

Successful Restoration of Native Plant Communities in the Great Basin Depends on....?

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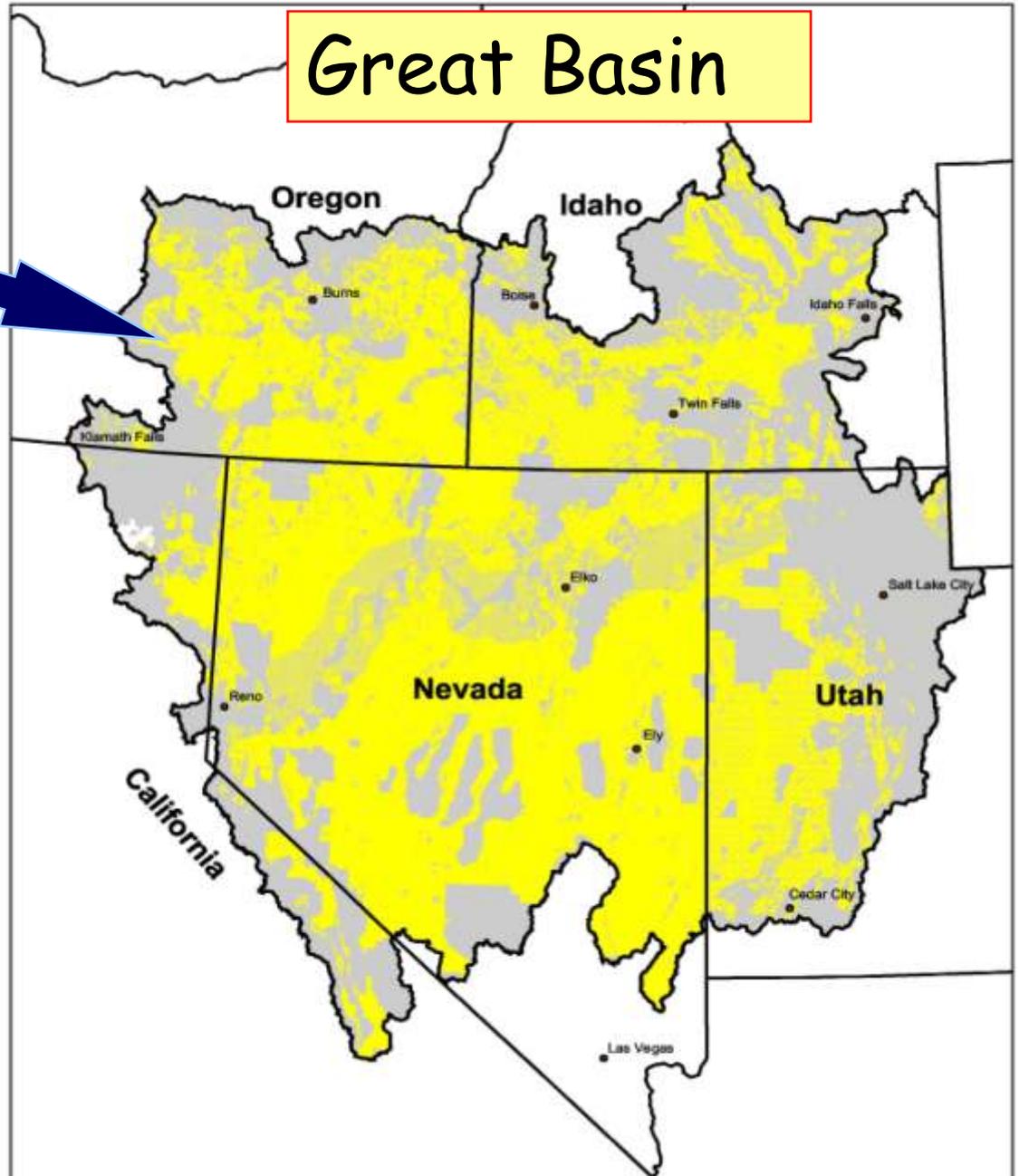
Depends on....?

- Setting and Competition
- Plant Materials & Seedbed Ecology
- Seeding Equipment
- Post-Restoration Management



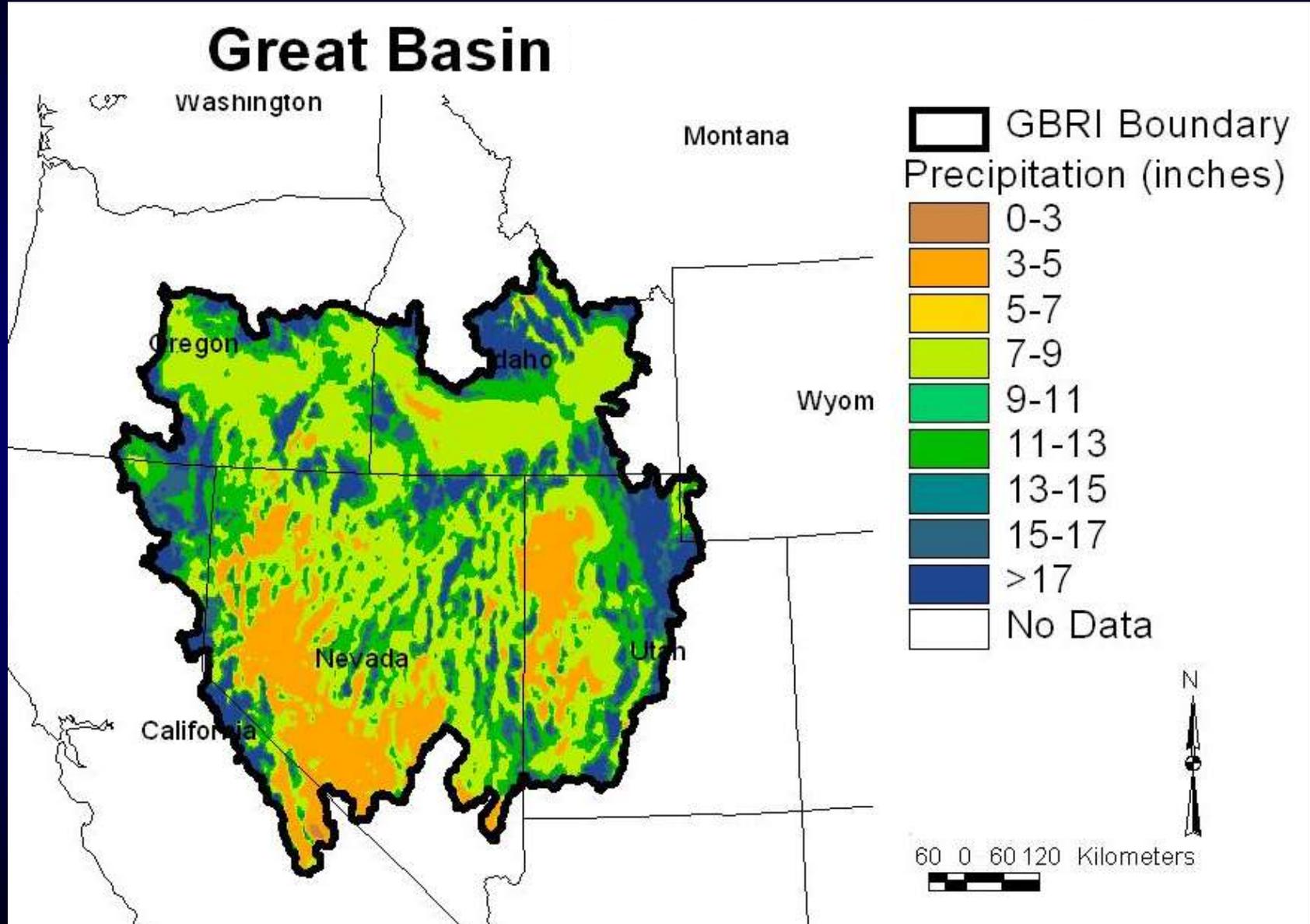


Great Basin



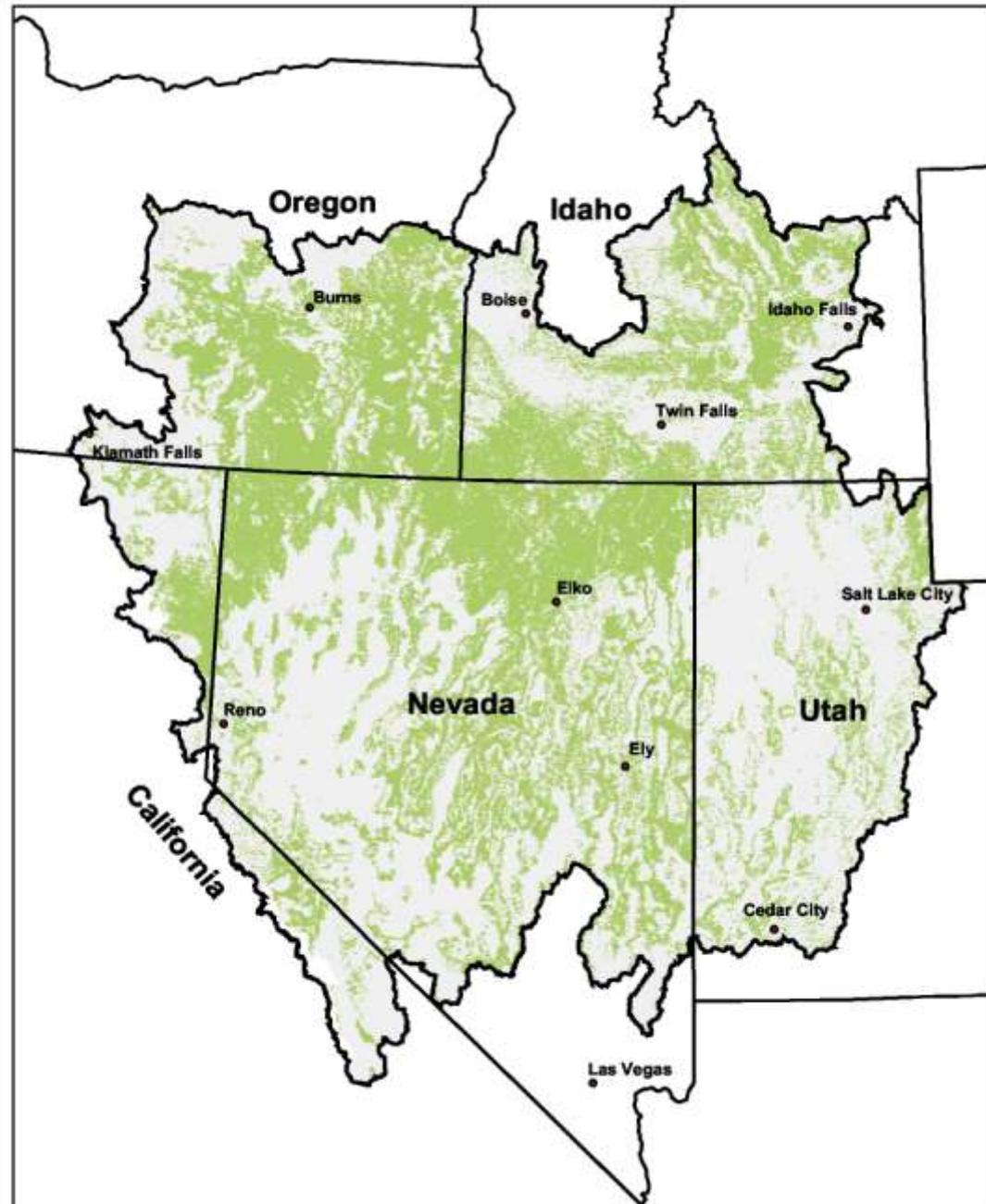
Owner	Acres
BLM	73 million
Private	29 million
FS	19 million
State	4 million
D.Def.	3 million
Tribes	2 million
Other	5 million
Total	135 million

