How Vegetation Classification Informs Ecological Trends and Land Management on the Modoc Plateau, California

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Land managers and conservation biologists have been concerned by the rapid rate of environmental change in the Modoc Plateau and adjacent northwest Great Basin. In order to create a baseline for ecosystem monitoring and management in this region, CDFW, BLM, and CNPS selected a contiguous area of 1.1 million acres to produce a high-resolution surveys were conducted in the assignment of 65 Associations nested within 46 Alliances. This classification helps identify geographic and ecological settings where management problems tend to be extreme. Observed effects include type-conversion of high-diversity native shrublands to low-diversity non-native annual grasses, and a rapid increase in western juniper colonization, which replaces sagebrush shrublands. In the high elevations, formerly extensive woodlands of Ponderosa pine, and mountain mahogany are being replaced by seral shrublands and grasses. This is an interim report; further sampling in the spring and summer of 2017 will refine the classification, and detailed vegetation mapping will follow in 2018.







Figure 4: Positive effects of fire. Although land managers have been concerned that the extensive fires of the past few years would negatively impact the landscape, there appear to be some positive effects of the 2012 Rush fire. 4a) In the southeast portion of the area, extensive stands of the native bunchgrasses *Elymus spicatus* and *Poa secunda* have rebounded since the fire. 4b) And in upper slope concavities, *Populus tremuloides* groves resprouted vigorously after the fire, providing valuable wildlife habitat.

Figure 2: Management concerns are directly related to vegetation type in much of the Modoc. This cluster diagram shows the relationships among the 2016 vegetation surveys. Vegetation alliance types are listed in the left column and a dendrogram displaying floristic relationships is on the right. Four groups have been selected to illustrate major management concerns. They are described on the right, and representative photographs are shown on the left.

Two general trends emerge from the cluster analysis. The lower elevation alliances are grouped at the top of the diagram and all of the main vegetation types with serious management issues are located here. Higher elevation and "wet" vegetation groups are clustered at the bottom of the diagram. These types have largely maintained their historic seral relationships and do not exhibit a widespread increase of non-native vegetation.

_OW-1: 83% of all samples in this group have *Juniperus* occidentalis present and increasing, most are still considered ridentata or Purshia – Artemisia tridentata Shrubland Alliance stands. This is an example where recent increase of junipers has not resulted in an alliance-level

LOW-2: interface where both *Juniperus occidentalis* and non-native annual grasses increase relative to Artemisia tridentata and Purshia tridentata shrublands: the "crucible of Modoc Plateau novel

LOW-12: most stands are upland, native-dominated grasslands (*Elymus spicatus*), seral following extensive 2012 fire, but all contain some nonnatives and some are now non-native ruderal grasslands (Bromus

LOW-149: degraded Artemisia arbuscula Alliance on fine-textured soil, converted to Bromus tectorum – Elymus caput-medusae Alliance, *E. caput-medusae* Association, mostly found on Likely

The "High" and "Wet" groupings exhibit relatively low cover of exotic species and no wide-spread increase of novel vegetation throughout higher elevation or wetland vegetation types







Figure 6: Poorly understood vernal pools and seasonal wetlands. The seasonal wetlands of the Modoc Plateau are floristically transitional between California and Columbia Plateau vegetation types, and several are rare and/or endemic. Summer 2016 sampling identified at least one group of vernal pool vegetation (*Muhlenbergia richardsonis – Downingia* spp. Provisional Association) Further sampling in the spring of 2017 is needed to clarify relationships. 6a) The shoreline of a temporary lake is dominated by *Muhlenbergia richardsonis*, but contains California vernal pool species such as Downingia bacigalupii, Navarretia leucocephala, Cuscuta howellii, and Psilocarphus brevissimus. 6b) Large drying playa-pool with Taraxia tanacetifolia.

Conclusion

The introduction of non-native plants, rangeland practices, recent increase in fire frequencies, and regional climatic shifts have significantly changed the vegetation of the Modoc Plateau. The most heavily altered vegetation types are those from the drier, lower elevations of the study area. These alterations come in two forms:

- Invasive, exotic, largely annual grasses and forbs dominating the herbaceous layer. These provide nearly continuous flashy fuels, encouraging frequent fires that can quickly "type-convert" historic Artemisia shrublands of high species diversity to lowdiversity annual grasslands.

• Increasing Juniperus occidentalis presence in areas formerly occupied by Artemisia shrublands or native grasslands. The increase in juniper cover has been significant in the past 100+ years, shading existing vegetation and reducing the cover and density of both woody and herbaceous forage plants for wildlife and non-native ungulates. In contrast, the higher elevation and more arid southeast regions of the study area seem to respond to fire and other disturbance by regenerating historic successional or obligate seed-banking species, rather than increasing non-native vegetation.

