Importance of Shrub Reestablishment for Wyoming's Landscapes

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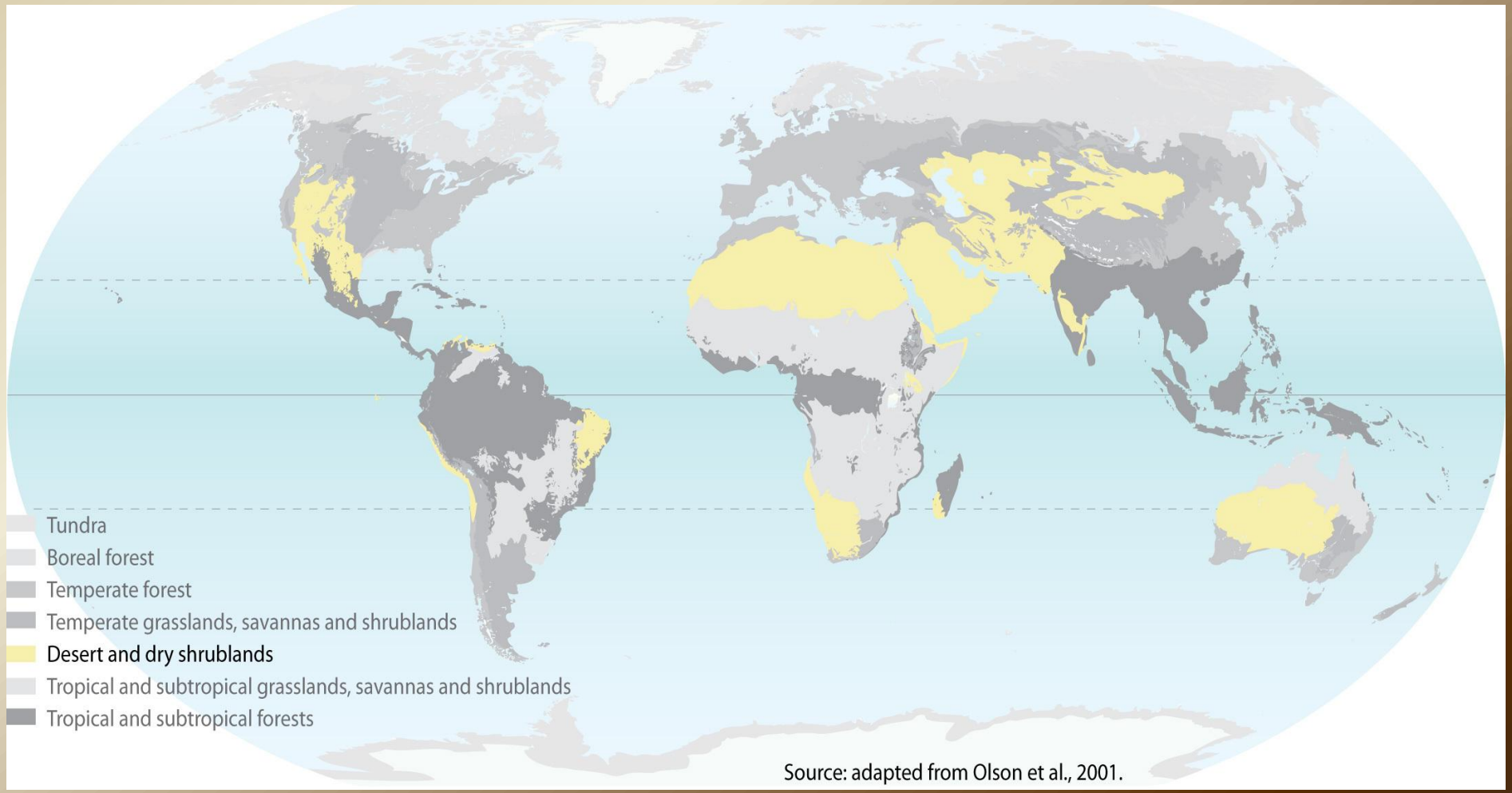
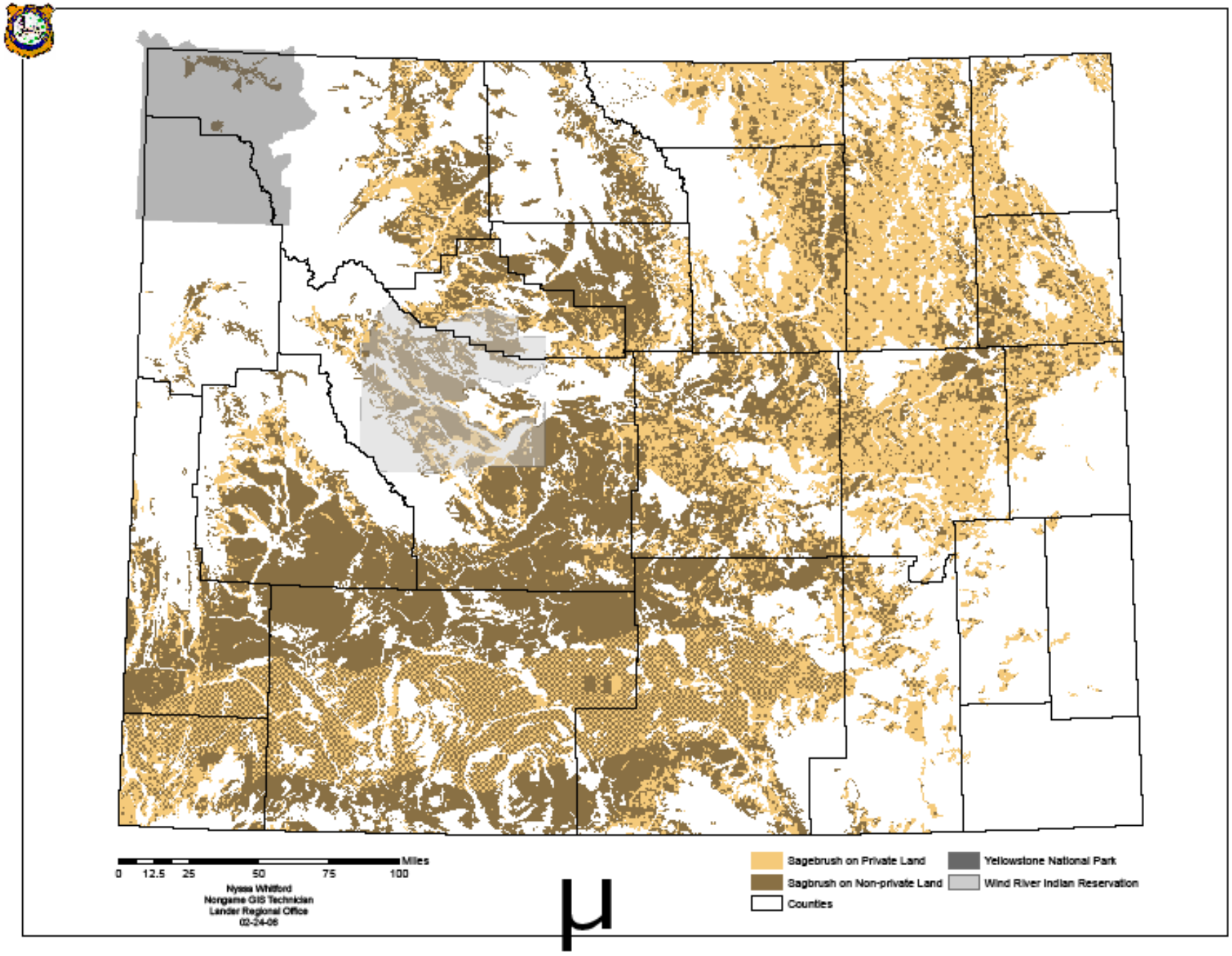
Why are systems dominated by shrubs?