Great Basin—Cold and Dry

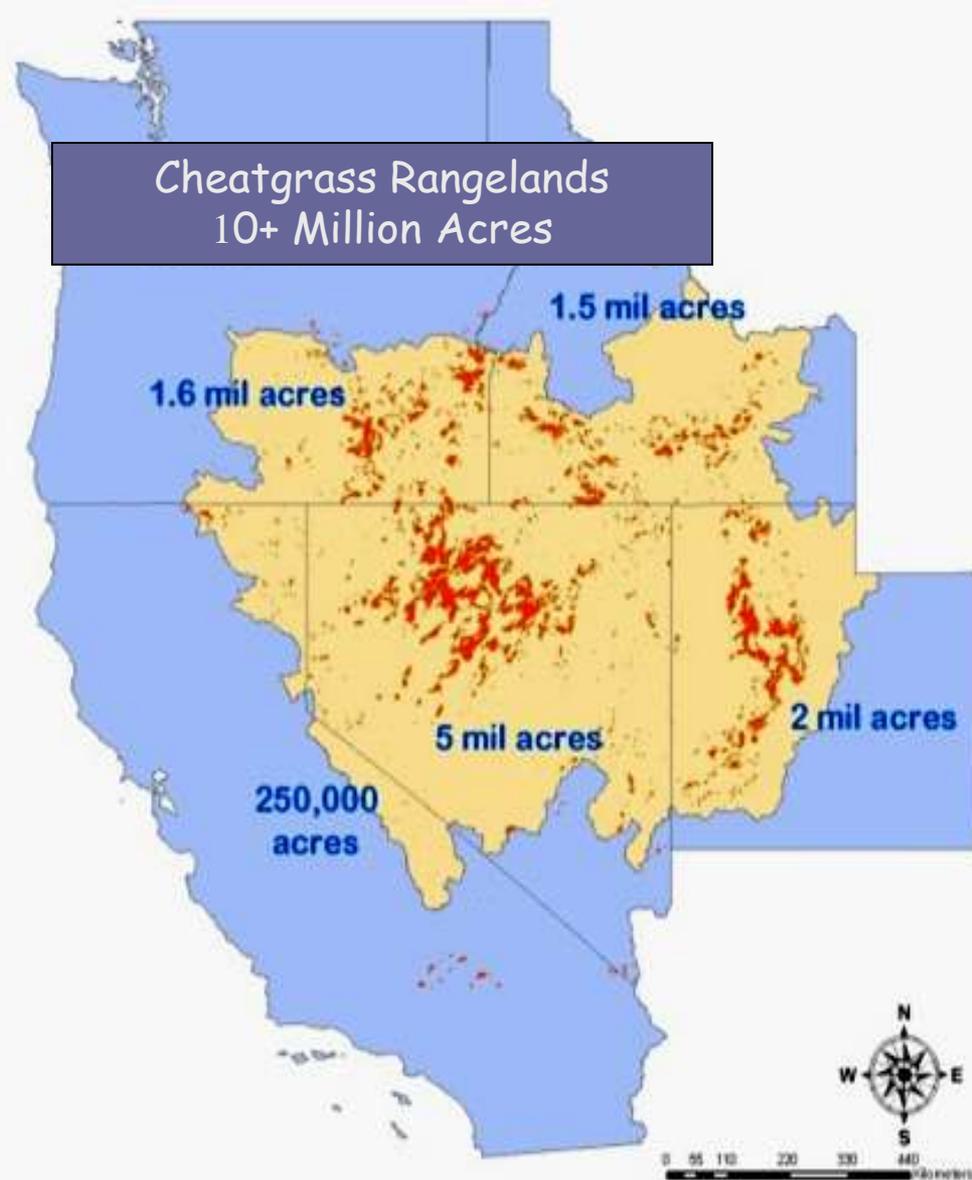


Sagebrush in the Great Basin

- 57 million acres of sagebrush in the Great Basin (54% of total remaining)
- At risk due to wildfires and invasives.



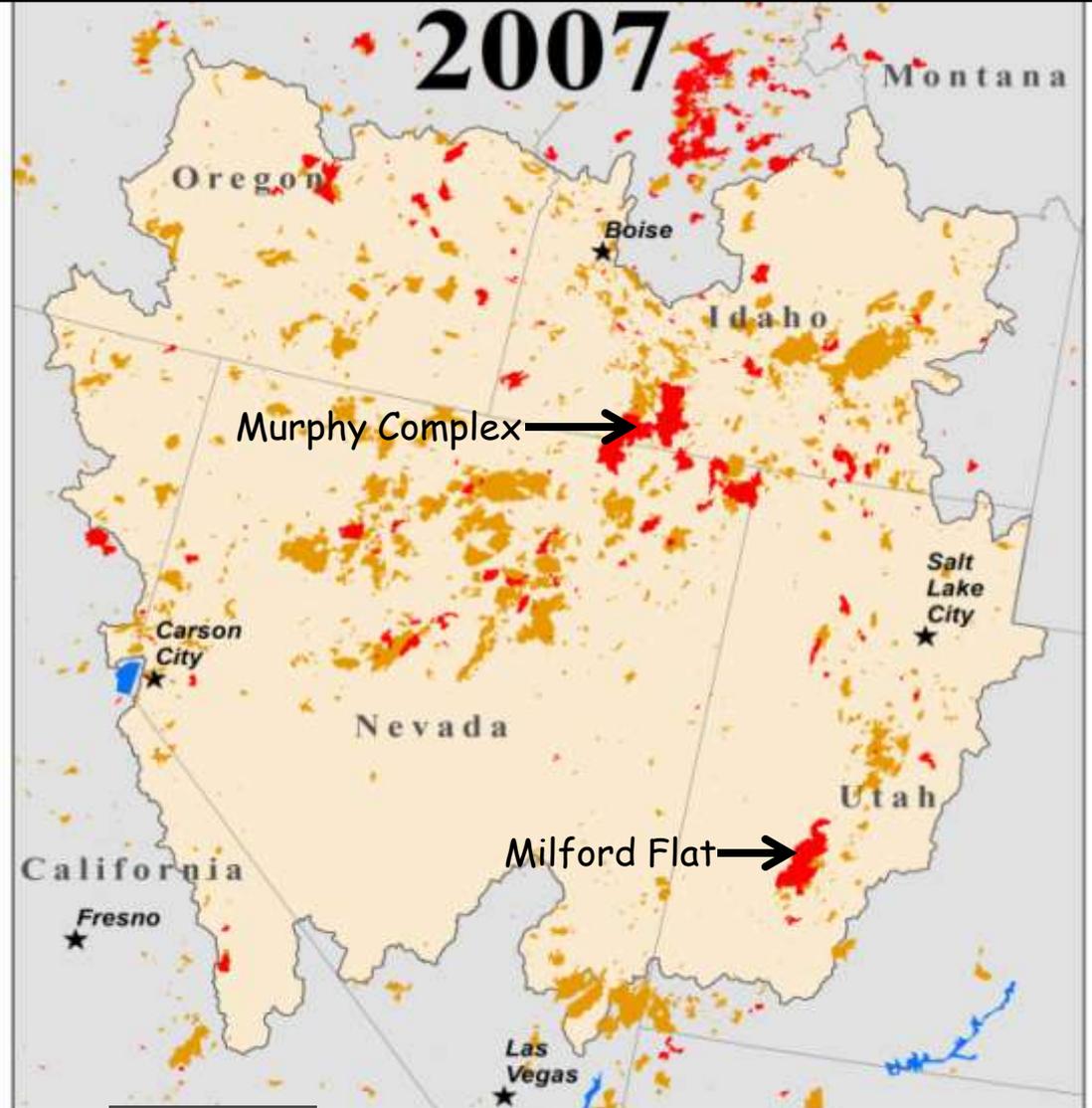
Cheatgrass is the most pervasive exotic species.



This map describes cheatgrass presence using methods outlined in Bradley & Mustard 2005. Cheatgrass is difficult to detect when it occurs beneath the shrub canopy and therefore the actual distribution of cheatgrass is likely more extensive.

Great Basin Wildfires 1990-2007 (2007 in red)

2007-
Beginning of
the rangeland
mega-fire era?

