Importance of Shrub Reestablishment for Wyoming’s Landscapes

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Why are systems dominated by shrubs?

Source: adapted from Olson et al., 2001.
Shrubs are usually dominant in habitats that place plants under considerable stress, such as:

- Drought or arid
- Nutrient-poor soils
- Fire regime
- Wind

- Poor soil aeration
- Winter cold short growing season

McArthur and Kitchen 2007
Distribution of sagebrush on both private and public lands in Wyoming (modified from [Merrell et al. 1996, BLM 2001]).
Sagebrush Communities

• One of the most widespread shrub genera in the Intermountain West

• Grow in a wide range of various climates and soils

• Easily disturbed and can be challenging to restore

• Can take between 10 and >50 yrs to recover to predisturbance levels (Ziegenhagen and Miller 2009)
• Wyoming has VERY diverse landscapes
• Location of shrub communities is driven by:
  – Precipitation
  – Soils
  – Temperature
  – Topography
What do shrub communities provide and why are they important?
Taking a historical perspective, shrublands were the vegetation type that has been the most neglected, abused, and even cursed.
Modern livestock producers and wildlife managers are aware of shrub values

• Benefits such as:
  – Animal feed
  – Erosion control
  – Wildlife habitat
  – Ornamentals
  – Maintaining ecosystem functions

McKell and Garcia-Moya 1989
Browse and Forage Use

• Except for digestible energy, shrubs have higher values for protein, phosphorus, lignin, and carotene than grasses or forbs and are most important for fall and winter grazing (Cook 1972)
  – Grasses and forbs are not readily available, increasing shrubs forage value

• Species preference helps balance level of plant use
Erosion Control

- Shrubs have a deep rooted system and a spreading habit
- Study in Texas where microcatchment technologies were evaluated in the establishment of little-leaf leadtree and four-wing saltbush and their role in initiation of autogenic landscape restoration on a shallow site

Whisenant et al. 1995
Microcatchment basin showing initial site conditions and the pattern of water collection after precipitation event

Whisenant et al. 1995
• Microcatchments effectively captured runoff water that would have been lost to the site
• Soil organic matter content was significantly greater in microcatchment basins 32 months after transplanting than in unmodified sites
• Microcatchments and shrub reestablishment initiated autogenic successional processes leading to fertile islands
  – Greater herbaceous development around shrubs
Wildlife Habitat


• Sagebrush-associated vegetation types provide habitat for:
  – 87 species of mammals
  – 297 species of birds
  – 63 species of fish, reptiles and amphibians (Wyoming Interagency Vegetation Committee 2002)
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brewer's Sparrow</td>
<td>Spizella breweri</td>
</tr>
<tr>
<td>Greater Sage-Grouse</td>
<td>Centrocercus urophasianus</td>
</tr>
<tr>
<td>Sage Sparrow</td>
<td>Amiphispiza belli</td>
</tr>
<tr>
<td>Sage Thrasher</td>
<td>Oreoscoptes montanus</td>
</tr>
<tr>
<td>Eastern red bat</td>
<td>Lasiurus borealis</td>
</tr>
<tr>
<td>pocket mouse</td>
<td>Perognathus parvus</td>
</tr>
<tr>
<td>pocket gopher</td>
<td>Thomomys idahoensis</td>
</tr>
<tr>
<td>Olive-backed pocket mouse</td>
<td>Perognathus fasciatus</td>
</tr>
<tr>
<td>Pallid bat</td>
<td>Antrozous pallidus</td>
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<tr>
<td>Plains pocket gopher</td>
<td>Geomys bursarius</td>
</tr>
<tr>
<td>Pygmy rabbit</td>
<td>Brachylagus idahoensis</td>
</tr>
<tr>
<td>Sagebrush vole</td>
<td>Lemmiscus curtatus</td>
</tr>
<tr>
<td>Spotted Bat</td>
<td>Euderma maculatum</td>
</tr>
<tr>
<td>Spotted ground squirrel</td>
<td>Spermophilus spilosoma</td>
</tr>
<tr>
<td>White-tailed Prairie Dog</td>
<td>Cynomys leucrus</td>
</tr>
</tbody>
</table>

Sagebrush Ecosystems Species of Greatest Conservation Need in Wyoming (WGFD 2005)
Maintaining Ecosystem Functions

Shrubs create microsystems influencing temperature, nutrient cycles, wind speeds (reduced), add organic matter, thus adding stability to the plant-soil-animal complex.
What might cause negative impacts to shrubland communities?

- Livestock grazing
- Weed invasion
- Wildfires
- Land conversion projects
  - Housing development
  - Natural resource extraction
What have we lost by removing shrubs in area that normally have them?

- Depends on backgrounds, experience, geographical location and economic impact of those shrublands

Everest 1972 (Australian shrublands)
Wildlife
Population indices of sage grouse (number of lekking males in spring) on a plowed study area and an unplowed control area in south central Montana.

Swensen et al. 1987
Swensen et al. 1987

• Removal of sagebrush (plowing) from wintering areas greatly reduced sage grouse populations
  – 1973 to 1984 population index declined 73% from 241 to 65 lekking males

• Results suggested plowing is more harmful to sage grouse than spraying
  – Cultivated annually so sagebrush cannot reestablish
Weed Invasion
Vegetation Dynamics of an altered system

• Extensive loss of winterfat-dominated communities (southwest of Boise, ID) linked to shortened fire intervals due to cheatgrass

• Study to compare germination and seedling growth of 4 native winterfat collections with cheatgrass competition

Hild et al. 2007
Winterfat seedling leaf area by seed source and cheatgrass density per pot (2, 4, or 8 seedlings) after 21 weeks growth in greenhouse

* Number of cheatgrass seedlings per pot

Hild et al. 2007
In the presence of cheatgrass at any competition level, growth of all 4 sources was reduced by at least **90%**

- Winterfat seedlings are vulnerable to cheatgrass competition, even at very low densities

Sites where cheatgrass densities are high following wildfires are likely to be problematic for winterfat establishment regardless of seed source
Conclusion

• Where shrublands are found
• Why important what role they serve
• What happens when they are no longer there
• Introduction and outline for important information to come
Website: http://www.rmh.uwyo.edu/index.php

Rocky Mountain Herbarium webpage

**RM Specimen Database**
The RM specimen database is now accessible online with nearly 700,000 specimen records. Search by a variety of text criteria or by selecting a geographic region on a map. View the results on an interactive map and as a list of records. Download data in several formats for use in GIS, Excel, or Google Earth, or print out a list of specimens. Go to search page.

**Recent News & Events**
- *Erwin Evert’s death, publication of flora Greater Yellowstone Area*
- *Completed - Comanche and Cimarron National Grasslands, Colorado/Kansas (San Isabel NF: 2007-2009)*
- *Current - Vermejo Park, New Mexico/Colorado (private funding: 2007-2009)*
- *Current - BLM Lands Peripheral to the Medicine Bow Mountains (BLM, Wyoming: 2000-2010)*

**Quick Links**
- Specimen Database
- Vascular Plant Atlas
- Checklists: CO & WY
- Floristics Projects
- Books by Robert D. Dorn
- Staff, Graduate Students, Associates
- Visiting RM

**External Links**
- Department of Botany
- Wyoming Natural Diversity Database
- Wyoming Native Plant Society
- UW Give on Line

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