

Wildlife/Habitat Relationships within the Sagebrush-Grass Continuum

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HISTORICAL PERSPECTIVE

Miller and Eddleman (2001):

“The Wyoming big sagebrush and low sagebrush cover types, with less frequent disturbance events but slower recovery rates, and the mountain big sagebrush cover type, with more frequent disturbance but faster recovery rates, created a mosaic of multiple vegetation successional stages across the landscape.”

Miller and Eddleman (continued):

“In addition, fire patterns were patchy, leaving unburned islands, particularly in Wyoming big sagebrush cover types, because of limited and discontinuous fuels. Plant composition ranged from dominant stands of sagebrush to grasslands.”

In the book, *Forgotten Fires* (2002), in a 25-page section on the Great Basin and Plateau, anthropologist Omer Stewart, through an extensive literature review concluded “The statements of burning by Indians ... are sufficient to support the conclusion that fire was used by Indians of the Great Basin and Plateau regularly and for many purposes.”

Julian H. Steward, who wrote the most comprehensive book on the region, *Basin-Plateau Aboriginal Sociopolitical Groups*, came to the same conclusion, for he said in 1948 (p. 278): “[Indians] changed the natural landscape by repeated firings, probably intentional as well as accidental, which ... created grasslands where climax vegetation would have been brush or forest.”

Kitchen (2010) – provides empirical evidence that consequential early and late season anthropogenic firings were common in the eastern Great Basin between 1400 and 1900 CE.

Wildlife in Sagebrush-Grass Communities

- 91 bird species
 - * 33 possibly near-obligates
- 88 mammal species
 - * 19 possibly near-obligates
- 45 reptile species

Sagebrush Habitat Obligates

- Sage Grouse
- Sage Sparrow
- Brewer's Sparrow
- Sage Thrasher
- Pygmy Rabbit
- Sagebrush Vole
- Pronghorn?
- Least Chipmunk?
- Mule Deer?
- Sagebrush Lizard?

Sage Grouse

- 
- A photograph of two Sage Grouse in a natural, arid environment. The birds are positioned in the center of the frame, facing each other. They have mottled brown and black feathers on their backs and wings, with a prominent white patch on their necks. Their heads are turned slightly towards each other. The background consists of dry, yellowish-brown grasses and shrubs, typical of a sagebrush steppe. The lighting is bright, suggesting a sunny day.
- Require sagebrush for food and/or cover
 - Thrive best in sagebrush mosaics
 - Optimal habitat has varying sagebrush heights/species and diverse understory

Shrub-Nesting Sagebrush Obligates - Habitat

- **Sage Sparrow – clumped sagebrush areas within large continuous sagebrush stands; tall shrubs & low grass cover**
- **Brewer's Sparrow – abundant scattered shrubs & short grass**
- **Sage Thrasher – tall dense sagebrush with interspersed relatively open understory**

Shrub-Nesting* Sagebrush Obligates – Nest Sites

- **Sage Sparrow** – in shrub typically higher than surrounding shrubs, avoiding SW portion – early nests often on ground
- **Brewer's Sparrow** – typically in top half of shrub, above densest portion
- **Sage Thrasher** – within most dense portion of shrub; tallest, most dense clump of shrubs

*Each species sometimes nests beneath shrubs

Brewer's Sparrow



**Shrub-Nesting
Species**



Sage Sparrow



Seedlings With 10% Shrub Cover

48% Shrub Nesting Birds

52% Grass Nesting Birds

(McAdoo et al. 1989, J. Wildl. Manage.)



Sagebrush Obligate Mammals

- Pronghorn (?) – eat forbs mostly, but sagebrush in winter; need openess for visibility
 - Pygmy Rabbit – tall sagebrush clumps/friable soils
 - Sagebrush Vole – grass cover critical
- 
- A photograph of a pronghorn standing in a field of sagebrush. The pronghorn is facing left, with its head turned slightly towards the camera. It has a light brown body with a white patch on its side and a black face. The background is a vast, open field of dry, brownish sagebrush under a clear blue sky.

Sagebrush Habitat Associated Bird Species

- **Loggerhead Shrike – shrub nester**
- **Gray Flycatcher – shrub nester (near-obligate)**
- **Green-tailed Towhee – higher elevations; ecotones**
- **Horned Lark – ground nester**
- **Vesper Sparrow – grass nester**
- **Western Meadowlark – grass nester**
- **Lark Sparrow – diverse sagebrush/bunchgrass**
- **Burrowing Owl – open/disturbed areas**
- **Many others, including raptors**













Sagebrush Habitat Associated Ungulates

- **Mule Deer – prefer shrub-forb mix – use sagebrush for forage and cover in GB winter range**
- **Elk – eat dominantly grass, but shrubs in winter**
- **Bighorn Sheep – sagebrush/grass as winter range**

Regional Obligate??







Sagebrush Habitat Associated Lagomorphs

- **Black-tailed Jackrabbit – more shrub-associated**
- **White-tailed Jackrabbit – more grass-associated**
- **Mountain Cottontail**
- **Desert Cottontail**

Black-tailed Jackrabbit “Increaser”





**White-tailed Jackrabbit
“Decreaser”**

A close-up photograph showing a person's hands holding a small, greyish-brown mouse. The mouse is being held by its tail and body, and a thin metal rod is visible near its tail. The background is dark and out of focus.