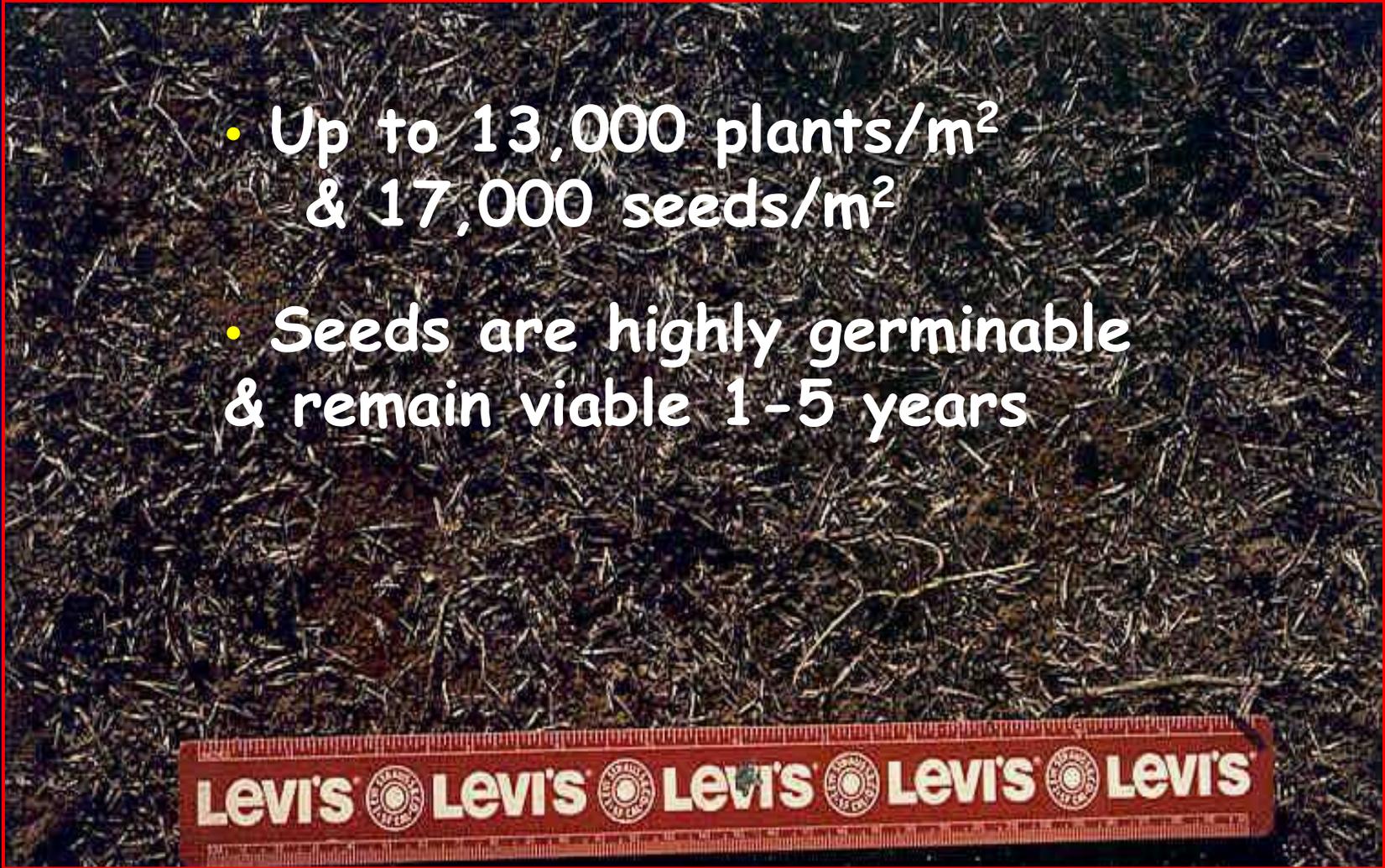


2007
2,722,838 Acres

Cumulative
16,241,995 Acres

Cheatgrass saturates it's environment with plants and seed

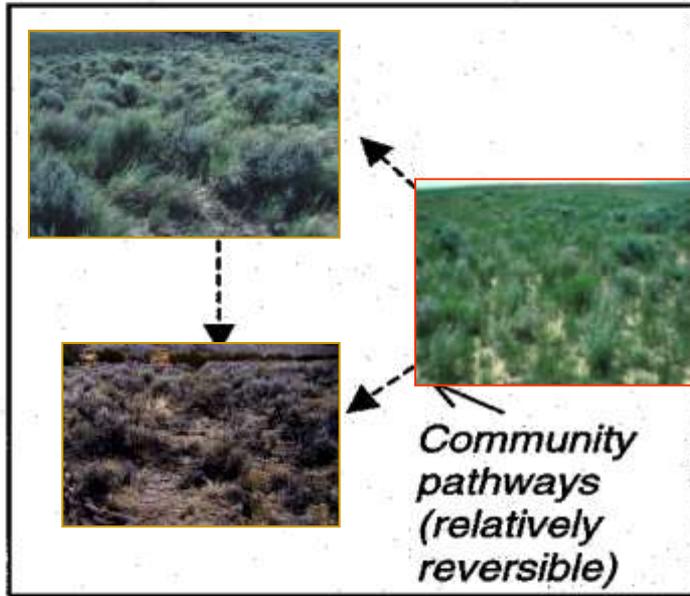
- Up to 13,000 plants/m²
& 17,000 seeds/m²
- Seeds are highly germinable
& remain viable 1-5 years



Levi's Levi's Levi's Levi's Levi's

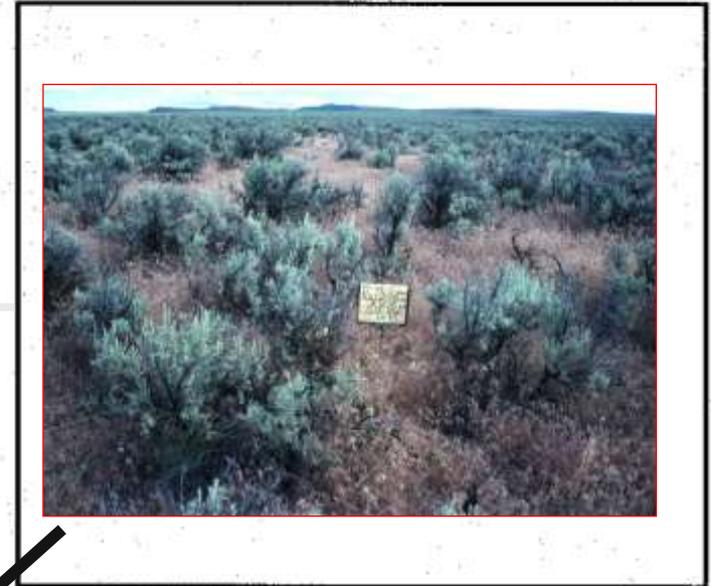
Site Preparation/Competition Control

Reference State
Shrub – Native Perennial Grass



Transition 1

State B
Shrub – Exotic Annual Grass
Reduced diversity; increased fire



Transition 2

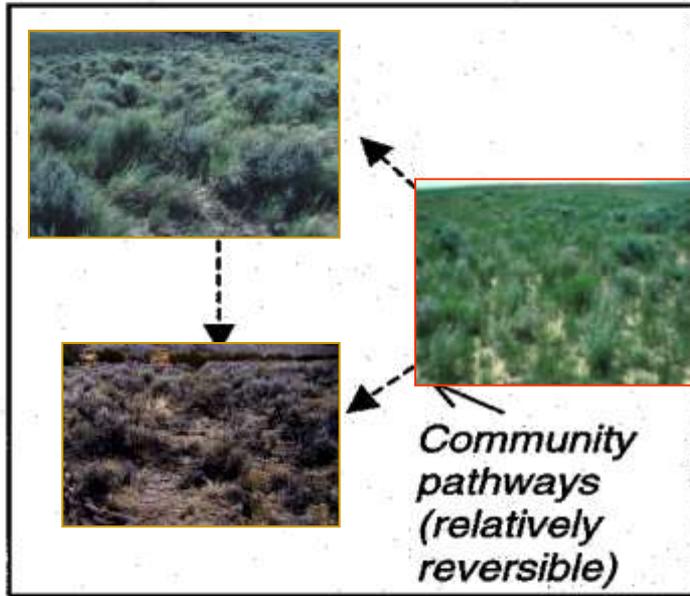


State C
Exotic Annual Grass
Increased Fire

Threshold

Site Preparation/Competition Control

Reference State
Shrub – Native Perennial Grass



Transition 1

State B
Shrub – Exotic Annual Grass
Reduced diversity; increased fire



Transition 2

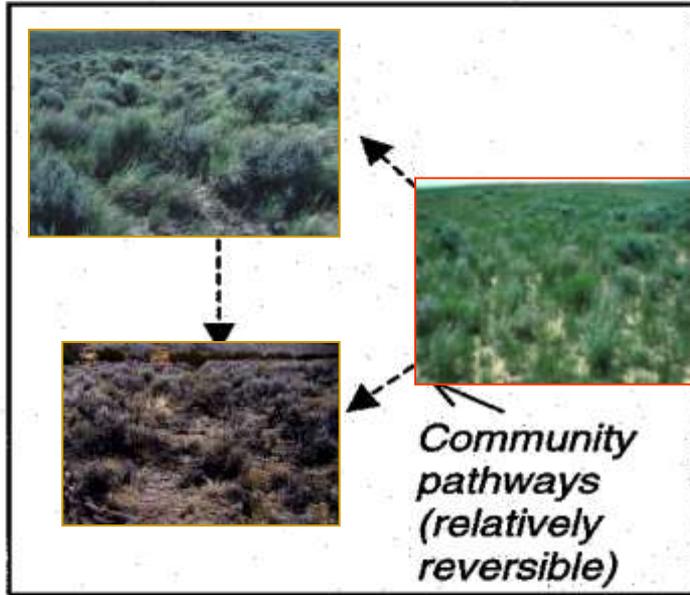


State C
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Transition 1

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Transition 2

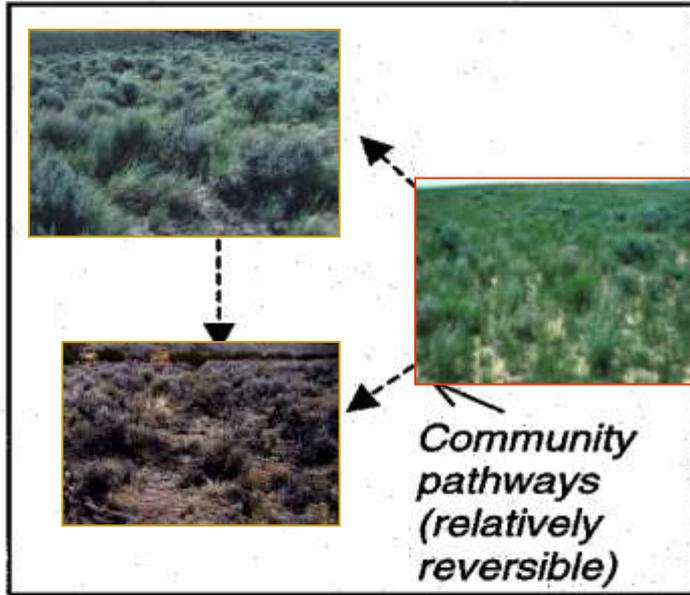


State C
Exotic Annual Grass
Increased Fire

Threshold

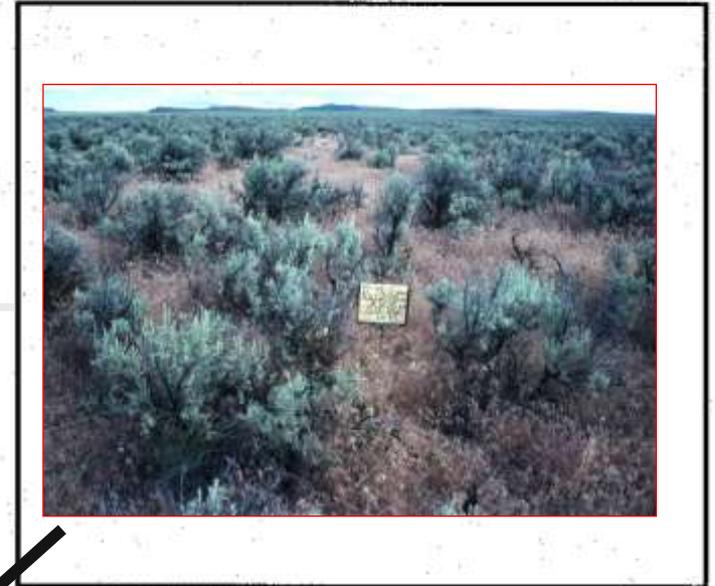
Site Preparation/Competition Control

Reference State
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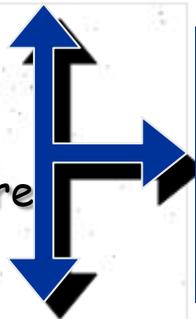
Transition 1