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

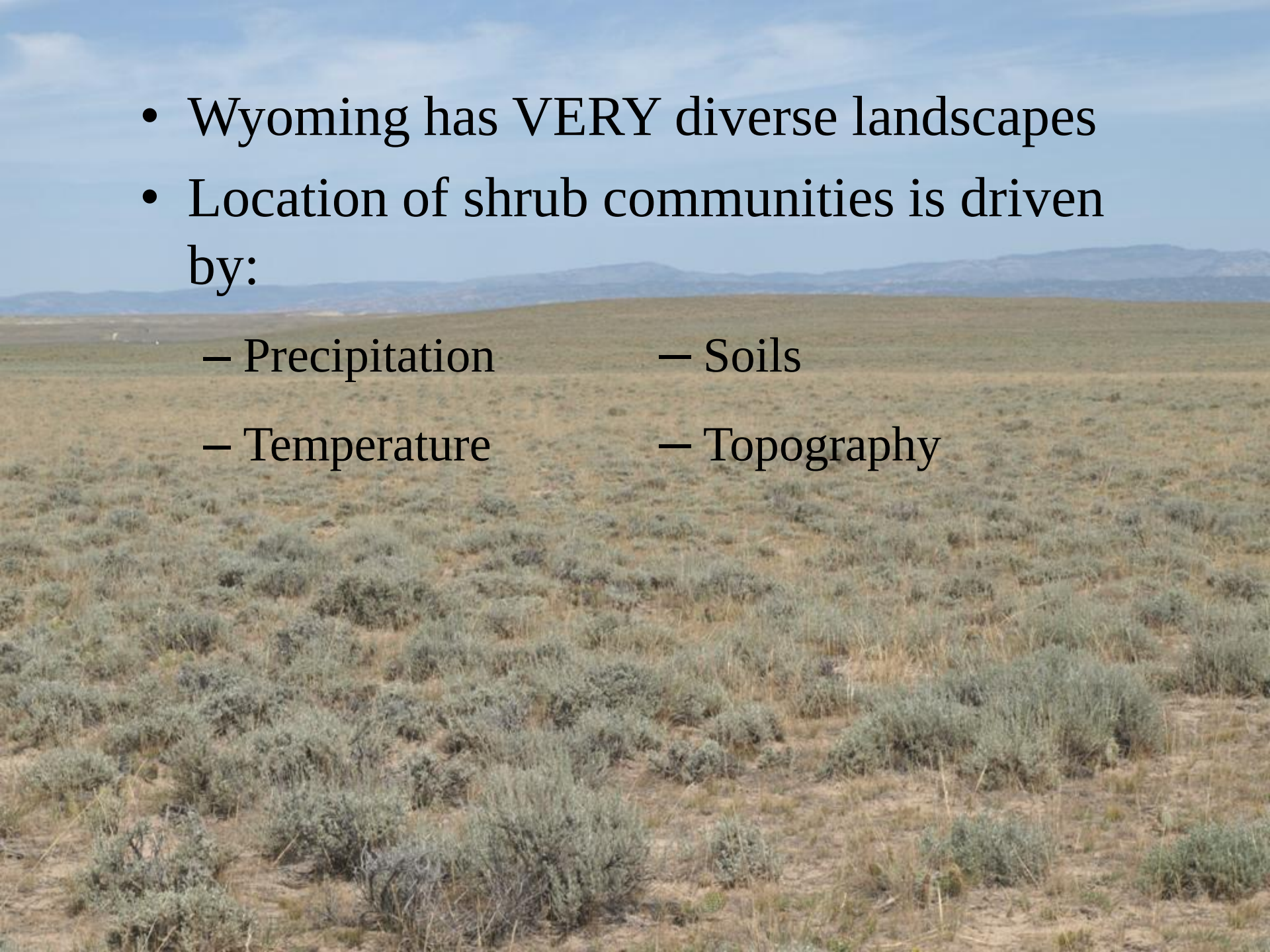
McArthur and Kitchen 2007



