# *Science in Support of Rangeland Management*

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USDA ARS

# Eastern Oregon Agricultural Research Center
# Burns, OR

View of headquarters of Northern Great Basin Experimental Range

Placidia Butte in background


Washington
Montana
Oregon
California
Idaho
Nevada

# Eastern Oregon Agricultural Research Center – Burns
# Oregon State University & USDA-Agricultural Research Service, cooperating

***Mission:*** **Provide scientific information for the development of sound land and livestock management for present and future generations**

***Research:*** **Solve regional problems, but generate principles that apply nationally and internationally**

***Outreach:*** **Knowledge is transferred to both the public and managers of federal and private land**

## Forage/Livestock Systems

- Grazing Behavior
- Alternate Forages
- Supplementation Strategies
- Alternative Beef Management
- Behavior & Temperament Management

## Wildland Systems

- Fire
- Weeds
- Juniper
- Riparian
- Reseeding
- Wildlife Habitat
- Basic Studies (e.g.: Physiology)

## Outreach

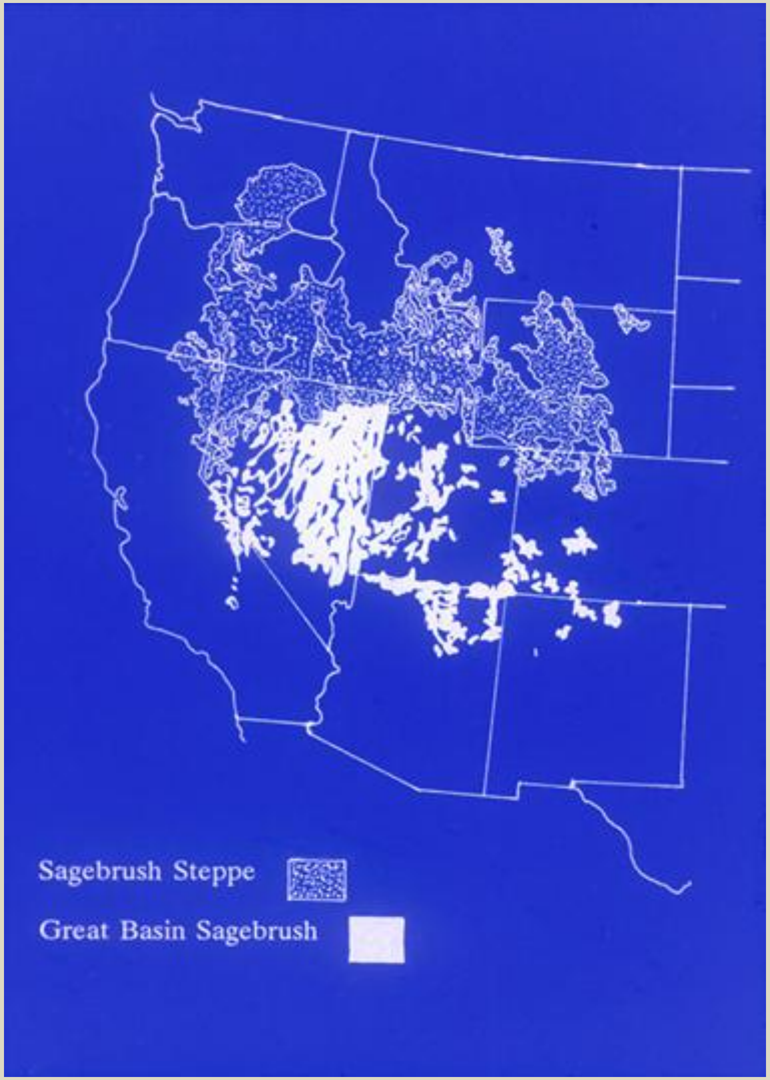
- Ag Minutes
- Field Day & Tours
- Web and Power Point
- Community Involvement
- Research Reports and Fact Sheets
- Direction for Future Research

# Other points of note:

- EOARC has an active Liaison/Advisory Committee.

- We also have two members of The Nature Conservancy housed at EOARC, and they are active cooperators.