State B
Shrub – Exotic Annual Grass
Reduced diversity; increased fire



Transition 2

1. Biological
2. Mechanical
3. Prescribed Fire
4. Herbicides



**S
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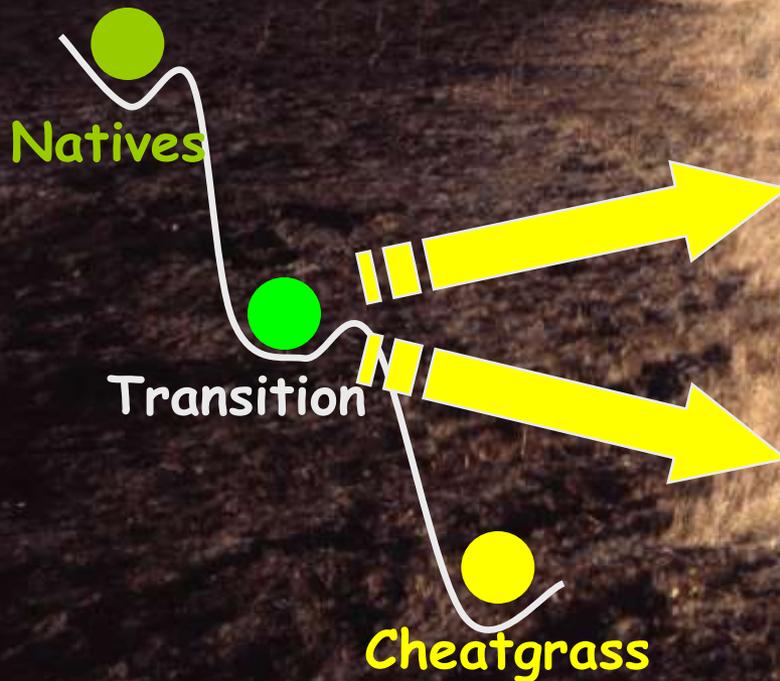


State C
Exotic Annual Grass
Increased Fire

Threshold

Strategy to Convert Cheatgrass Rangelands to a Desired, Diverse Plant Community

Assisted Succession Model



Ecologically-Based Invasive Plant Management

Boise Foothills Project Area



<http://www.ebipm.org/>

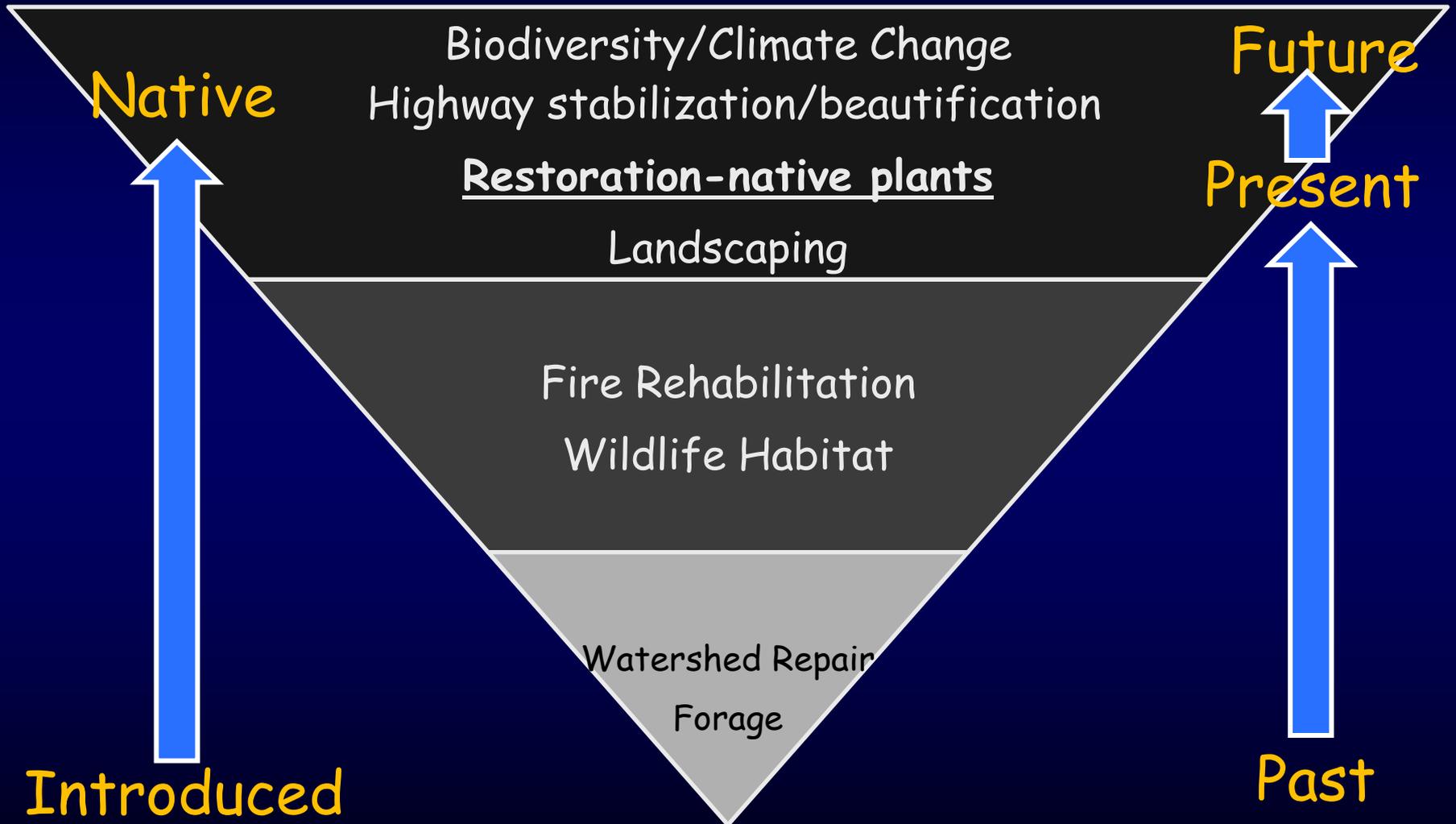
EBIPM Workshop in Boise 9/14-17
(see poster)

Depends on....?

- Setting and Competition
- Plant Materials & Seedbed Ecology
- Seeding Equipment
- Post-Restoration Management



Great Basin Plant Material Needs



Early Solution: Introduced Wheatgrasses

1947

UNIVERSITY OF IDAHO
AGRICULTURAL EXPERIMENT STATION
Department of Agronomy

FEBRUARY 1947

CIRCULAR NO. 112

How to Reseed Abandoned Land for Pasture and Range in Southern Idaho

R. H. STARK, J. L. TORVS, AND A. L. HAFENRICHTER

SEEDING your abandoned wheatland to grass will increase your profits. You can get 50 pounds of meat per acre where now you get only 10 pounds. You can do this at the low cost of from 50 cents to \$1.60 per acre plus seed.

This easy way to turn abandoned wheatland into lush range was worked out at the Aberdeen Branch Experiment Station in southeastern Idaho. You can profit by the results if:

1. Your land is in the unforested areas of southern Idaho.
2. Your rainfall is more than 8 inches a year.
3. Your ranch has some ground that once was cropped, or can be plowed.
4. Your operations could use more late spring and summer grazing.

The method of seeding range to permanent grasses was tested and approved by the Soil Conservation Service and the Idaho Agricultural Experiment Station. It insures you good stands of range grasses. You can graze the grasses at the rate of 1 to 1¼ acres per cow per month. You can stock much heavier than you do on cheatgrass, where you need 5 to 8 acres a cow per month.

In addition to getting your stock or flock to make 40 extra pounds of meat, seeding wheatgrasses on abandoned croplands enable you to:

1. Stretch the grazing season both ways.
2. Make quality hay for winter feed.
3. **Lessen the cheatgrass fire hazard.**
4. Protect your native range so it will improve and produce more feed.

LIBRARY

1946

UNIVERSITY OF IDAHO
AGRICULTURAL EXPERIMENT STATION
Department of Agronomy

Grasses and Cultural Methods for Reseeding Abandoned Farm Lands in Southern Idaho

R. H. STARK, J. L. TORVS, AND A. L. HAFENRICHTER



BULLETIN NO. 267

MARCH 1946

Published by the University of Idaho, Moscow, Idaho

Reseeding 1944

**EASTERN OREGON
SUMMER RANGES**

RMRS
RUB SCIENCES LAB
LIBRARY COPY
NO. _____

By G. D. Pickford
and E. R. Jackson



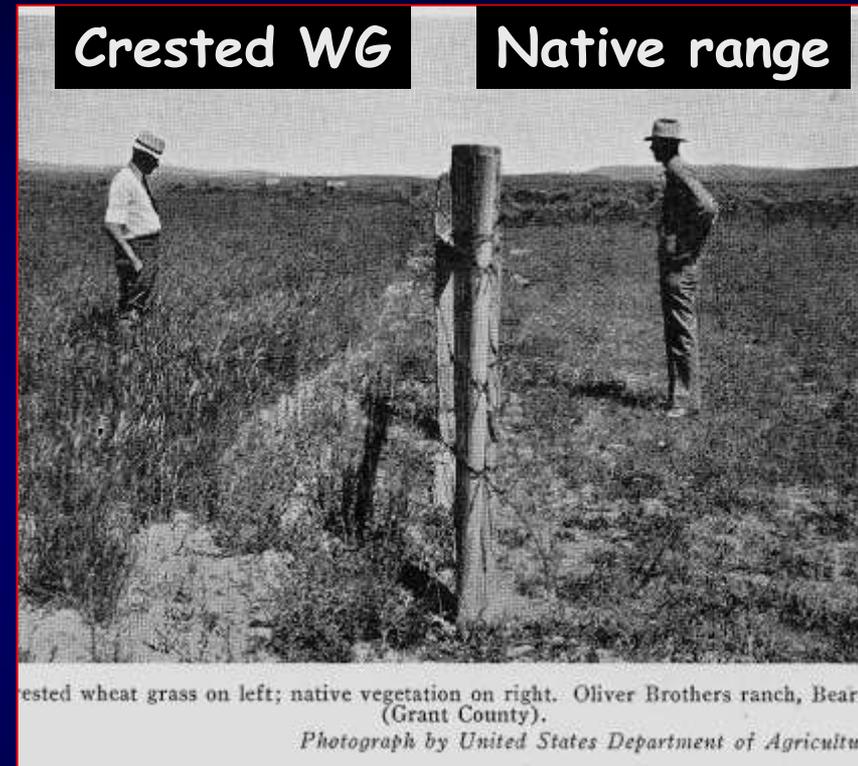
Oregon State System of Higher Education
Agricultural Experiment Station
Oregon State College
Corvallis

Series Group 119

January 1944

Characteristics of Crested Wheatgrass

- Adapted to environment
- Good seed production
- Competes with weeds
- Provides soil protection
- Palatable to livestock and able to withstand heavy grazing

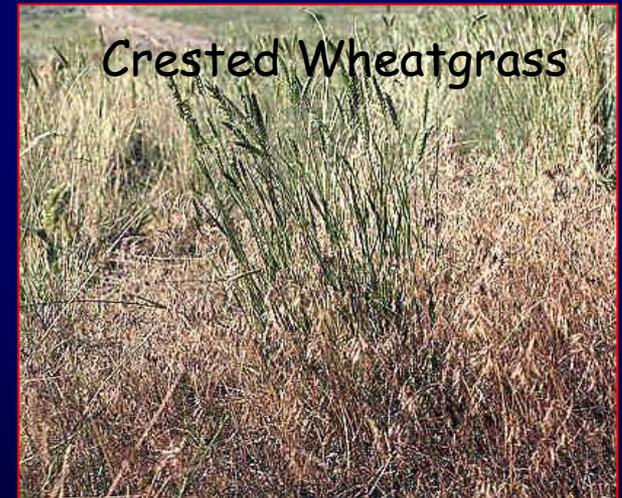


Grant County, Oregon (1936)

Early Native/Introduced Seeding Trials

A.C. Hull Jr. 1973. Species for Seeding arid rangelands in Southern Idaho. JRM 27:216-218.