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

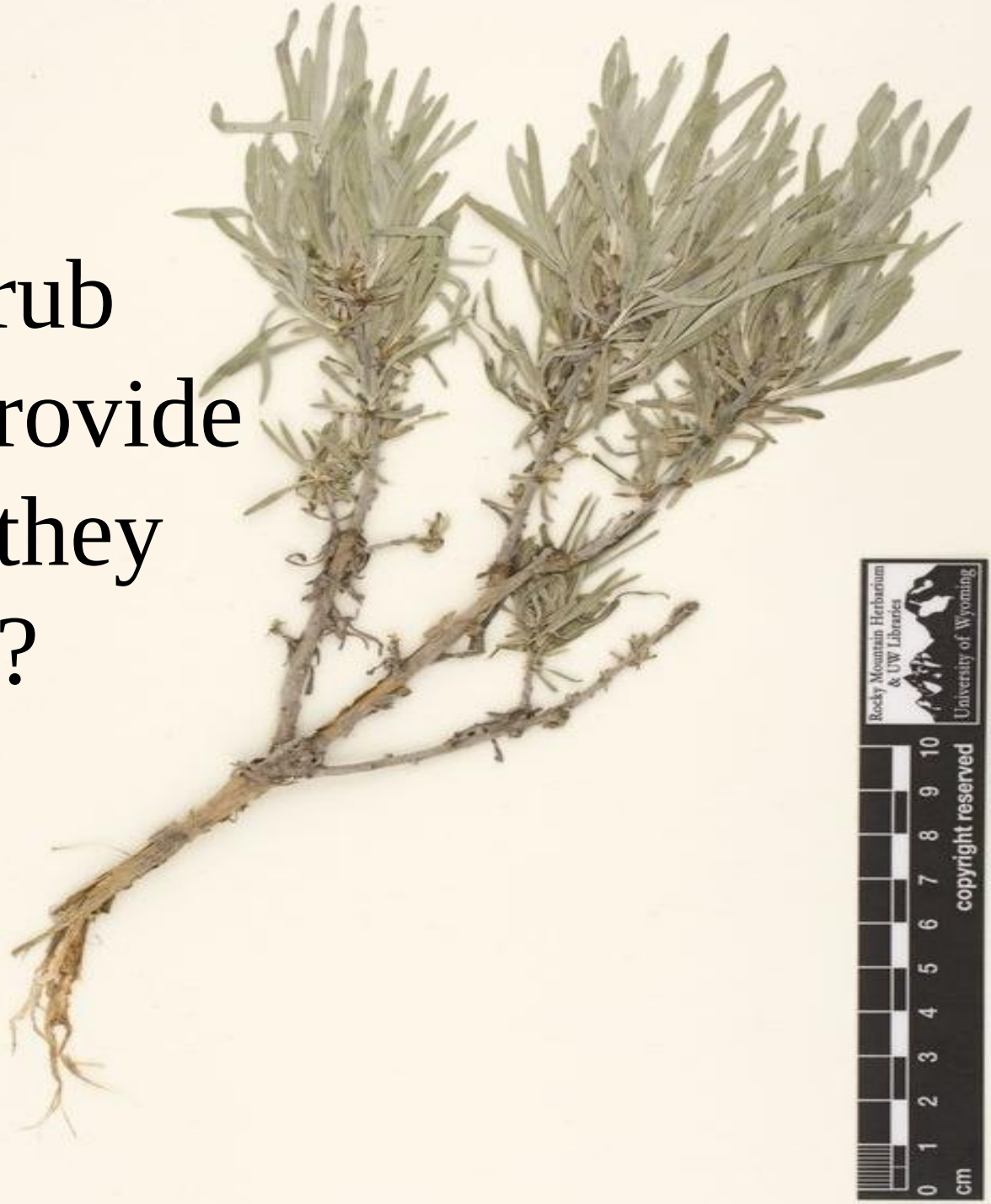
Sagebrush Communities

- 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)