# *Extent of Sagebrush Steppe and Great Basin Sagebrush Range*



# Scientific Staff

**ARS Scientists**

- Seven full-time research scientists
- Two postdoctoral research associates

**OSU Scientists**

- Three research /extensions specialists at Burns

# General characteristics of our program

- Committed to problem solving and outreach.
- Committed to scientific excellence (work is published in outstanding scientific journals).
- Mostly field-oriented (as opposed to modeling and lab-oriented).
- Long-term research is also a focus.

# Major Thrust Areas

1) Managing the good condition rangeland – keeping what we have.
2) Restoring rangeland that is not meeting management objectives.
3) Dealing with annual invaders –mostly medusahead, but also cheatgrass.

# Eastern Oregon Agricultural Research Center
## Need Directed Programs & On-the-Ground Solutions



**Low Elevation** | **Mid Elevation** | **High Elevation**

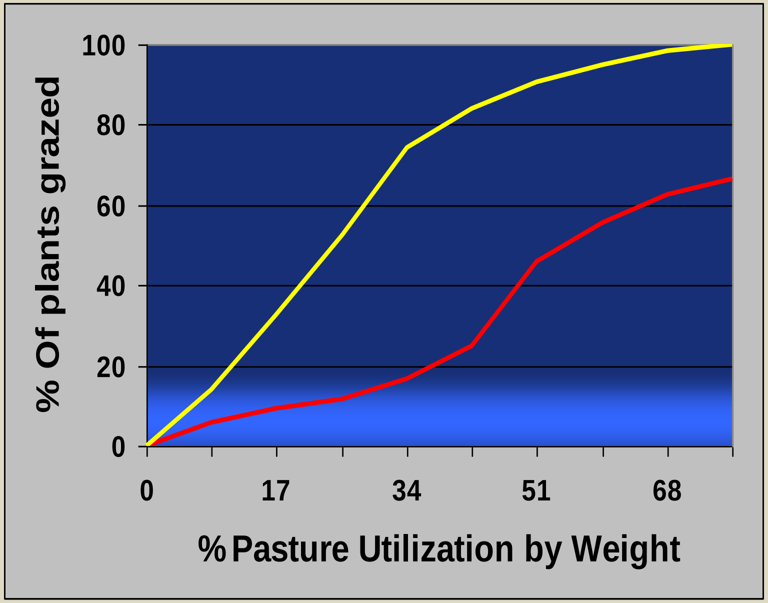
Restoration | Conservation | Restoration

Increased Fire Frequency
Annual Grass Control
Establish Desired Vegetation
Establish Desired Vegetation
Increase Desired Vegetation
Grazing
Climate
Decreased Fire Frequency
Woody Plant Control

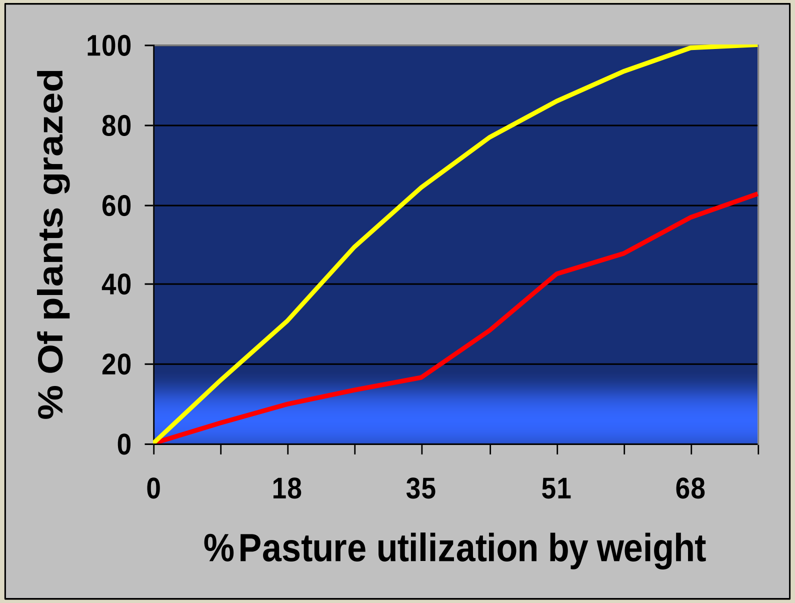
# Cattle and Sage-Grouse

Results were very consistent each year. Cattle do not graze many plants under the sagebrush until they have grazed about 80% of the plants between sagebrush.

