## Black and Low Sagebrush (LSG)

### General Information

### Cover Type Overview

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* Crosswalks
  + EVeg: Regional Dominance Type 1
    - Low Sagebrush
    - Black Sagebrush
  + LandFire BpS Model
    - 0610790: Great Basin Xeric Mixed Sagebrush Shrubland
  + Presettlement Fire Regime Type:
    - Black and Low Sagebrush

### Vegetation Description

The LSG landcover type is generally dominated by broad-leaved, evergreen shrubs of short stature, typically averaging about 15% cover. Depending on site conditions, crowns may touch. Deciduous shrubs and small trees are sometimes sparsely scattered within this type. The ground cover of grasses and forbs is typically a sparse 5-15% cover (Verner 1988).

LSG may be dominated by either *Artemisia arbuscula* or *Artemisia nova*, often in association with *Chrysothamnus viscidiflorus*, *Purshia tridentata*, or *Artemisia tridentata*; *A. nova* is also commonly associated with *Krascheninnikovia* and *Ephedra*. *Juniperus occidentalis* may be sparsely scattered in stands dominated by *Artemisia arbuscula*, and *Juniperus osteosperma* and *Pinus monophylla* are sometimes scattered in stands dominated by *Artemisia nova*. A rich variety of forbs is usually present, including *Eriogonum, Erigeron, Phlox, Castilleja, Sphaeralcea,* and *Lupinus*. Common grasses include *Poa, Pseudoroegneria, Elymus, Stipa* and *Festuca.* The abundance and distribution of associated plants is highly influenced by soils and precipitation (Verner 1988, LandFire 2007).

### Distribution

Stands of *A. arbuscula* are usually found on shallow soils with impaired drainage in the transition zone between the wetter bottom and open timber on the mountainsides. The type also occurs on terraces with hardpan or heavy clay soils. In mosaics formed with *P. tridentata, A. arbuscula* occurs on harsher sites with shallow, well-drained soils, while *P. tridentata* occupies areas with deeper soils. Soils typically associated with stands of *A. nova* are shallow, contain a high percentage of gravel, and are rich in mineral carbonates. It is prevalent on limestone soils (Verner 1988).

*A. arbuscula* communities are generally restricted to elevated arid plains along the eastern flanks of the Sierra Nevada. *A. nova* can occur in subalpine areas, at elevations above 2420 m (8000 ft). Stands dominated by *A. arbuscula* arnge in elevation from 1210 to 2740 m (4000-9000 ft) (Verner 1988).

**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.

*A. nova* generally supports more fire than other dwarf sagebrushes. Stand-replacing fire is rare due to relatively low fuel loads and herbaceous cover. Bare ground acts as a micro-barrier to fire between low-statured shrubs. Stand-replacing fires can occur in this type when successive years of above average precipitation are followed by an average or dry year. Stand-replacing fires predominate in the late successional class where the herbaceous component has diminished or where trees dominate (LandFire 2007).

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 66 years, median of 53 years, mean min of 35 years and mean max of 115 years. The LandFire model for this type (2007) predicted a mean replacement FRI of 227 years with a range of 100-250 years, a mean mixed severity FRI of 133 years with a range of 75-140 years, no surface fire, and an overall mean FRI of 84 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, 140 years for low mortality fire, and 86 years for any fire.

Table 1. Fire return intervals (years) and percentage of high versus low mortality fires. Values were derived from BpS model 0610790 (LandFire 2007) and Van de Water and Safford (2011).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variant** | **Modifier** | **Fire Mortality** | **Mean** | **Min** | **Max** | **% of Fires** |
| LSG | None | High | 226 | – | – | 38 |
| Low | 140 | – | – | 62 |
| All Fires | 86 | 35 | 115 | 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 four separate condition classes for LSG: Early Development (ED), Mid Development – All (MDA), Late Development – Open (LDO), and Late Development – Closed (LDC).. We use condition classes not in the sense of fire regime condition classes, but as an alternative to “successional” classes that imply a linear progression of states and tend not to incorporate disturbance. The condition classes identified here are derived from a combination of successional processes and anthropogenic and natural disturbance, and are intended to represent a composition and structural condition that can be arrived at from multiple other conditions described for that landcover type. Thus our condition classes incorporate age, size, canopy cover, and vegetation composition as well as relative seral stages. In general, the delineation of stages has originated from the LandFire biophysical setting model descriptive of a given landcover type; however, condition classes are not necessarily identical to the classes identified in those models.

### Early Development (ED)

### Description Early seral community dominated by herbaceous vegetation, including *Poa, Pseudoroegneria,* and *Achnatherum*. Shrub canopy is less than 20%. Fire-tolerant shrubs, such as *Chrysothamnus* species are initial sprouters post-fire (LandFire 2007).

**Succession Transition** In the absence of disturbance, this class will transition to MD 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 – All (MD)**

**Description** Mid-seral community with a mixture of herbaceous and shrub vegetation. Vegetation present likely includes *A. nova*, *A. arbuscula, Poa, Achnatherum,* and *Pseudoroegneria.*  Shrub cover less than 25% (LandFire 2007).

**Succession Transition** After 120 years without high mortality disturbance, this class will transition to LDO.

**Wildfire Transition** High mortality wildfire (28.6% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire (71.4%) maintains the MD condition.

**Late Development – Open (LDO)**

**Description** Late seral community with a mixture of herbaceous and shrub vegetation. Shrub cover less than 25%. Establishment of dispersed conifer seedlings and saplings (less than 5% cover). Vegetation present includes *A. nova, A. arbuscula, Juniperus, Pseudoroegneria,* and *Achnatherum* (LandFire 2007).

**Succession Transition** After 70 years without disturbance, this class will transition to LDC.

**Wildfire Transition** High mortality wildfire (39.4% of fires in this condition) recycles the patch through the ED condition. Low mortality wildfire (60.6%) maintains the LDO condition.

**Late Development – Closed (LDC)**

**Description** Late seral community with an increased presence of conifer trees (up to 40% cover). The degree of tree canopy closure differs depending on whether it is an *A. arbuscula* (closure likely under 15%) or an *A. nova* (closure up to 40%) community. In *A. arbuscula* communities a mixture of herbaceous and shrub vegetation with over 10% shrub cover would still be present. In *A. nova* communities the herbaceous and shrub component would be greatly reduced (less than 1% cover). Vegetation present includes *A. nova, A. arbuscula, Juniperus, P. monophylla* and *Achnatherum* (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**

Because condition classification was done through orthophoto analysis, no polygons will be assigned to the LDC condition class, which is actually not an *Artemisia*-dominated condition. Only 3 polygons were assigned to LSG. Typical fields used to assign early-mid-late condition (overstory tree diameter) are null for shrubs. Cover is available. Polygons with cover less than 50% are assigned to MD and polygons with cover greater than 50% are assigned to LDO.

**Draft Model**

(See PDF) Disturbance-Succession model for LSG.

**References**

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.

Verner, Jared. “Low Sage (LSG).” *A Guide to Wildlife Habitats of California*, edited by Kenneth E. Mayer and William F. Laudenslayer. California Deparment of Fish and Game, 1988. <http://www.dfg.ca.gov/biogeodata/cwhr/pdfs/SGB.pdf>. Accessed 4 December 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.