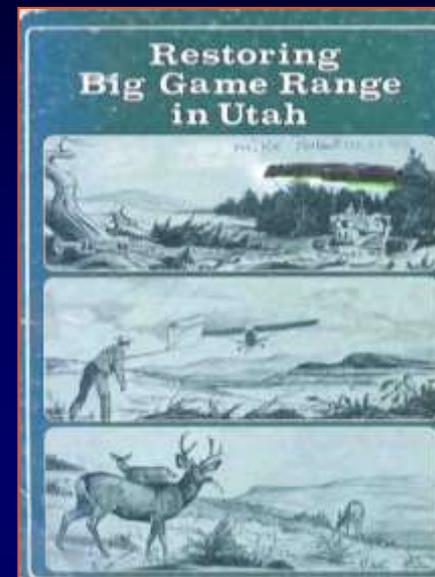
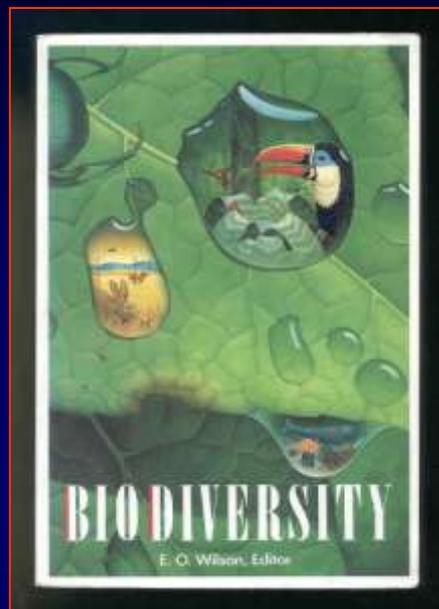
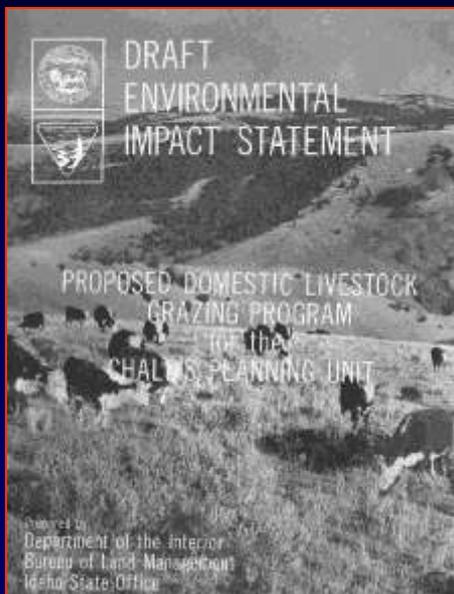
- Native species failed in 67 of 134 trials.
- Introduced wheatgrasses failed in only 2 of 248 trials.



60-70's: Increased wildfires caused significant sagebrush losses & increased wildlife concerns.



"Environmental Era"



- National Environmental Policy Act (1970)
- Threatened and Endangered Species Act (1973)
- Federal Land & Policy Management Act (1976)
- Wildlife habitat concerns

Invasive Species Executive Order (2/3/99)

To the extent practicable each agency shall identify actions to:

“..provide for restoration of native species and habitat conditions in ecosystems that have been invaded.”





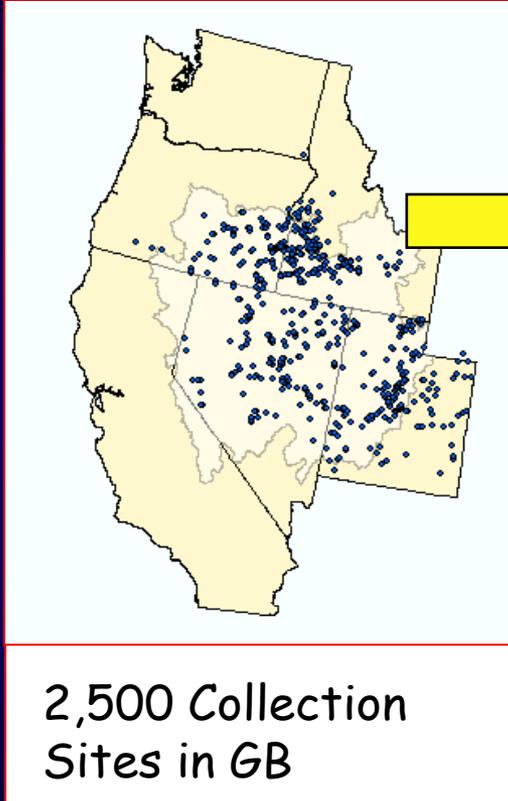
The Great Basin Native Plant Selection & Increase Project



Penstemon spp. in SW Idaho grower's field
<http://www.fs.fed.us/rm/boise/research/shrub/greatbasin.shtml>

Great Basin Native Plant Selection & Increase Project

Seed Collection



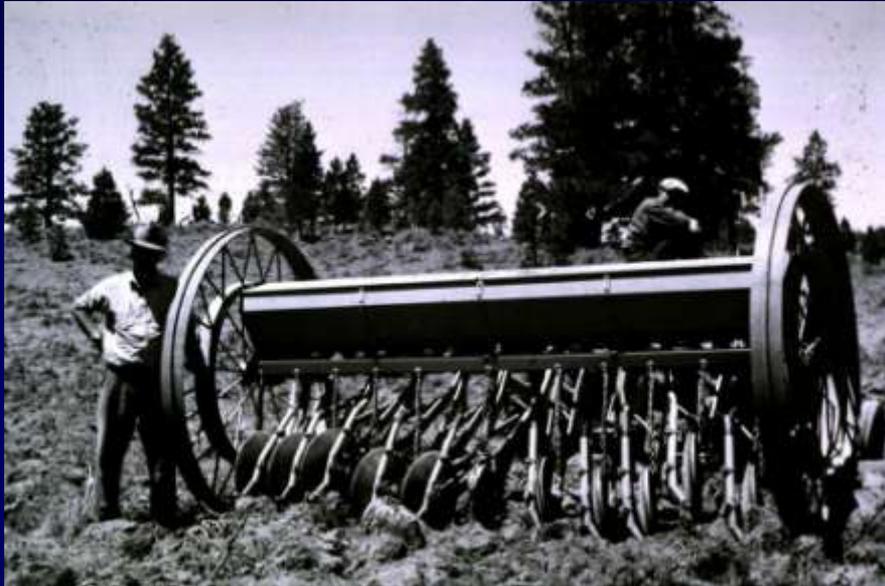
Biggest challenge---Consistent market for native plant seed!

Depends on....?

- Setting and Competition
- Plant Materials & Seedbed Ecology
- Seeding Equipment
- Post-Restoration Management



Seeding Equipment- Rangeland Drill



First rangeland drill constructed by the Forest Service in Oregon in 1951.



Range Seeding Committee (now RTEC) designed the drill which was first constructed commercially by Laird Welding and Manufacturing Works in 1955

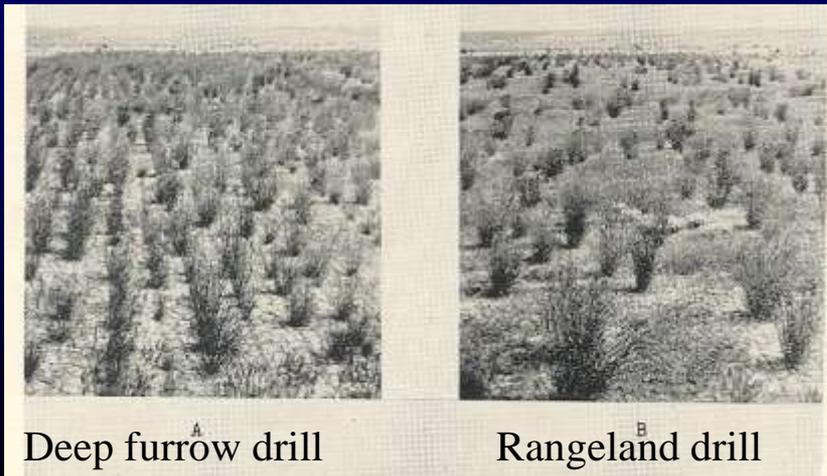
Modifications to the Rangeland Drill



Drag chains/tubes to cover seed



Depth bands to reduce seeding depth or add weights on drill arms to increase seeding depth



Deep furrow drill ^A

Rangeland drill ^B

Deep furrow drill = two disc openers instead of one.



Native Seed—Rangeland Drill Compatibility Issues



Diverse Seed
Mixtures



Suitable
Seedbed





Rough Rider Drill



- Planting width: 10 ft.
 - Overall width: 13.5 ft.
 - Height: 7.5 ft
 - Front to back length: 17 ft. (with tongue)
- Row Spacing: 10 rows on 12" centers :
Weight: Approximately 8,000 lbs