2003




2004




Interspace

Under-canopy

# Effect of long term grazing exclusion on Wyoming sage community. On left -- not grazed since 1937, right was grazed. Both plots burned September, 1993. Photos taken 2008

No Grazing-Burned treatment
(15 yrs post fire)

Grazing-Burned treatment
(15 yrs post fire)

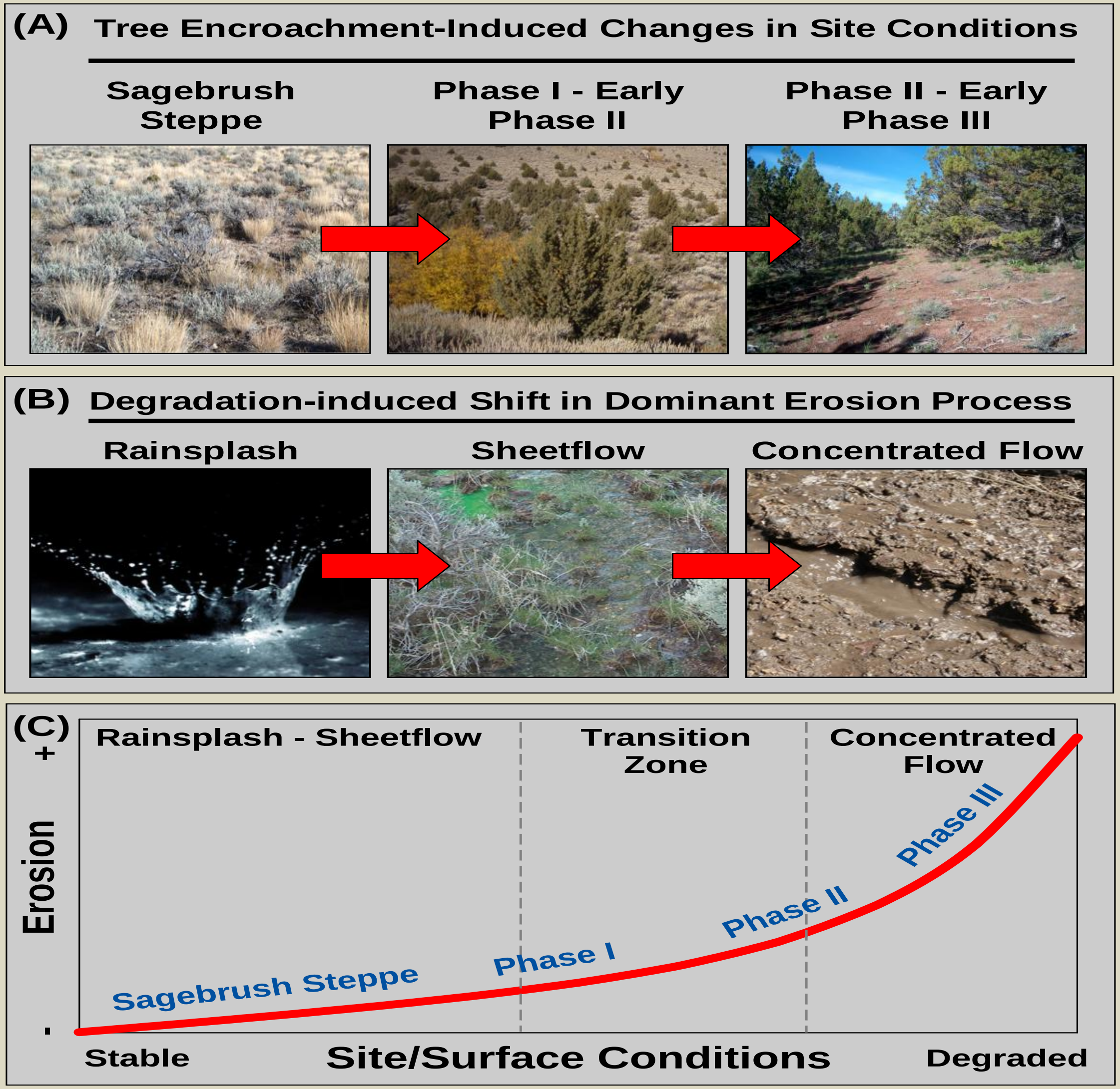

Fuel moisture
21%  July 3, 2013


Fuel moisture
46%  July 3, 2013

# Implications

- Higher fuel accumulations and heights in ungrazed
  - More likely to ignite
  - Greater flame heights and lengths
