ross, NV BLM).

Adjacency or Identification Concerns

Littleleaf mountain mahogany, Cercocarpus intricatus, is restricted to limestone substrates and very shallow soils in California, Nevada, and Utah. It has similar stand structure and disturbance regime, so the curlleaf mountain mahogany model should be applicable to it. Some existing curlleaf mountain mahogany stands may be in the big sagebrush PNVG, now uncharacteristic because of fire exclusion.

Scale Description

Sources of Scale Data ☐ Literature ☐ Local Data ☑ Expert Estimate

Because these communities are restricted to rock outcrops and thin soils, stands usually occur on a small scale, and are spatially separated from each other by other communities that occur on different aspects or soil types. A few curlleaf mountain mahogany stands may be as much larger than 100 acres.

Issues/Problems

Data for the setback in succession caused by native grazing are lacking, but observed by experts; in the model, only class A had a setback of -10, whereas no setback was specified for classes B and C, which do not have many seedlings.

Several fire regimes affect this community type. It is clear that being very sensitive to fire and very long-lived would suggest FRG V. This is true of late development classes, but younger classes can resemble more the surrounding chaparral or sagebrush communities in their fire behavior and exhibit a FRG IV. Experts had divergent opinions on this issue; some emphasized infrequent and only stand replacing fires whereas others suggested more frequent replacement fires, mixed severity fires, and surface fires. The current model is a compromise reflecting more frequent fire in early development classes, surface fire in the late, open class, and infrequent fire in the late, closed class.

Note that C and B are reversed from the standard 5-box model in this case: class B is open and class C is

closed canopy.

Model Evolution and Comments

Data from a thesis in Nevada and expert observations suggests some large mountain mahogany may survive less intense fires. Therefore, surface fires were added as a disturbance to late seral stages, but this is a more recent concept in curlleaf mountain mahogany ecology. Surface fires were assumed to occur on a very small scale, perhaps caused by lightning strikes.

An extensive zone of mixed mountain mahogany and pinyon pine exists in western Nevada and Eastern California, and perhaps elsewhere. This type was not incorporated into the model, and is probably more appropriately included in the pinyon pine model.

Succession Classes

Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 5 %

Early1 PostRep

Description

Curlleaf mountain mahogany rapidly invades bare mineral soils after fire. Litter and shading by woody plants inhibits establishment. Bunch grasses and disturbance-tolerant forbs and resprouting shrubs, such as snowberry, may be present. Rabbitbrush and sagebrush seedlings are present. Vegetation composition will affect fire behavior, especially if chaparral species are present. Replacement fire (average FRI of 200 yrs), mixed severity (average FRI of 100 yrs), and native herbivory (2 out every 100 seedlings) of seedlings all affect this class. Replacement fire and native herbivory will reset the ecological clock to zero. Mixed severity fire does not affect successional age. Succession to class B after 10 years.

Indicator Species* and Canopy Position

CELE3
ARTR2
CHRYS
SYMPH

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	25 %
Height	no data	no data
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

Class B 15%

Mid1 Open

Description

Curlleaf mountain mahogany is dominant with mature sagebrush, bitterbrush, snowberry, rabbitbrush co-dominant. Few mountain mahogany seedlings are present. Replacement fire (mean FRI is 150 yrs) will cause a transition to class A, whereas mixed severity fire (mean FRI of 50 yrs) will thin this class but not cause a transition to another class. Native herbivory of seedlings and young saplings occurs at rate described in class A but does not cause an ecological setback or transition. Succession to C after 40 yrs.

Indicator Species* and Canopy Position

CELE3
ARTR2
CHRYS
SYMPH

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	35 %
Height	no data	no data
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C 10%

Mid2 Closed

Description

Young curlleaf mountain mahogany are common, although shrub diversity is very high. One out of every 1000 mountain mahogany are taken by herbivores but this has no effect on model dynamics. Replacement fire (mean FRI of 100 yrs) causes a transition to class A. Mixed severity fire (mean FRI of 75 yrs) does not cause a transition or setback.

Indicator Species* and Canopy Position

CELE3
ARTR2
PUTR2
SYMPH

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	45 %
Height	no data	no data
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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Class D 40 %

Late1 Open

Description

Moderate cover of mountain mahogany. This class represents one of two late-successional endpoints for curlleaf mountain mahogany that is maintained by infrequent surface fire (mean FRI of 100 yrs). Evidence of 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. In the absence of fire for 200 yrs (2-3 FRIs for mixed severity and surface fires), the stand will become close (transition to class E) and not support a herbaceous understory. Stand replacement fire every 300 yrs on average will cause a transition to class A. Class D maintains itself with infrequent surface fire with trees reaching very old age.

Indicator Species* and Canopy Position

CELE3
ARTR2
PUTR2

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	45 %
Height	no data	no data
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 30 %

Late2 Closed

Description

High cover of large shrub- or tree-like mountain mahogany. Very few other shrubs are present, and herb cover is low. Duff may be very deep. Scattered trees may occur in this class. Replacement fire every 500 yrs on average is the only disturbance and causes a transition to class A. Class will become old-growth with trees reported to reach 1000+ years.

Indicator Species* and Canopy Position

CELE3

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	55 %
Height	no data	no data
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

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Non-Fire Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☑ Native Grazing
- ☐ Competition
- ☐ Other:
- ☐ Other:

Fire Regime Group: 3

I: 0-35 year frequency, low and mixed severity
II: 0-35 year frequency, replacement severity
III: 35-200 year frequency, low and mixed severity
IV: 35-200 year frequency, replacement severity
V: 200+ year frequency, replacement severity

Historical Fire Size (acres)

Avg:
Min:
Max:

Fire Intervals (FI):
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. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	250	100	500	0.004	31
Mixed	212			0.00472	37
Surface	250			0.004	31
All Fires	79			0.01272	

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