Drill Comparison Study

Rangeland drill



Minimum till drill



Rangeland & Minimum Till Drill Comparison

Drill mix

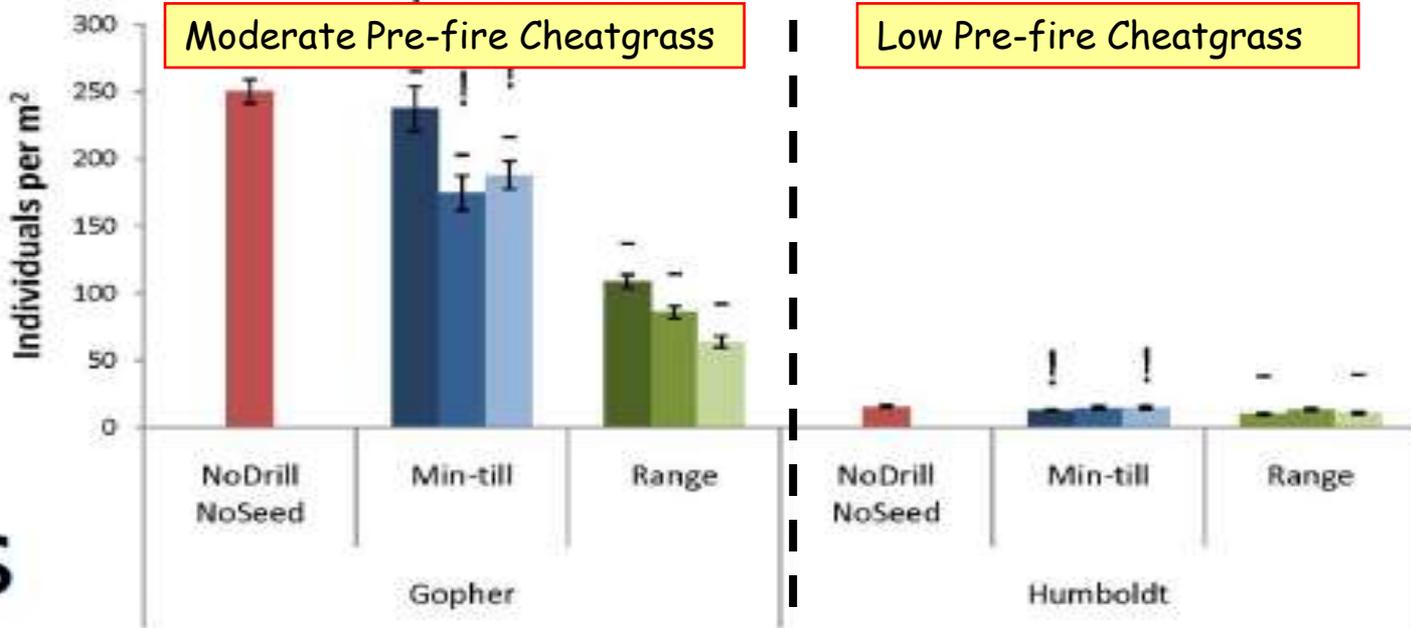
- Fourwing saltbush
- Blue flax
- Munroe globemallow
- Bluebunch wheatgrass
- Bottlebrush squirreltail
- Indian ricegrass

Broadcast mix

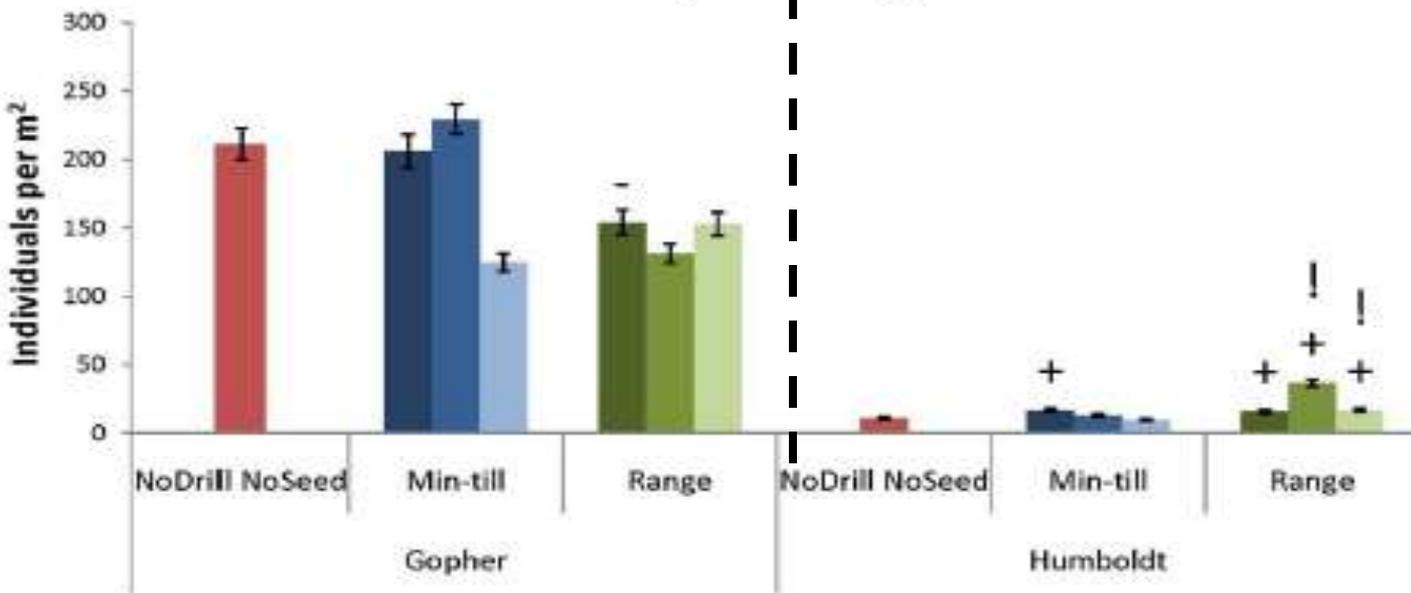
- Wyoming big sagebrush
- Rubber rabbitbrush
- Western yarrow
- Sandberg bluegrass

Application	Seeding Rates PLS/ft ²
Broadcast	No Seed
	22
	37
Drill into Furrow	No Seed
	16
	22

2007 Density of Cheatgrass



2008 Density of Cheatgrass



Drill mix:

Fourwing
saltbush

Blue flax

Munro
globemallow

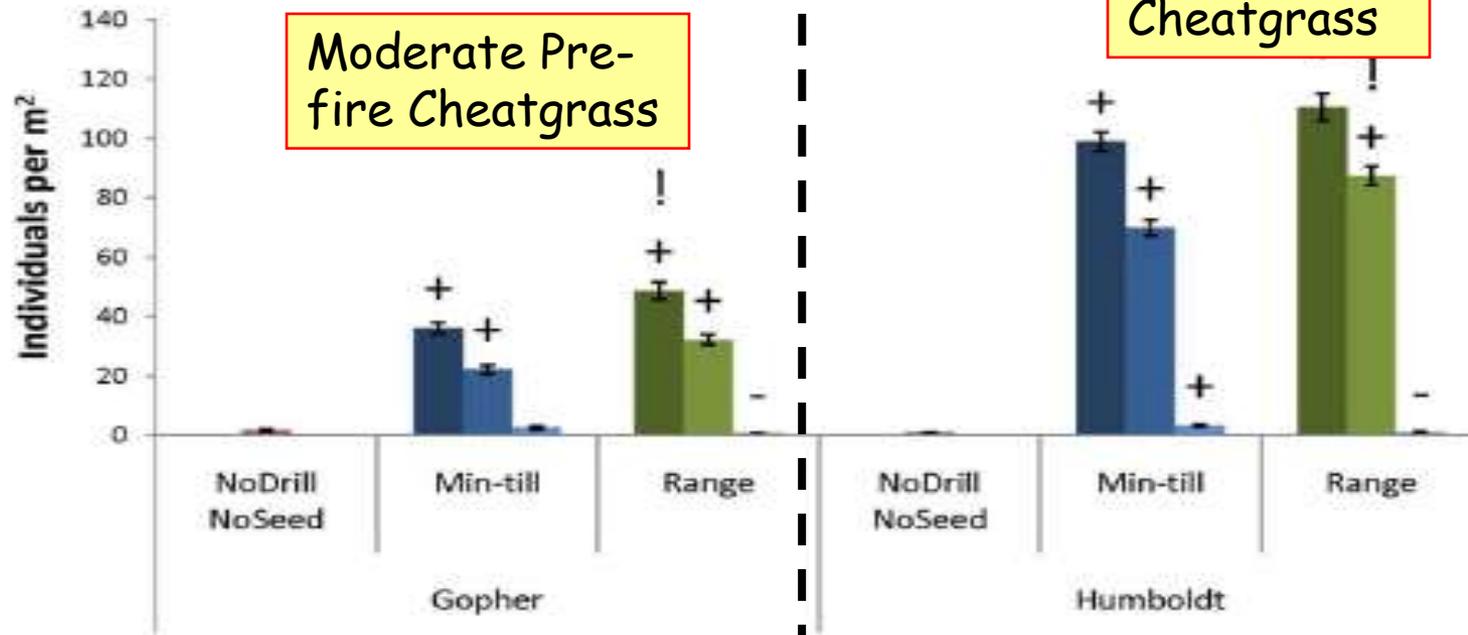
Bluebunch
wheatgrass

Bottlebrush
squirreltail

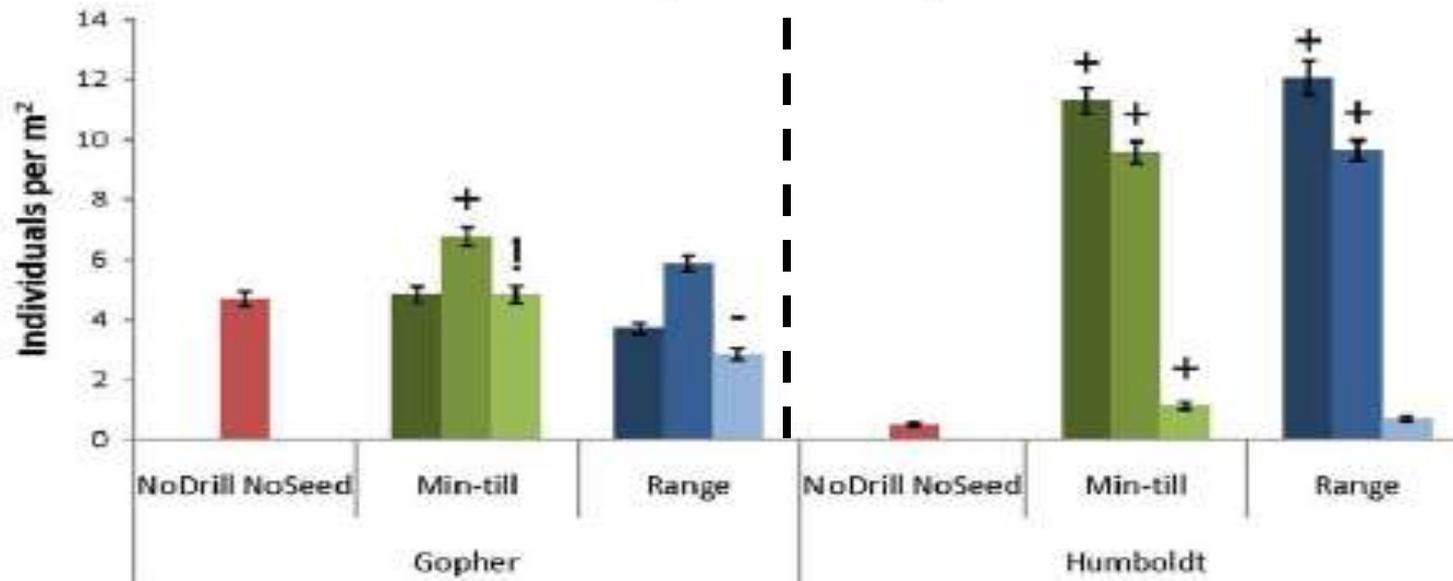
Indian
ricegrass

2007 Density of Drilled Species

Low Pre-fire
Cheatgrass



2008 Density of Drilled Species



Broadcast mix:

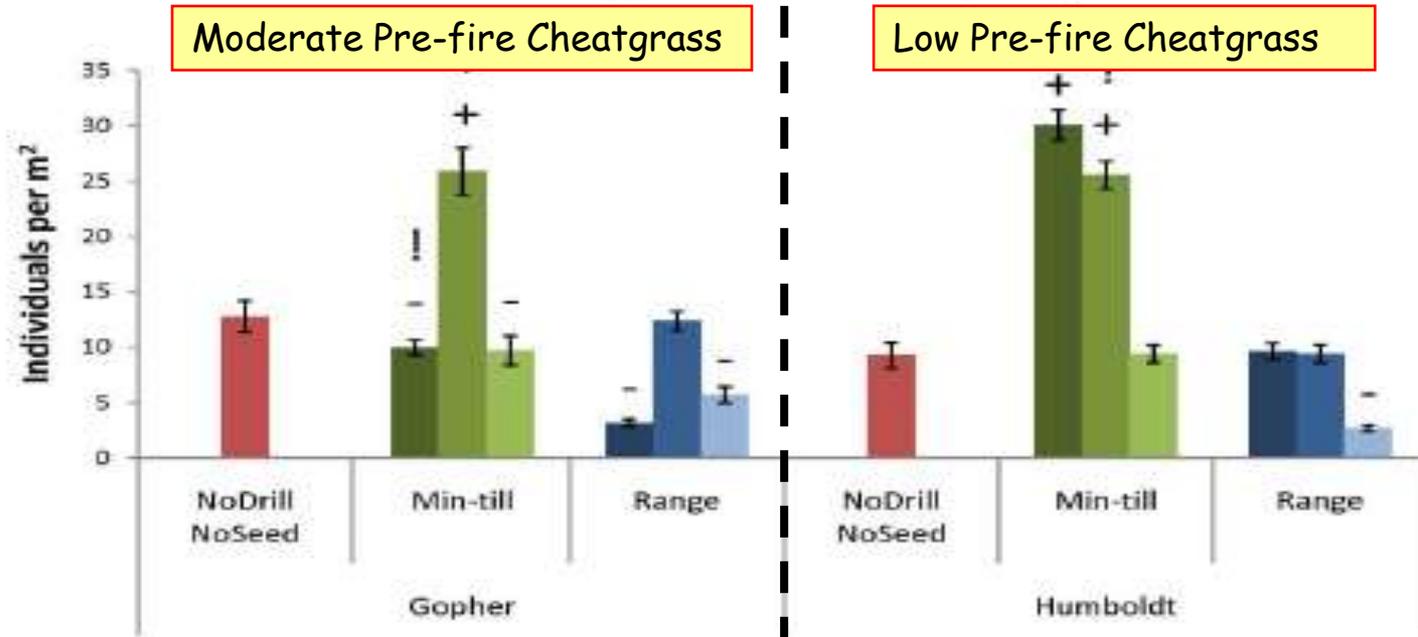
Wyoming big
sagebrush

Rubber
rabbitbrush

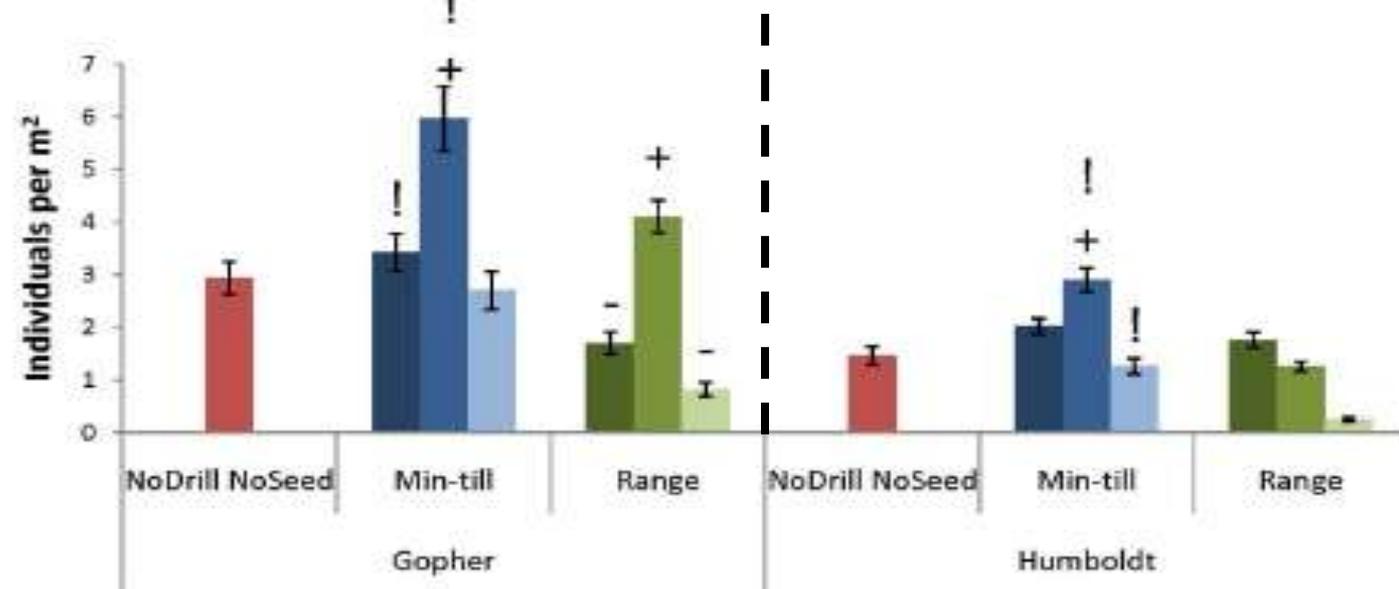
Western yarrow

Sandberg
bluegrass

2007 Density of Broadcast Species



2008 Density of Broadcast Species



Conclusions

- The minimum-till drill provided greater emergence of broadcast species
- Emergence of drilled species was similar between the two drills
- During the 1st year, cheatgrass density and cover were lower in plots that experienced the rangeland drill
- **Increase Diversity in Post-Wildfire Restoration Seedings by Using the Right Tool for the Right Job:**
 - When seeding a diverse seed mix including small-seeded species for broadcast, a newer minimum-till drill may provide better emergence at lower seeding rates (= \$\$\$\$ saved)

Successful Native Seeding



Depends on....?

- Setting and Competition
- Plant Materials & Seedbed Ecology
- Seeding Equipment
- Post-Restoration Management



Post-Restoration Management in the Past



Plant materials (crested wheatgrass) + equipment (rangeland drill) = Seeding that could be grazed one-two years after planting.

Post-Restoration Management with Natives

- What is appropriate grazing exclusion period for native plant establishment? **USGS will be studying this question.**
- What is the appropriate grazing management after establishment of native plants? **Need a grazing system that will maintain investment in native seedings.**
- When should grazing management decisions be made when natives are restored? **Project planning!**

South-central Idaho Fire Rehabilitation Case Study

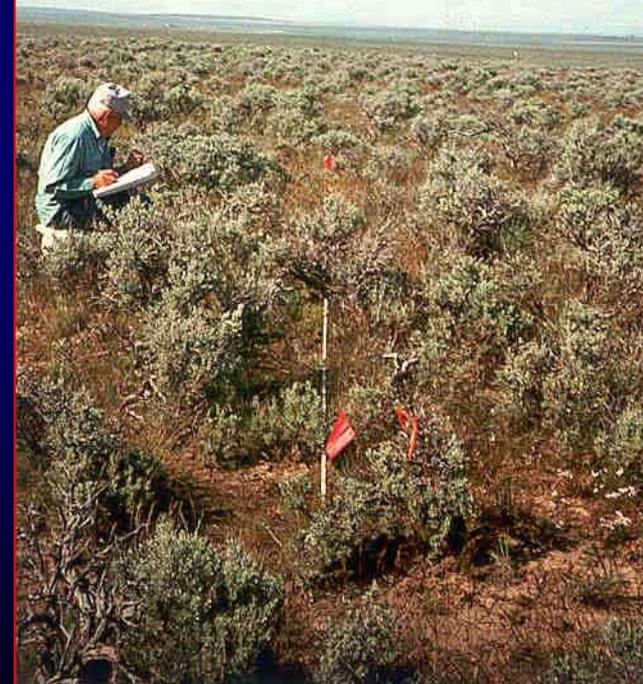
Summer 1994 wildfire, seeded in the fall of 1994



Livestock use resumed in the spring of 1997 (three-year grazing exclusion)

Loamy 8-10" PZ (Wyo. Big sagebrush/Thurbers needlegrass) ecological site

Pre-fire Situation



Seed Mixture

Species	Application	Seeding Rate (#'s/ac)
Crested Wheatgrass	Drill	4.5
Russian Wildrye	Drill	1.5
Fourwing Saltbush	Drill	1.0
WY Big Sagebrush	Aerial	2.0
Alfalfa	Aerial	3.0
Yellow Sweetclover	Aerial	0.5
	Total	12.5

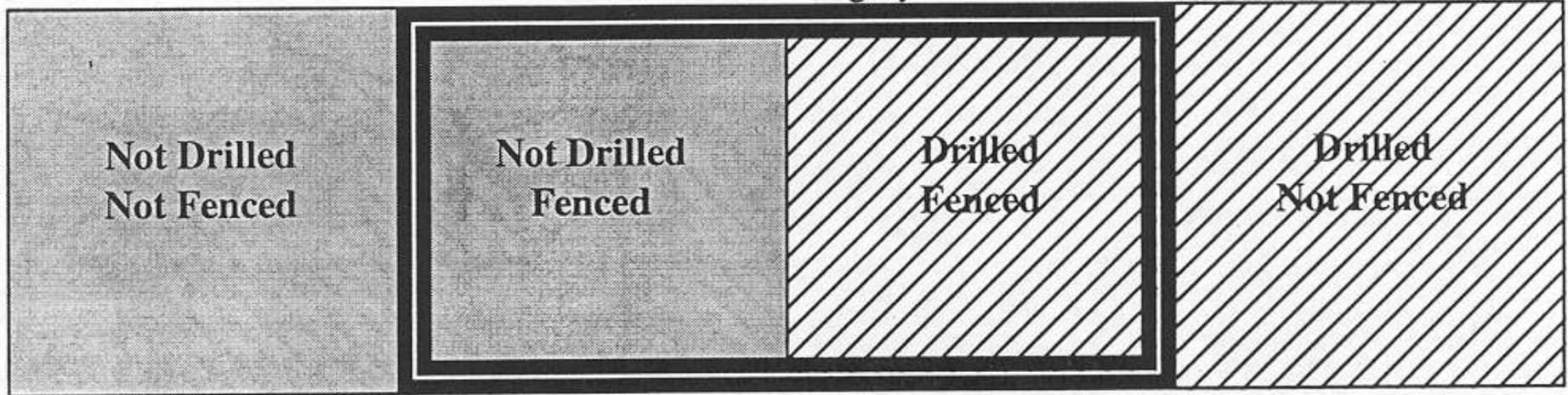
83 seeds/ ft²

Study Design for Evaluating Grazing and Seeding Treatments

Aerial seeding over all treatments!