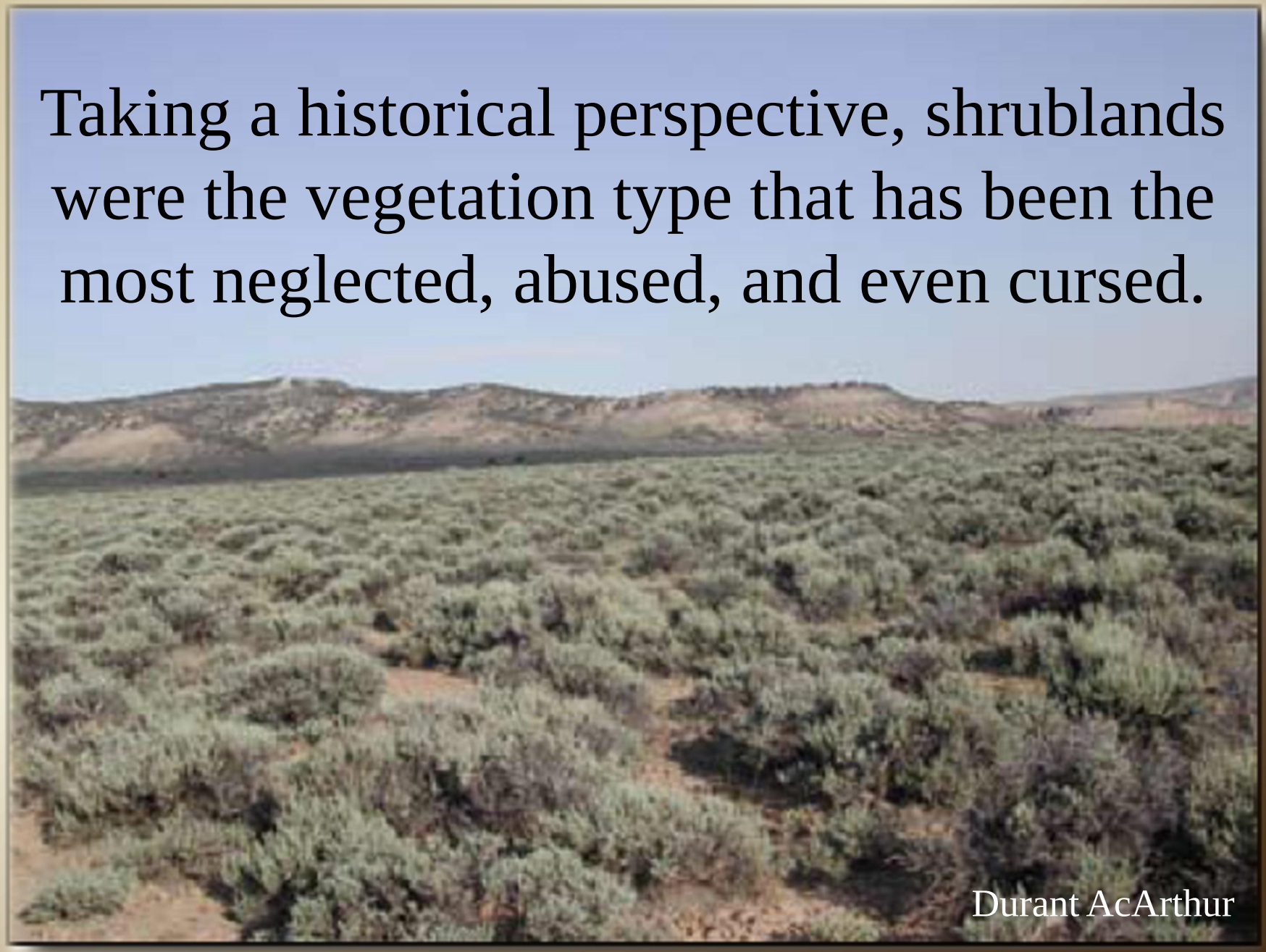


- Wyoming has VERY diverse landscapes
- Location of shrub communities is driven by:
  - Precipitation
  - Temperature
  - Soils
  - Topography

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.



McKell and Garcia-Moya 1989

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

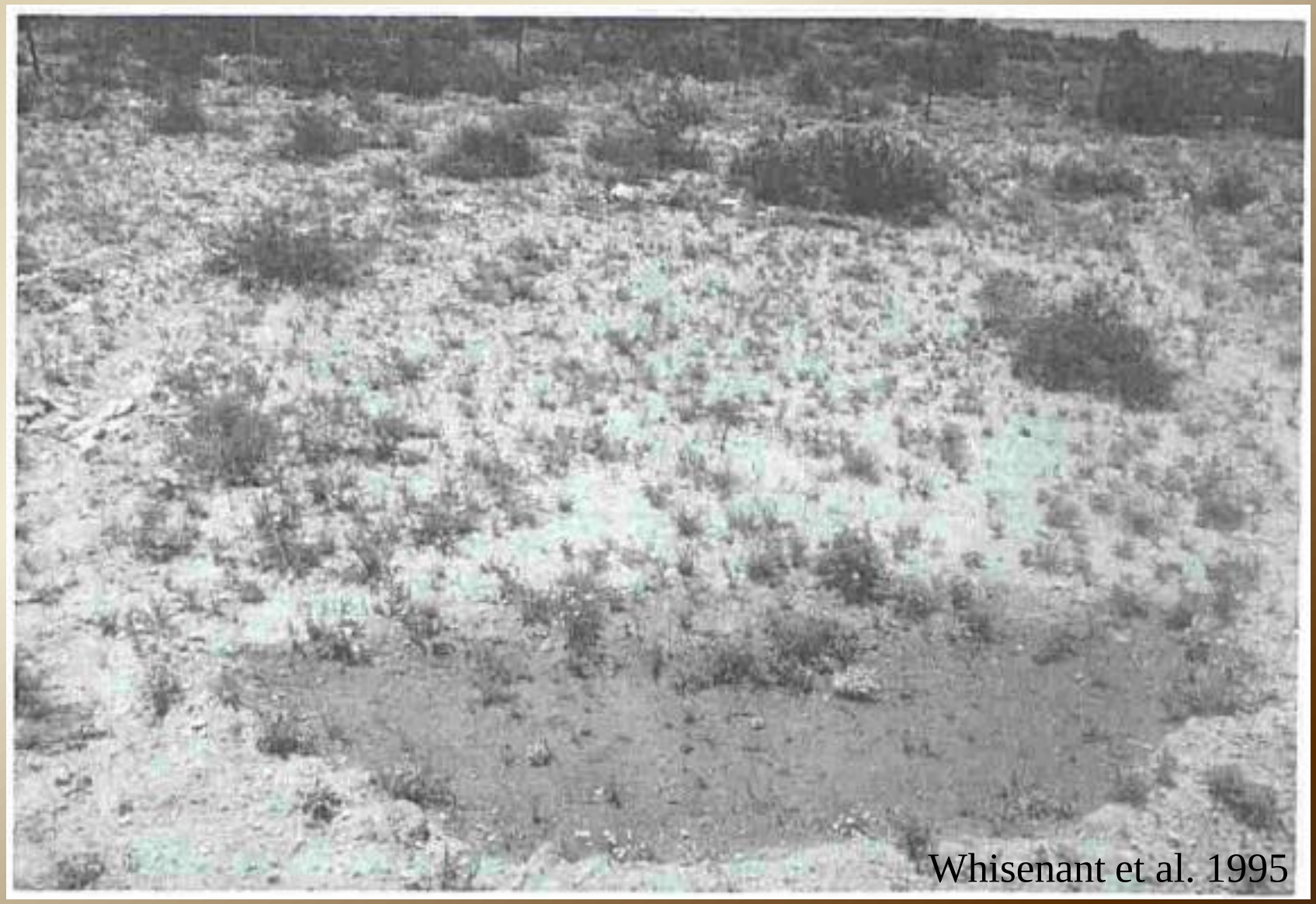
- Except for digestible energy, shrubs have higher values for protein, phosphorus, lignin, and carotene than grasses or forbs and are most important for fall and winter grazing (Cook 1972)
  - Grasses and forbs are not readily available, increasing shrubs forage value
- Species preference helps balance 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 significatnly greater in microcatchment basins 32 months after transplanting than in unmodified sites
- Microcatchments and shrub reesablishment initiated autogenic successional processes leading to fertile islands
  - Greater herbaceous development around shrubs