**Sagebrush Habitat
Associated Rodents – 28 Species**

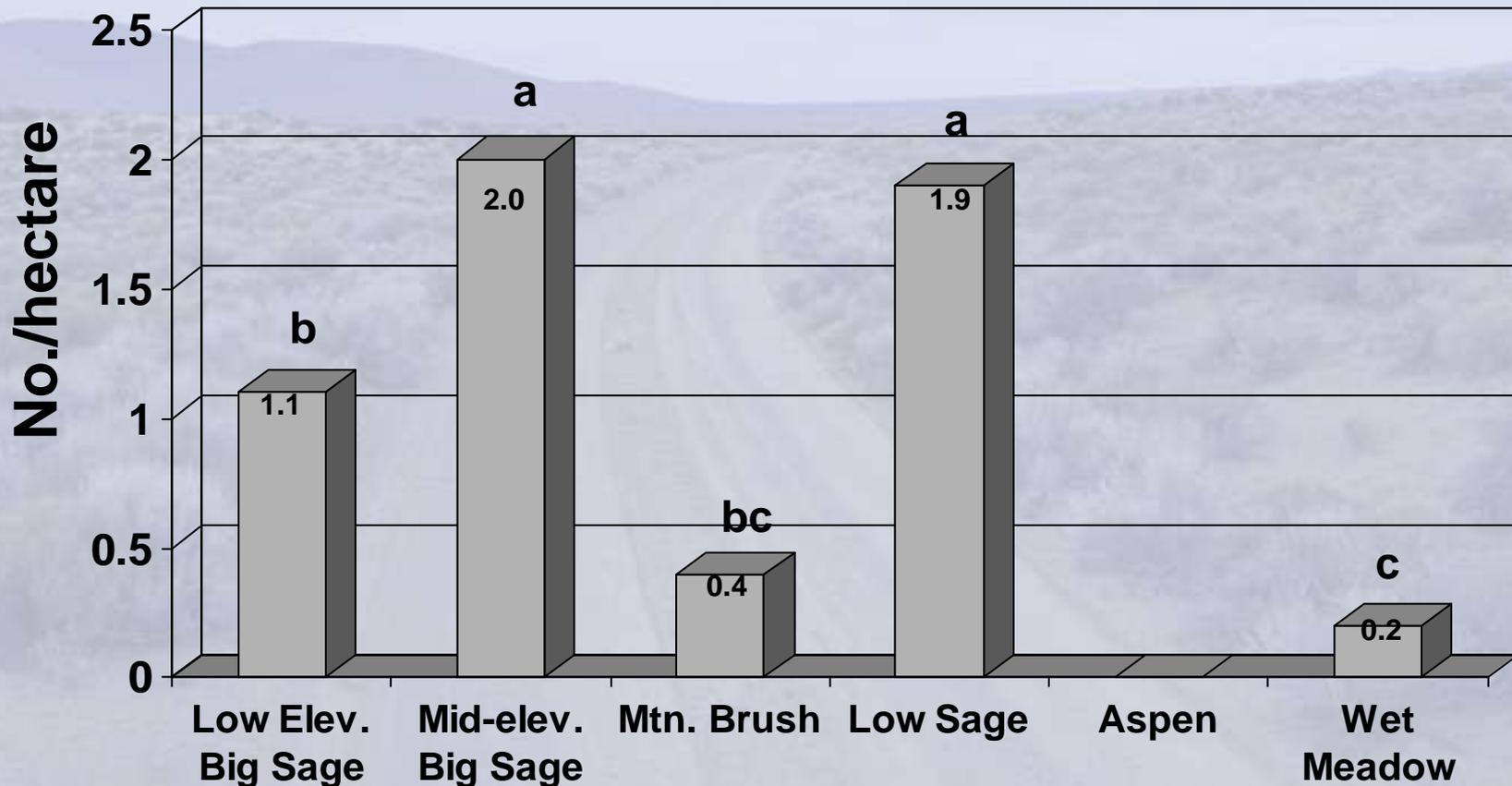
**Deer Mouse –
Most Abundant & Widespread Species**

SAGEBRUSH “NEAR-OBLIGATES”?

- Sagebrush voles – prefer grass cover (even crested wheatgrass)
- G.B. pocket mice – big sagebrush, low sagebrush, crested wheatgrass
- Least chipmunks – most abundant in big sagebrush; require shrub cover

Great Basin Pocket Mice Densities

(McAdoo et al. 2006, W. No. Am. Nat.)