North
↑
↓
South

Exclosure 0.2 mile long by 0.1 mile wide

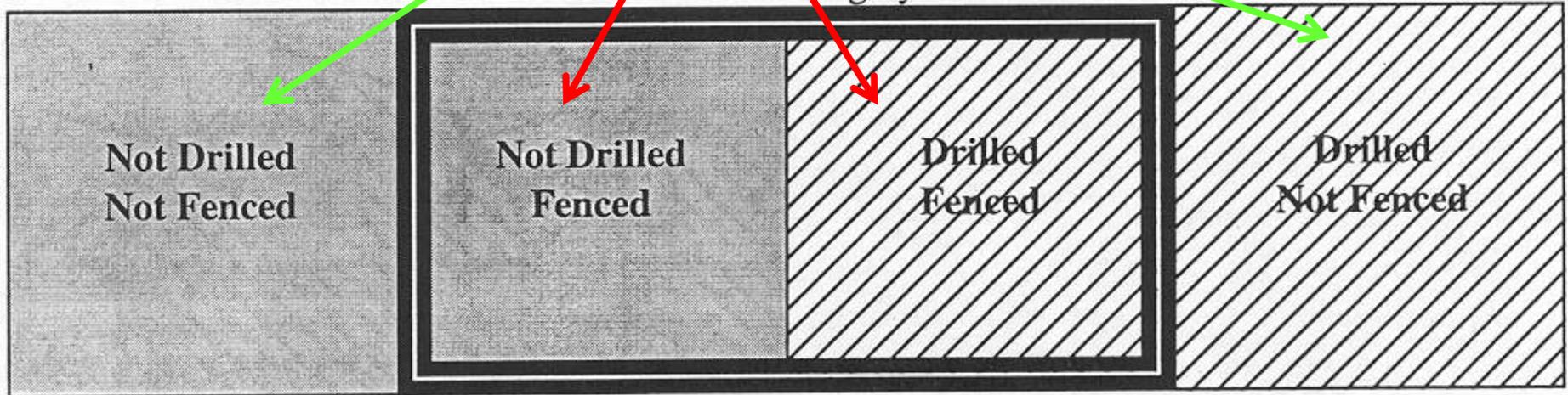


Study Design for Evaluating Grazing and Seeding Treatments

Did the burned area need to be drill seeded?

North
↑
↓
South

Exclosure 0.2 mile long by 0.1 mile wide

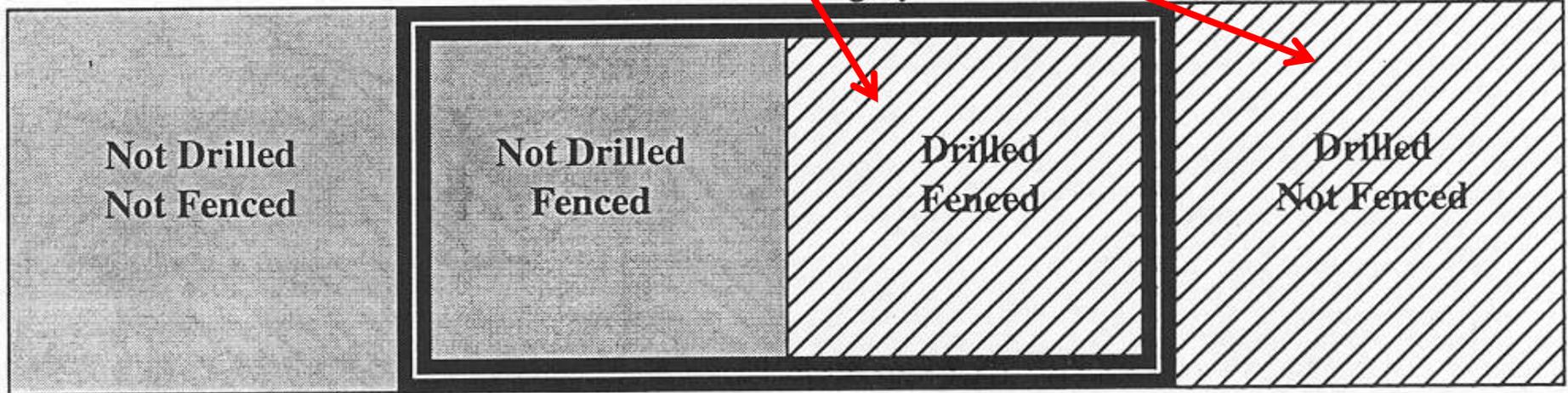


Study Design for Evaluating Grazing and Seeding Treatments

When are seeded native plants established and ready for grazing?

North
↑
↓
South

Exclosure 0.2 mile long by 0.1 mile wide

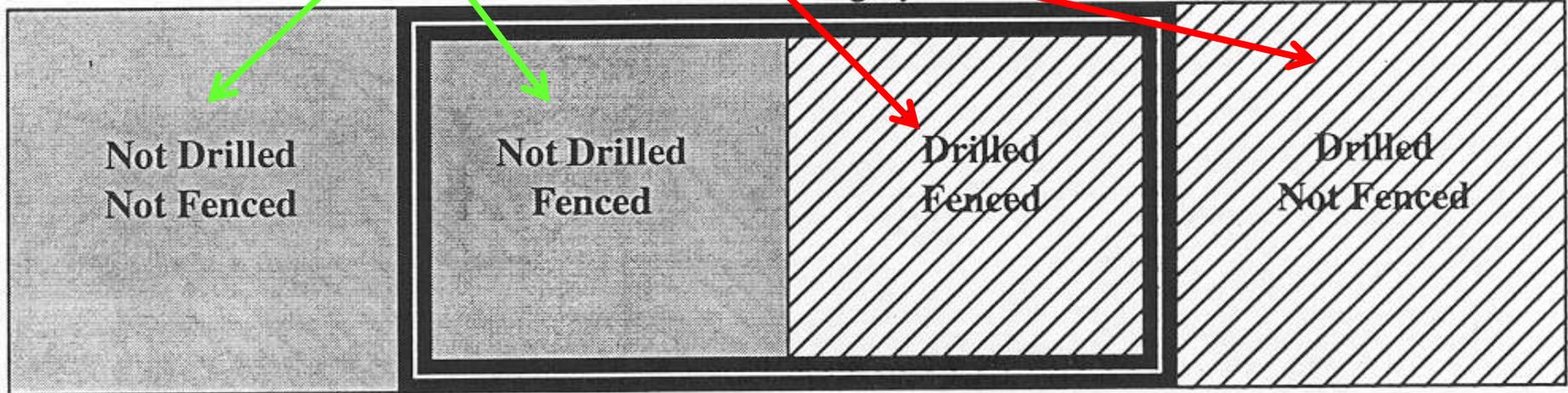


Study Design for Evaluating Grazing and Seeding Treatments

What are the long-term effects of livestock on native plant recovery and/or seeded native plant persistence?

North
↑
↓
South

Exclosure 0.2 mile long by 0.1 mile wide



Seeded to Crested
WG's @6 lbs/ac.

Green STP2
Rehab-June
2000 (6
years post-
fire)

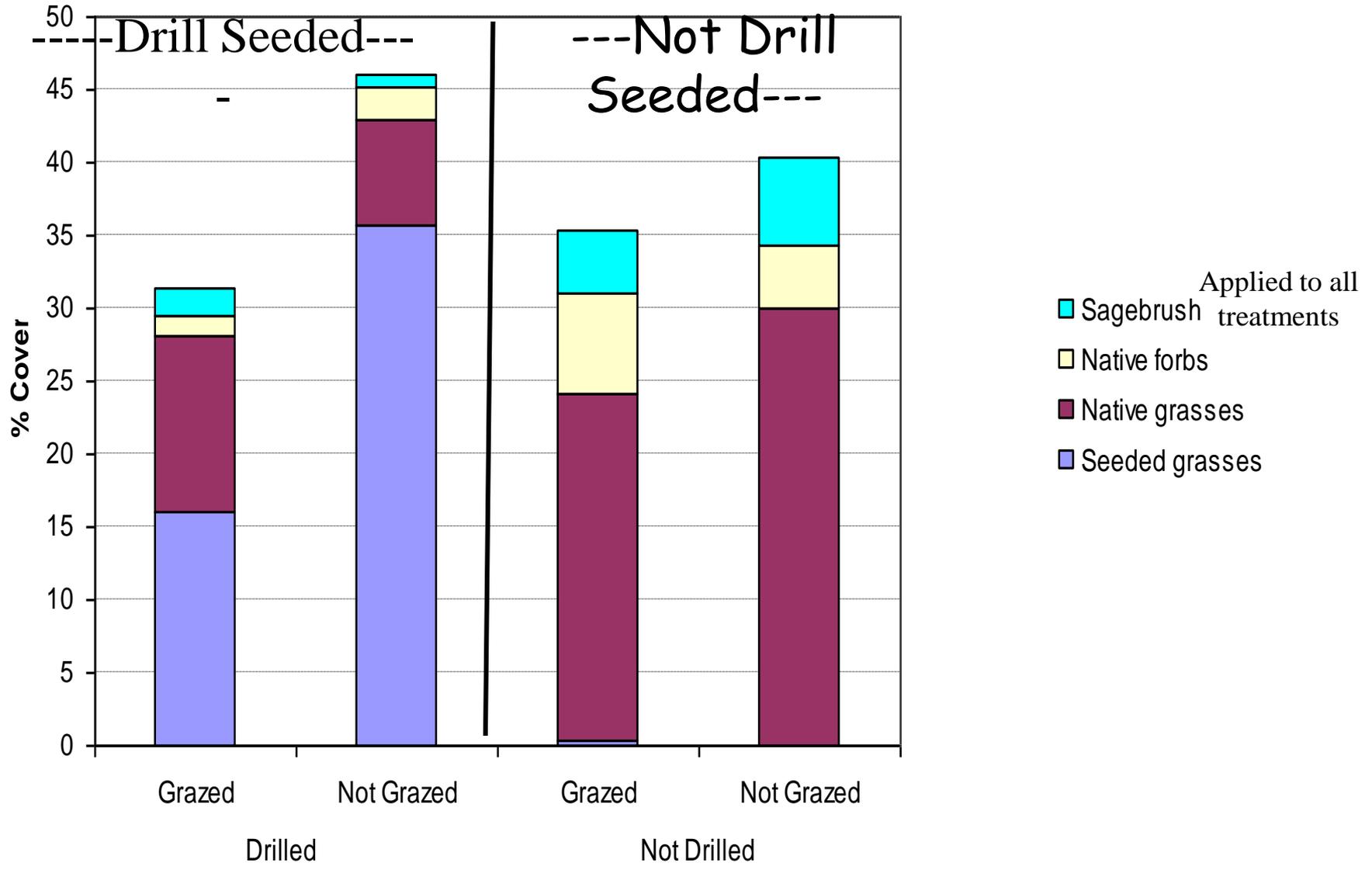


Not seeded to Crested WG- native grass recovery

Both areas were aerial
seeded with sagebrush at
two pound/acre (bulk)



Figure 2. Cover of residual native plants, seeded grasses, and seeded sagebrush in the Green STP-2 Rehabilitation Project.



Grazing Impacts to Biological Crust- June 2000



Ungrazed



Grazed

Proper site preparation + appropriate seed mixture +
right seeding equipment + favorable weather, and
good post-treatment management =



Successful Restoration of Native Plant
Communities in the Great Basin