Wildlife Habitat

- Sagebrush occupies ~50% of Wyoming's land area (Merrell et al. 1996, BLM 2001, Wyoming Sage-Grouse Working Group 2003).
- 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)

Common Name	Scientific Name
Brewer's Sparrow	*Spizella breweri*
Greater Sage-Grouse	*Centrocercus urophasianus*
Sage Sparrow	*Amphispiza belli*
Sage Thrasher	*Oreoscoptes montanus*
Eastern red bat	*Lasiurus borealis*
pocket mouse	*Perognathus parvus*
pocket gopher	*Thomomys idahoensis*
Olive-backed pocket mouse	*Perognathus fasciatus*
Pallid bat	*Antrozous pallidus*
Plains pocket gopher	*Geomys bursarius*
Pygmy rabbit	*Brachylagus idahoensis*
Sagebrush vole	*Lemmiscus curtatus*
Spotted Bat	*Euderma maculatum*
Spotted ground squirrel	*Spermophilus spilosoma*
White-tailed Prairie Dog	*Cynomys leucurus*

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

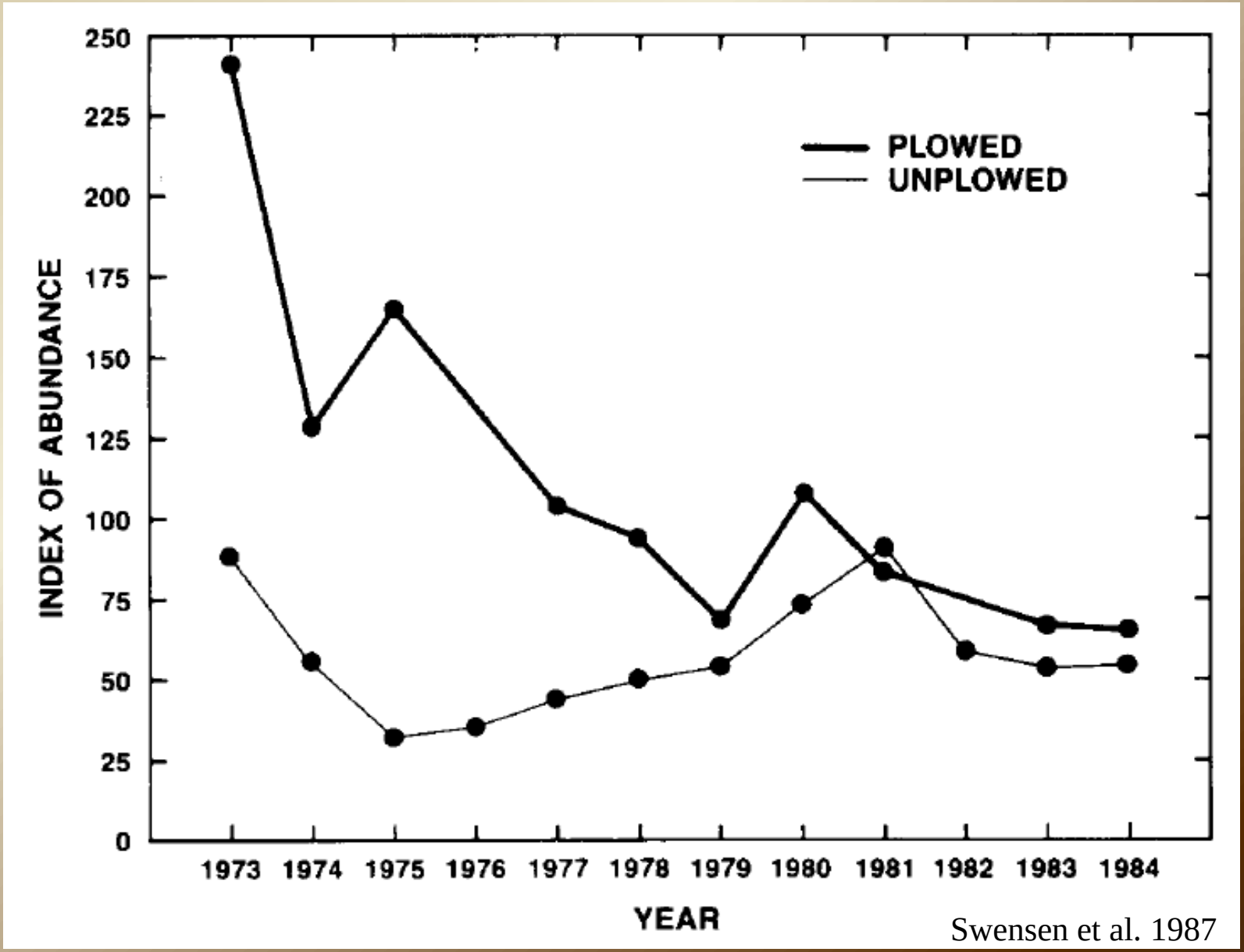
What have we lost by removing shrubs in area that normally have them?