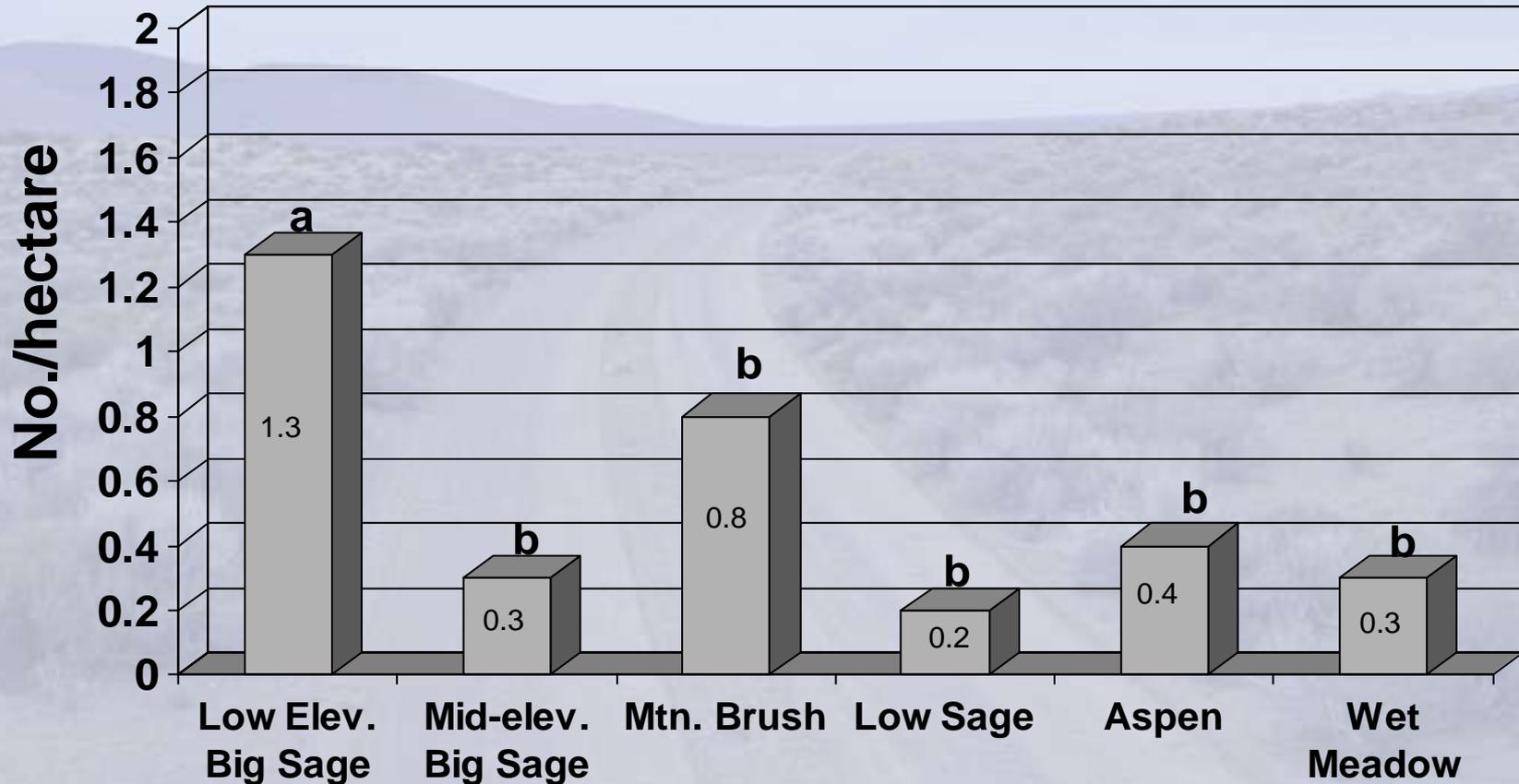


[Means with differing letters are significantly different ($p < 0.05$)]



Least Chipmunk Densities

(McAdoo et al. 2006, WNAN))



[Means with differing letters are significantly different ($p < 0.05$)]

Least Chipmunk Population Indices as Function of Sagebrush Cover

(McAdoo, unpubl. data)

<u>Treatment</u>	<u>Chipmunk Index</u>
• Before sage removal (18% cc)	15*
• After sage removal (4% cc)	1

*p<0.05

Insectivores

3 sagebrush habitat-associated species in northern Nevada (Ports & McAdoo 1986, SW Nat.):

- **Vagrant shrew**
- **Montane shrew**
- **Merriam's shrew**

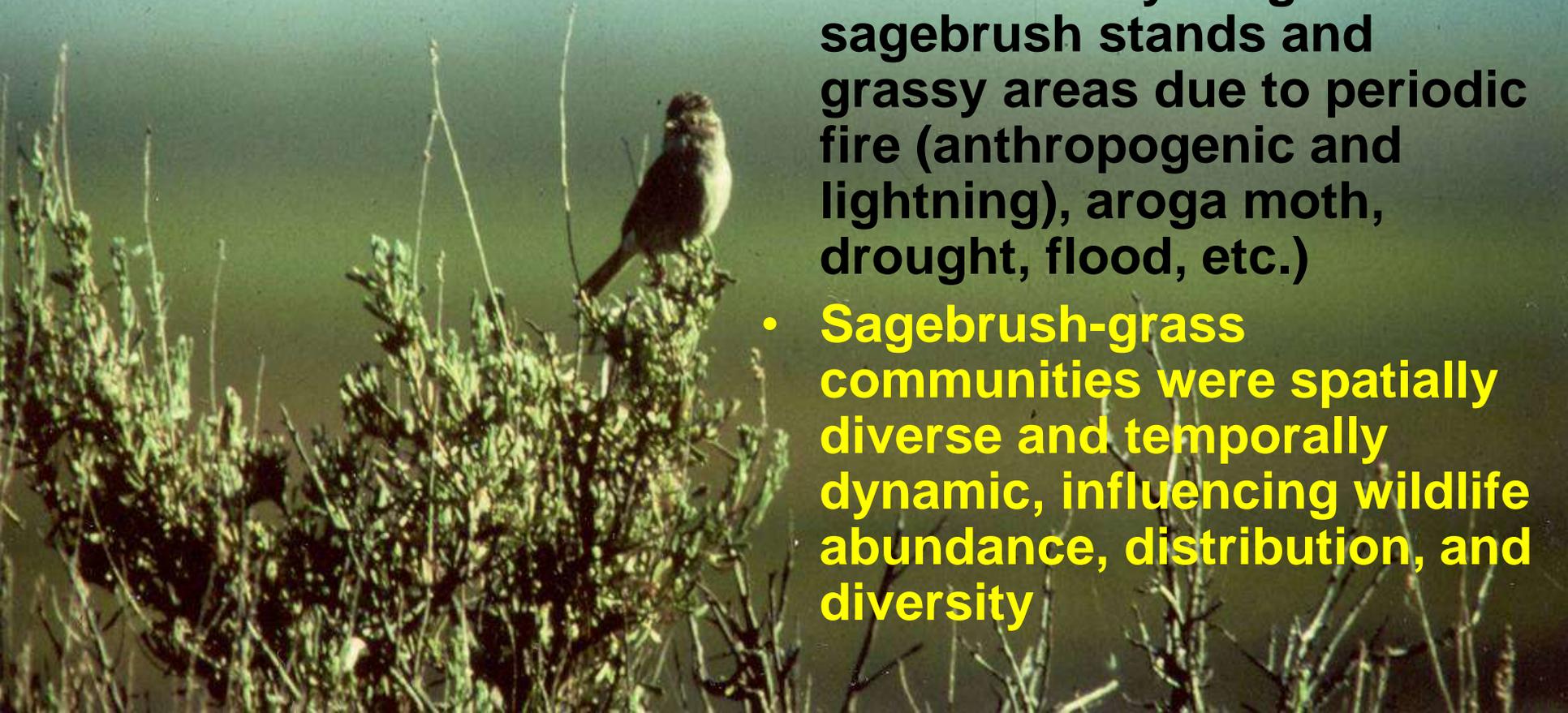
Sagebrush Habitat Associated Mammalian Predators