  - Greater risk for severe fire
  - Faster spread
  - Cross larger fuel gaps

- Wildfire creates risks for sage-grouse habitat



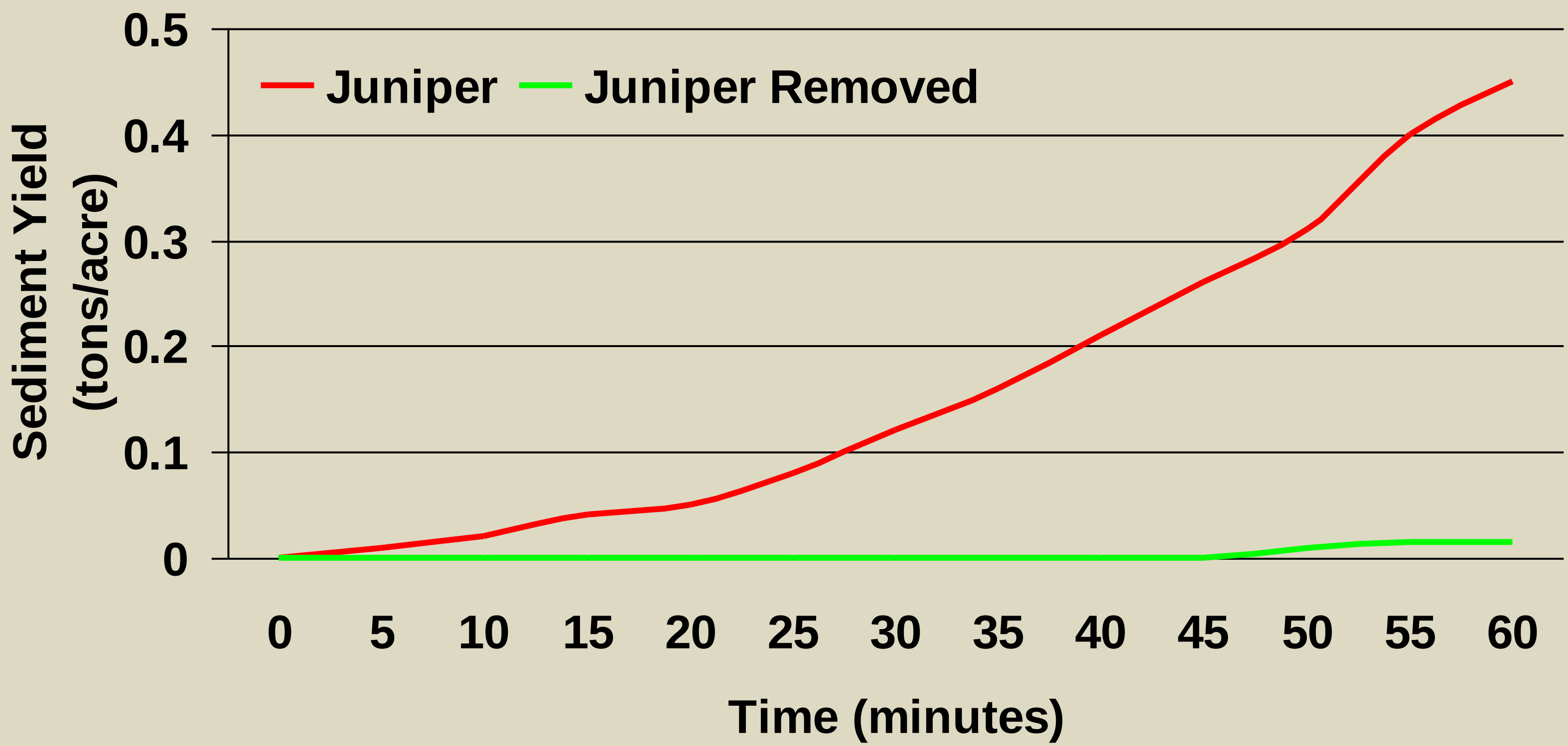
(A) Tree Encroachment-Induced Changes in Site Conditions
Sagebrush Steppe
Phase I - Early Phase II
Phase II - Early Phase III
(B) Degradation-induced Shift in Dominant Erosion Process
Rainsplash
Sheetflow
Concentrated Flow
(C)
Rainsplash - Sheetflow
Transition Zone
Concentrated Flow
+
Erosion
-
Sagebrush Steppe
Phase I
Phase II
Phase III
Stable
Site/Surface Conditions
Degraded

