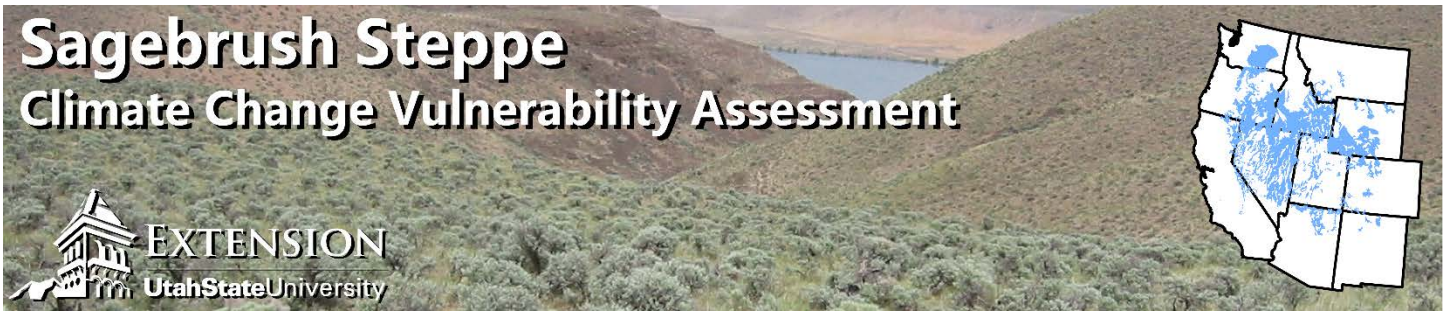

Brief for Resource Managers

Paleorecords of Sage Steppe Communities

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Management Implications

- Sage steppe distribution has changed with past changes in climate
- The current high frequency, high severity fire regime in sage steppe is likely a recent phenomena
- A warming climate, combined with the invasion of fire-prone annuals such as cheatgrass, highlights the importance of preserving intact sage steppe communities

Pollen reconstructions of vegetation change from glacial to interglacial times in the western US generally show that steppe communities have migrated from more northerly or higher elevation sites to southerly and lower elevation sites (Thompson and Anderson 2000). Since 6000 years ago, modern steppe vegetation has contracted in some regions (e.g. southeastern Idaho) but expanded into other regions (e.g. eastern Oregon; Thompson and Anderson 2000). These changes from the mid-Holocene to present may reflect generally cooler and wetter conditions (in the pre-industrial era) relative to the mid-Holocene thermal maxima, or perhaps reflect natural patterns of migration and expansion.

Other pollen reconstructions of vegetation history in the northwestern Great Basin suggests that from ca 11,000 to 7000 cal yr BP, steppe and open forest communities were present at high elevations; these were then replaced by forests composed of white fir, western white pine, and whitebark pine in the late Holocene (Minkley et al., 2007). This demonstrates that forests at higher elevations in the Great Basin have replaced sage to some extent during Holocene times.

Paleocharcoal records indicate that fire is an important part of these ecosystems in mid-elevation forests (10–25 fire episodes/1000 years; Minkley et al, 2007). Weppner et al. (2012) combined a woodrat midden series with alluvial charcoal stratigraphy to evaluate the Holocene phasing of local changes in vegetation, fire and erosion/sedimentation at City of Rocks National Reserve in south-central Idaho. Determining whether changes in vegetation preceded or followed change in fire regime was difficult; however, local pinyon expansion appears to coincide with accelerated fire activity and erosion after ~700 years ago. While establishing fire frequency in paleorecords for sagebrush systems can be challenging, it is very likely that the modern regime of frequent (~5-50 years) and high severity fires, especially in areas invaded by cheatgrass, is a recent phenomena.

Paleovegation studies show that even prior to anthropogenic influence, sage steppe communities were dynamic, and in some cases, susceptible to replacement by other vegetation communities (including forests) under changing climatic conditions. In addition, some forest communities (e.g. pinyon) have expanded northward relatively recently. Modern pollen assemblages show high *Artemisia* percentages in winter-cold and dry climates of the interior basins (Minkely et al., 2008), suggesting that these winter-cold and dry climates may be important for the regional persistence of sagebrush communities. A warming climate, combined with the invasion of fire-prone annuals such as cheatgrass, will only increase the importance of preserving intact sagebrush steppe communities.

Most relevant references:

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