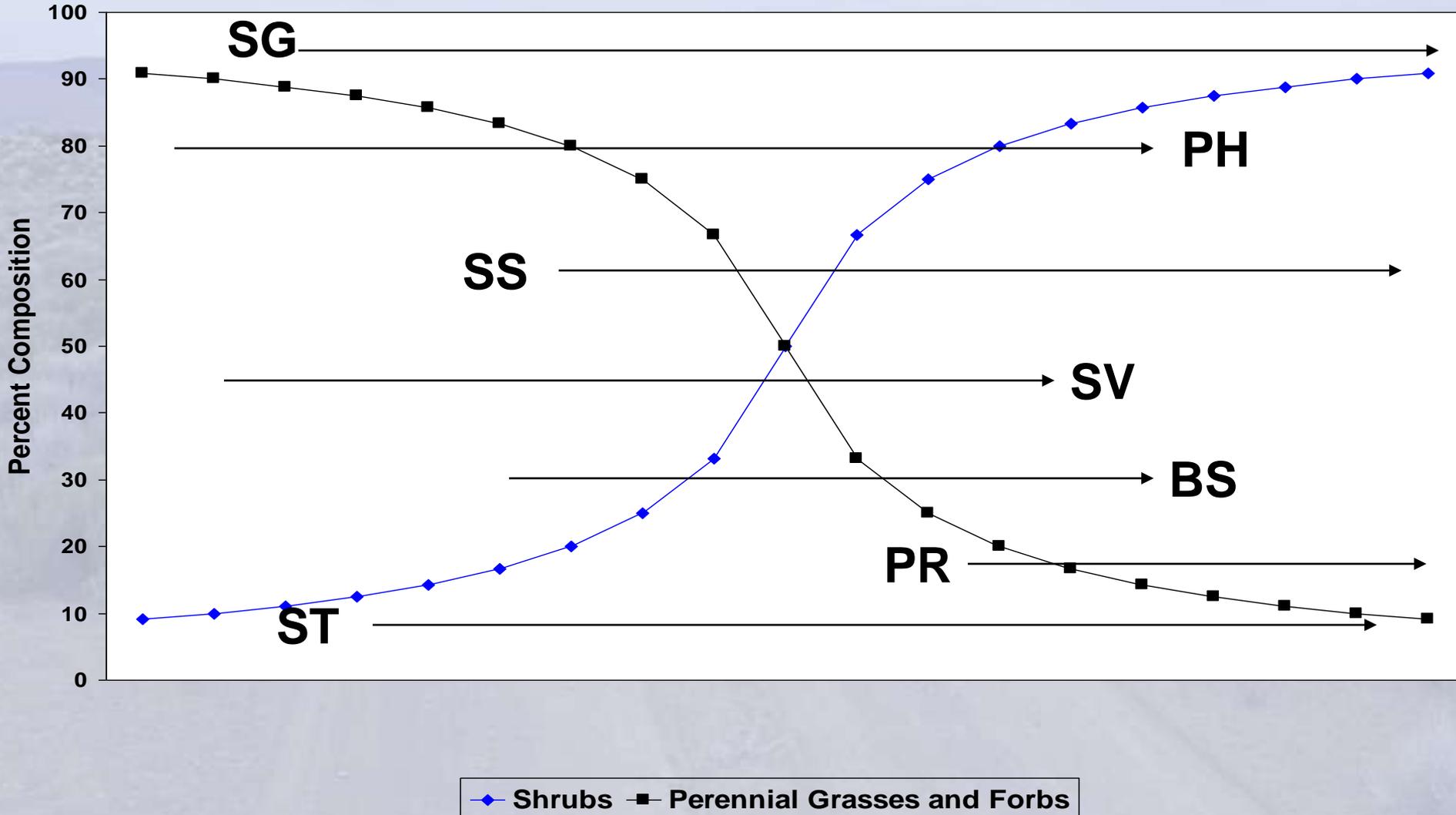
- Coyote
- Bobcat
- Mountain Lion
- Gray Fox
- Red Fox
- Kit Fox
- Short-tailed weasel
- Long-tailed weasel
- Badger
- Striped Skunk
- Others

Summary and Historic Inferences

- Habitat requirements of wildlife species are widely diverse
- Pre-settlement vegetation consisted of young and old sagebrush stands and grassy areas due to periodic fire (anthropogenic and lightning), aroga moth, drought, flood, etc.)
- Sagebrush-grass communities were spatially diverse and temporally dynamic, influencing wildlife abundance, distribution, and diversity