- 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



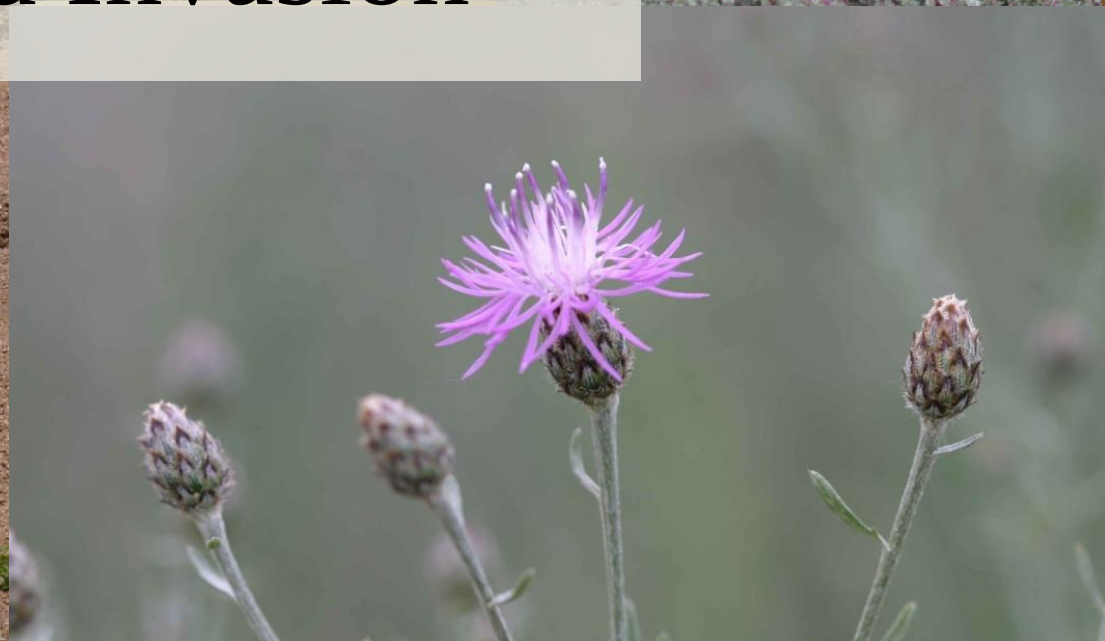
Swensen et al. 1987

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



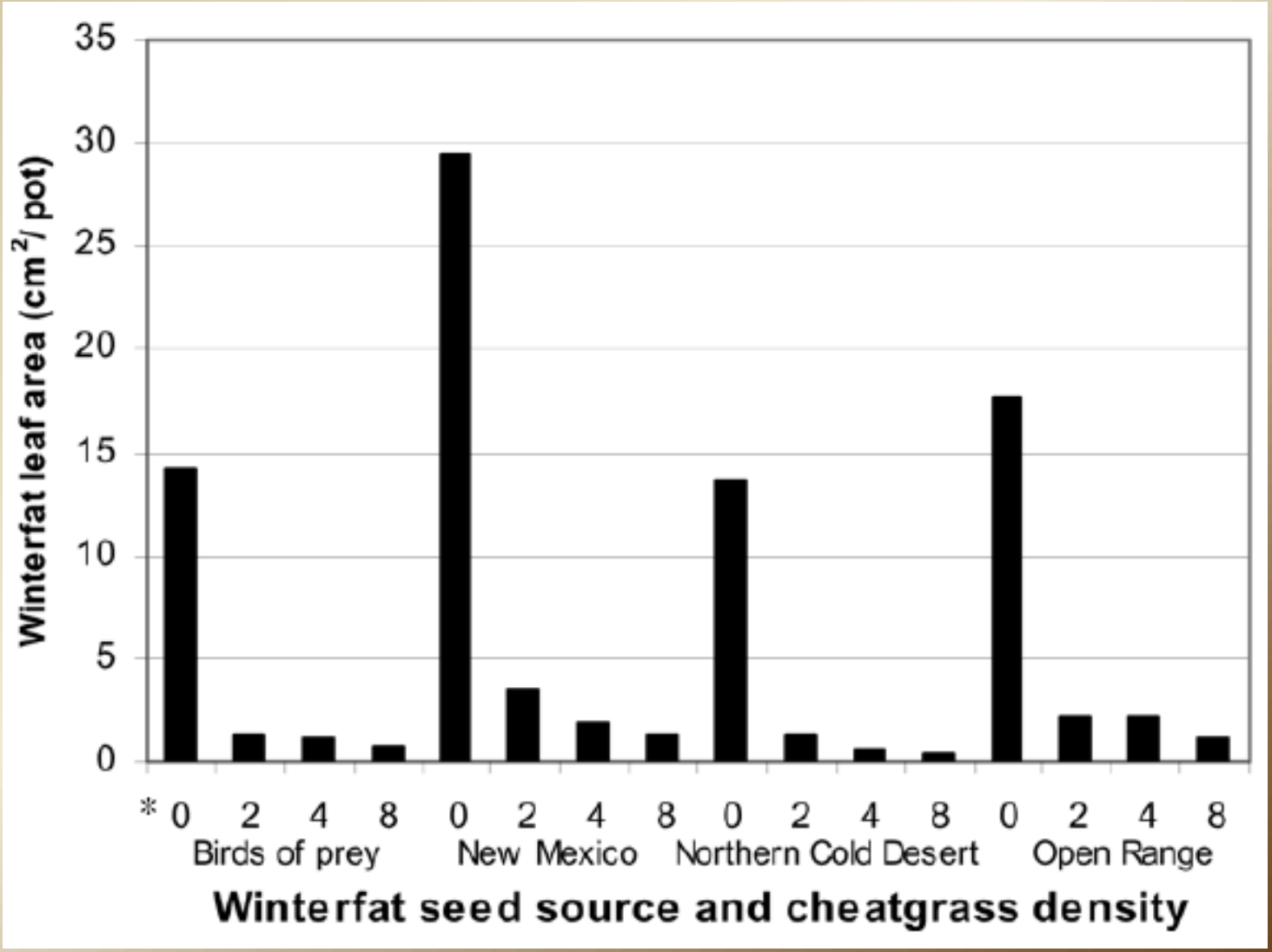
Weed Invasion

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

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

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