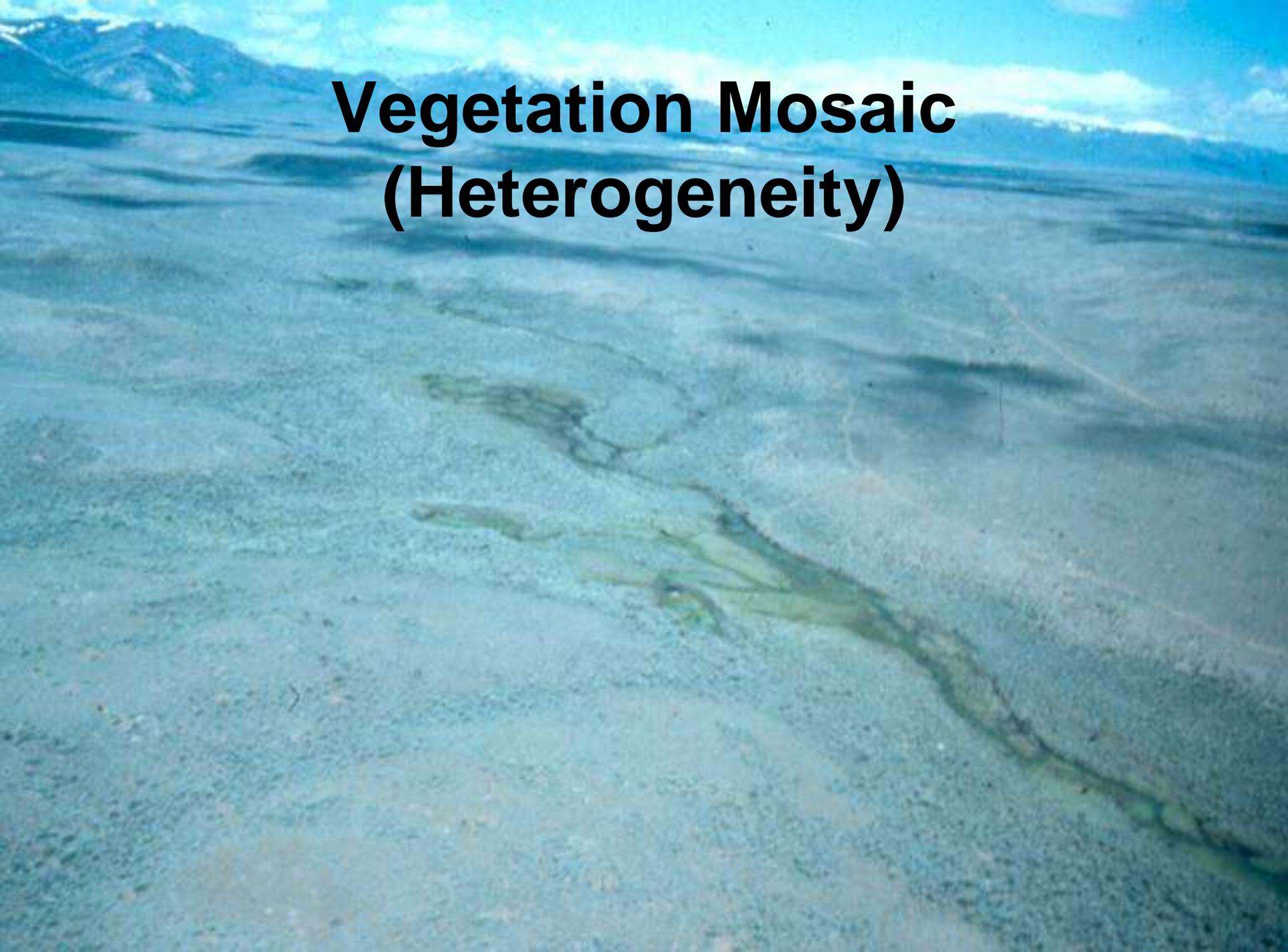
Habitat Requirements for Sagebrush Obligate Species



UMBRELLA SPECIES ?



Vegetation Mosaic (Heterogeneity)





Arlo

Artrw

Meadow

Arlo

Artrw

Arlo

Artrtr

**Mountain Big Sagebrush
Post-Burn Mosaic
(from cool season fire)**



Ebb & Flow of Grass- & Shrub-Associated Wildlife Species

Grassy/Open Areas

- W. Meadowlark
- Vesper Sparrow
- Sagebrush Vole
- W-t Jackrabbit
- Pronghorn

Shrub-Dominated Areas

- Sage Sparrow
- Sage Thrasher
- Least Chipmunk
- B-t jackrabbit
- Mule Deer

Based on faunal use records from archeological sites (Steward 1944; Pippin 1979; Matheny et al. 1997) and wildlife sightings by early Euro-American Great Basin explorers/travelers (Gruell and Swanson *in press*), grass- and open-habitat adapted wildlife species were apparently more common than shrub-dependent species in some areas of the Great Basin during both prehistoric and early historic times.

Obviously, wildlife species composition, distribution, and abundance was (and is) a function of plant succession, which in turn is a function of plant life forms and species, soils, geomorphology, topography, climate, and the scale, type, intensity, and frequency of disturbance.

Disturbance in Sagebrush-Grass Communities (Fire)



Disturbance in Sagebrush-Grass Communities (Aroga Moth)

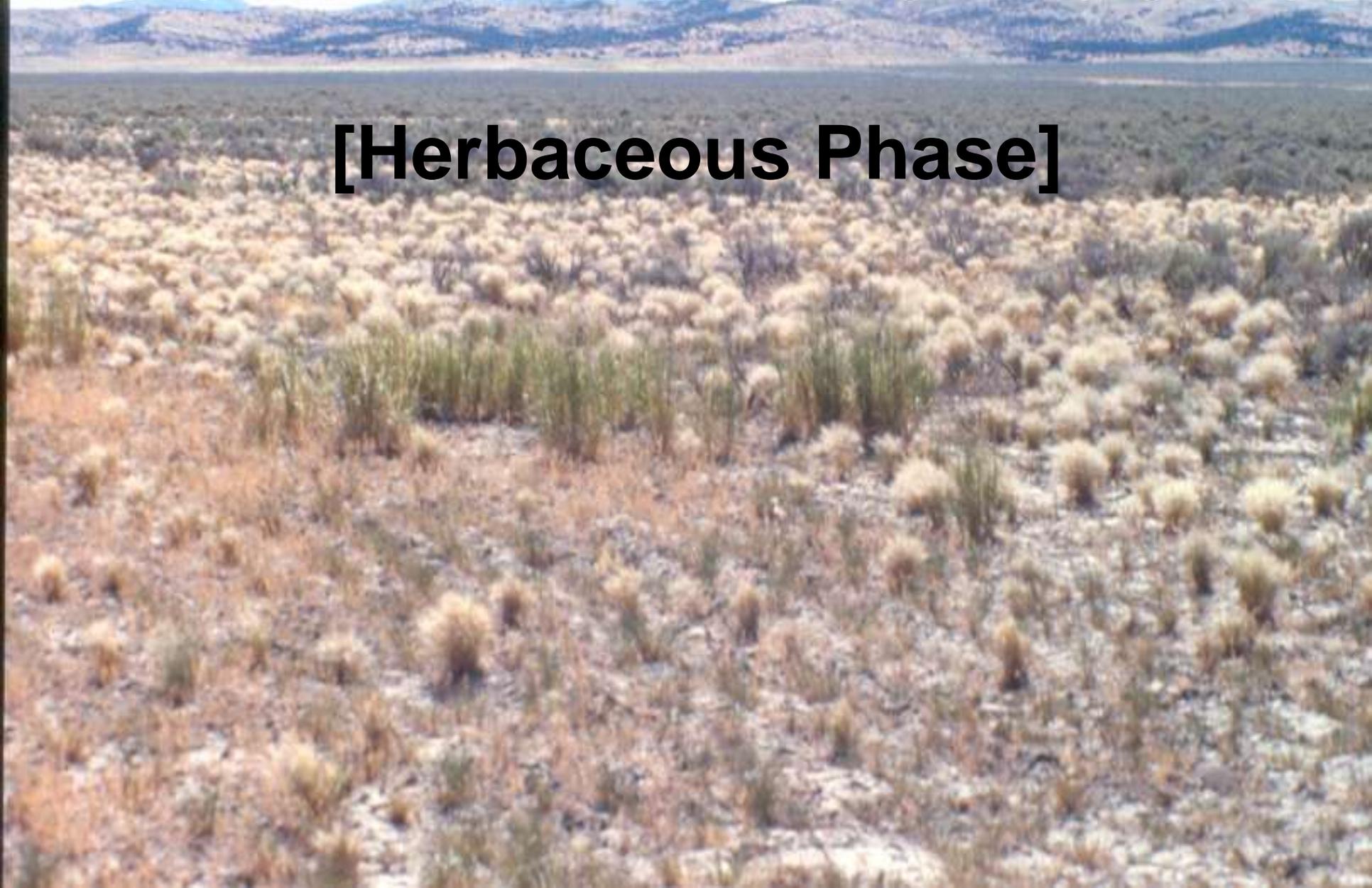


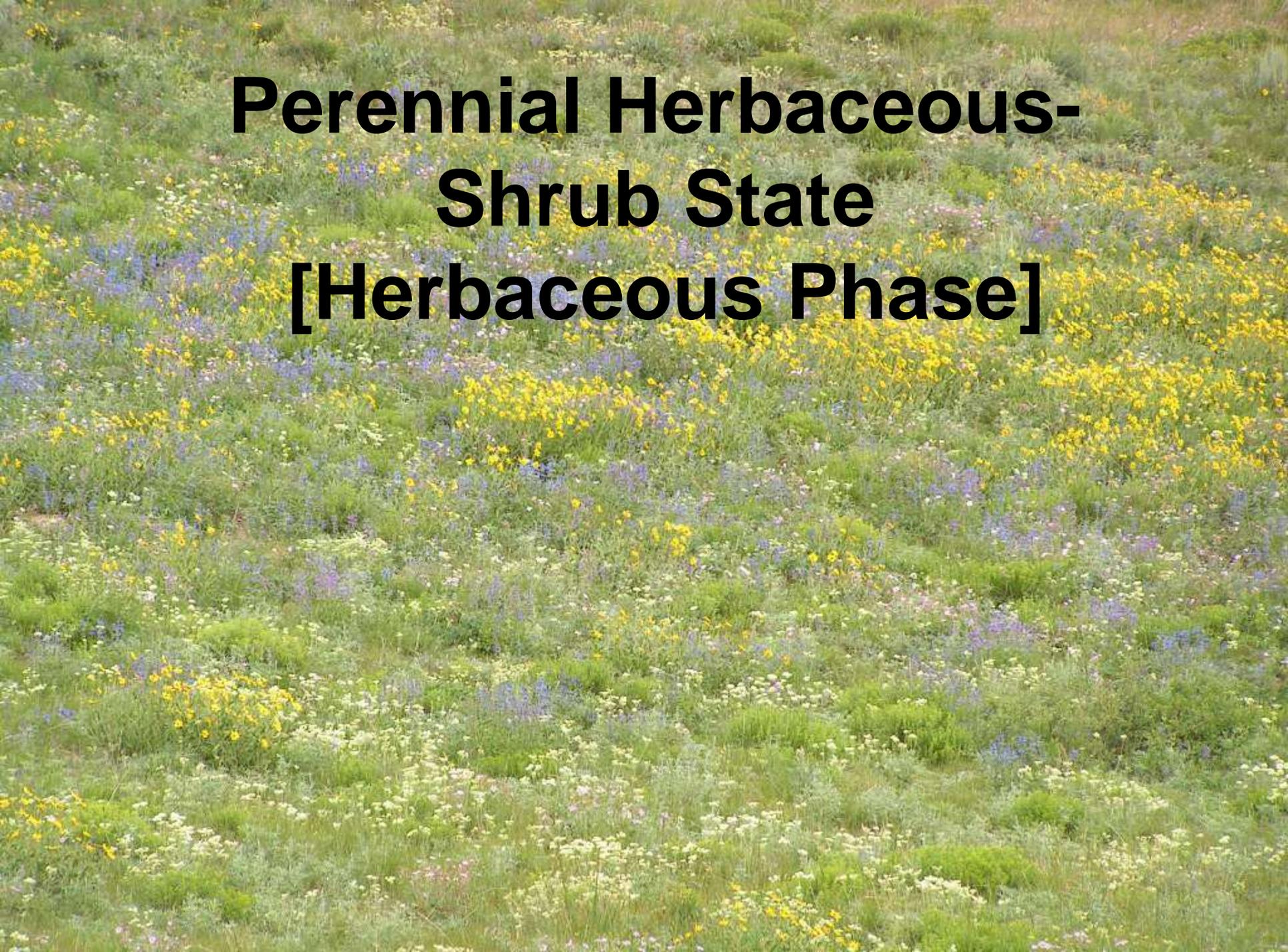
Only by preserving ecological processes (successional integrity-based resilience) can we maintain sagebrush communities across time

06.23.2006

Perennial Herbaceous-Shrub State

[Herbaceous Phase]





**Perennial Herbaceous-
Shrub State
[Herbaceous Phase]**

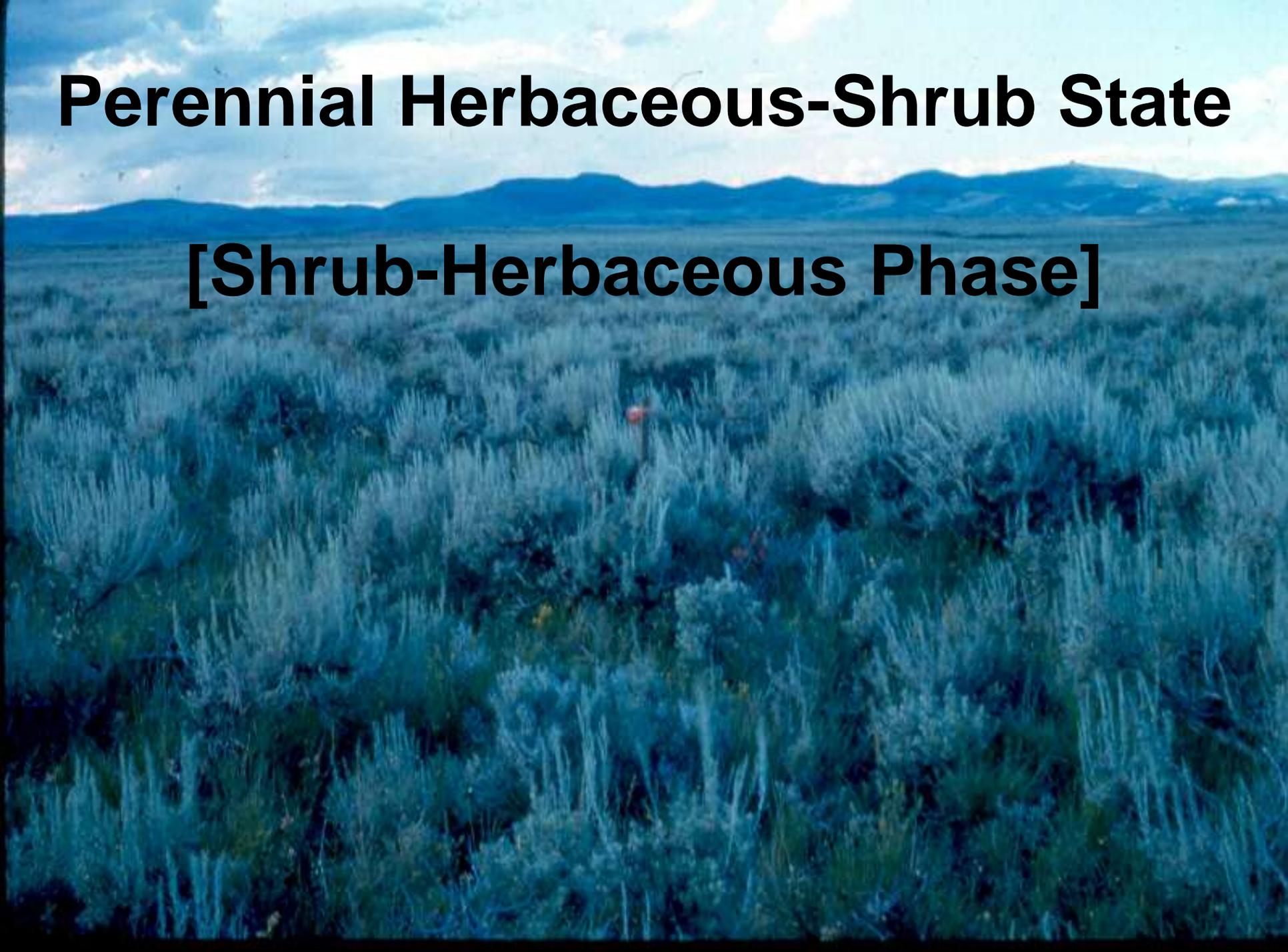
An aerial photograph of a landscape showing a mix of green and brown vegetation. The green areas are interspersed with larger, irregular patches of brown, suggesting a transition or a specific ecological state. The overall texture is dense and granular.

Perennial Herbaceous-Shrub State

[Herbaceous-Shrub Phase]

Perennial Herbaceous-Shrub State

[Shrub-Herbaceous Phase]





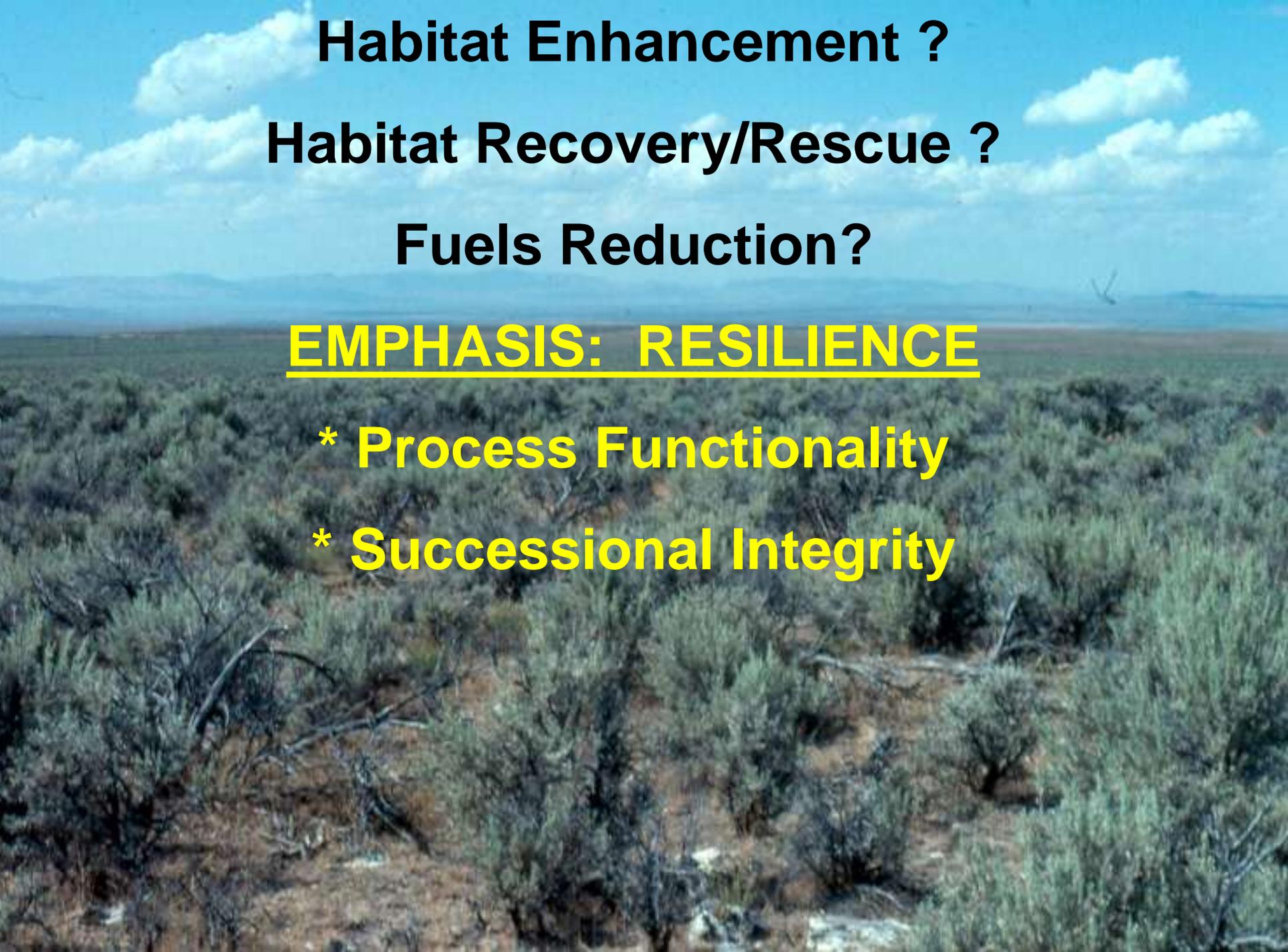
Minimize This - Threshold Crossed!
Active Mgmt Opportunity Missed

**Shrub State: Near-Monotypic Sagebrush
(no perennial herbaceous component)**

**Expect cheatgrass monoculture
after Fire!**

Cheatgrass Monoculture - Bleak Outlook for Wildlife





Habitat Enhancement ?
Habitat Recovery/Rescue ?
Fuels Reduction?

EMPHASIS: RESILIENCE

- * Process Functionality**
- * Successional Integrity**

Critical Passive Management – Proper Livestock Grazing



Active Management Needed for Sagebrush Community Resilience

Fires or other disturbances are inevitable, so:

- **Maintain perennial herbaceous component - without perennial grass component, cheatgrass or other invasive weeds will dominate after fire**
- **Maintain sagebrush seed source proximity**

Active Management is Critical - But...

Fire May or May Not Be the Best Prescribed Disturbance Mechanism

Options include: fire, herbicide, mechanical treatment, targeted grazing, seeding/planting, etc.

[Parallels A. Leopold's statement about using axe, plow, cow, and fire— i.e., all the tools in the toolbox]

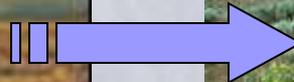
Davies et al. - 2008 J. Arid Environ. 72:1076 – 1085

- Evaluated Artr (w) – bunchgrass communities 4 years after prescribed fall burning at 6 sites.
- “Total herb. cover, density, and production significantly increased w/ burning”
- “Prescribed fall burning of late seral Artr(w)-bunchgrass communities stimulated the herbaceous component and increased the resistance of the communities to cheatgrass invasion 4 years post-burn. Results suggested that “periodic disturbances may be needed to maintain the long-term invasion resistance of plant communities that evolved with disturbances.””
- Decrease in Nitrogen and increase in herbaceous competition

“Assisted (Phased) Succession”

(Ongoing studies: Roundy, Anderson, Shaw, Pellant, Mangold, McAdoo)

- Restoration of weed-threatened areas may require “rehabilitation” *then* “restoration”



Assisted Succession in Crested Wheatgrass Monocultures



**Great Basin Native Plant
Selection & Increase Project
(Elko Area)**



**Transplanting Wyoming Big Sagebrush
into Crested Wheatgrass Seedlings
(EBIPM Research – Elko Area)**



**Establishment from
Spring Planting**

What Are the Implications of Assisted Succession for Wildlife?

Inferences from Research

**Bird Responses to Sagebrush Succession
in**

Crested Wheatgrass Seedlings

(McAdoo et al. 1989, J. Wildl. Manage)

A photograph of a sagebrush landscape. In the foreground, there is a field of dense, low-lying sagebrush with a wooden stake or survey marker in the center. The background features rolling hills and mountains covered in similar vegetation under a clear blue sky. The text is overlaid on the image.

In Near-Monoculture Sagebrush
80% Shrub Nesting Birds



In Monoculture Seedings
82% Grass Nesting Birds

Seedlings With 10% Shrub Cover

48% Shrub Nesting Birds

52% Grass Nesting Birds

(McAdoo et al. 1989, JWM)



Least Chipmunk Population Indices as Function of Sagebrush Cover

(McAdoo, unpubl. data)

<u>Treatment</u>	<u>Chipmunk Index</u>
Untreated (sagebrush cc = 20%)	20
Old Seeding (sagebrush cc = 14%)	14
New Seeding (sagebrush cc = 4%)	1

**What May Be Lost if We
Don't Ensure Sagebrush
Community (Sagebrush-
Grass Continuum)
Resilience?**



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