Rainfall simulation plots were run on eight replicates of cut and uncut treatments.

# Head Wall Style

# No Runoff in Cut Plot

# Removing Juniper Reduces Sheet Erosion




Rainfall = 2.1 inches/hour

# Rangeland Reseeding

- We’ve done a good job of spreading seeds around for the past 60 years, but have not really made anything I would call a major advance in our understanding of seedling establishment.
- Approach has been agronomic rather than ecological
- We started applying the management before we really understood the science.
- Major focus at EOARC

# Seedling demography

Sowing

Germination

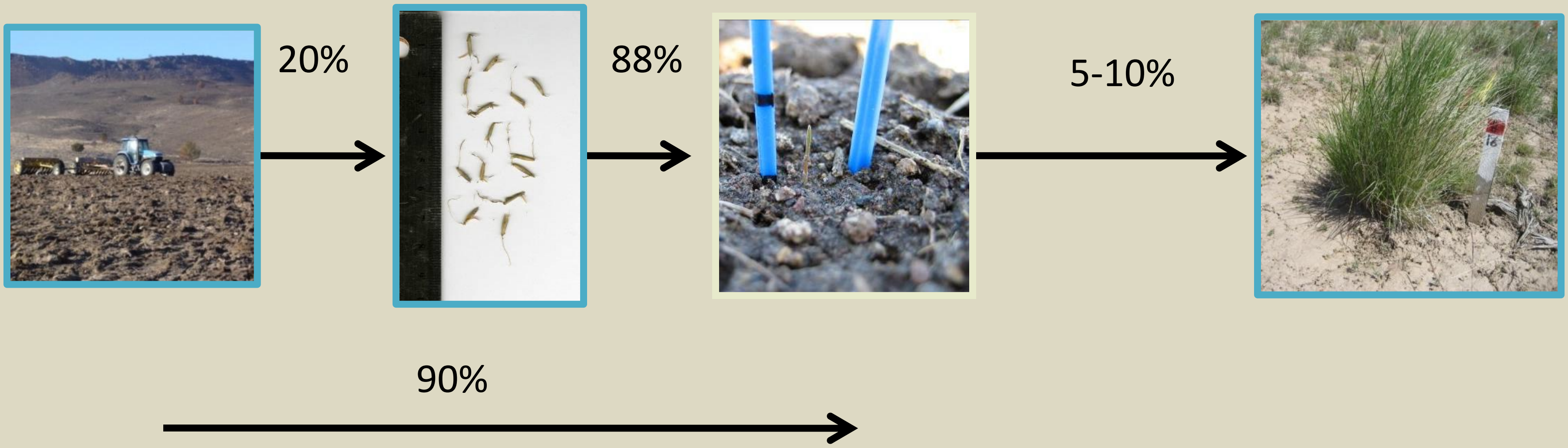
Emergence

Establishment

Juvenile Survival

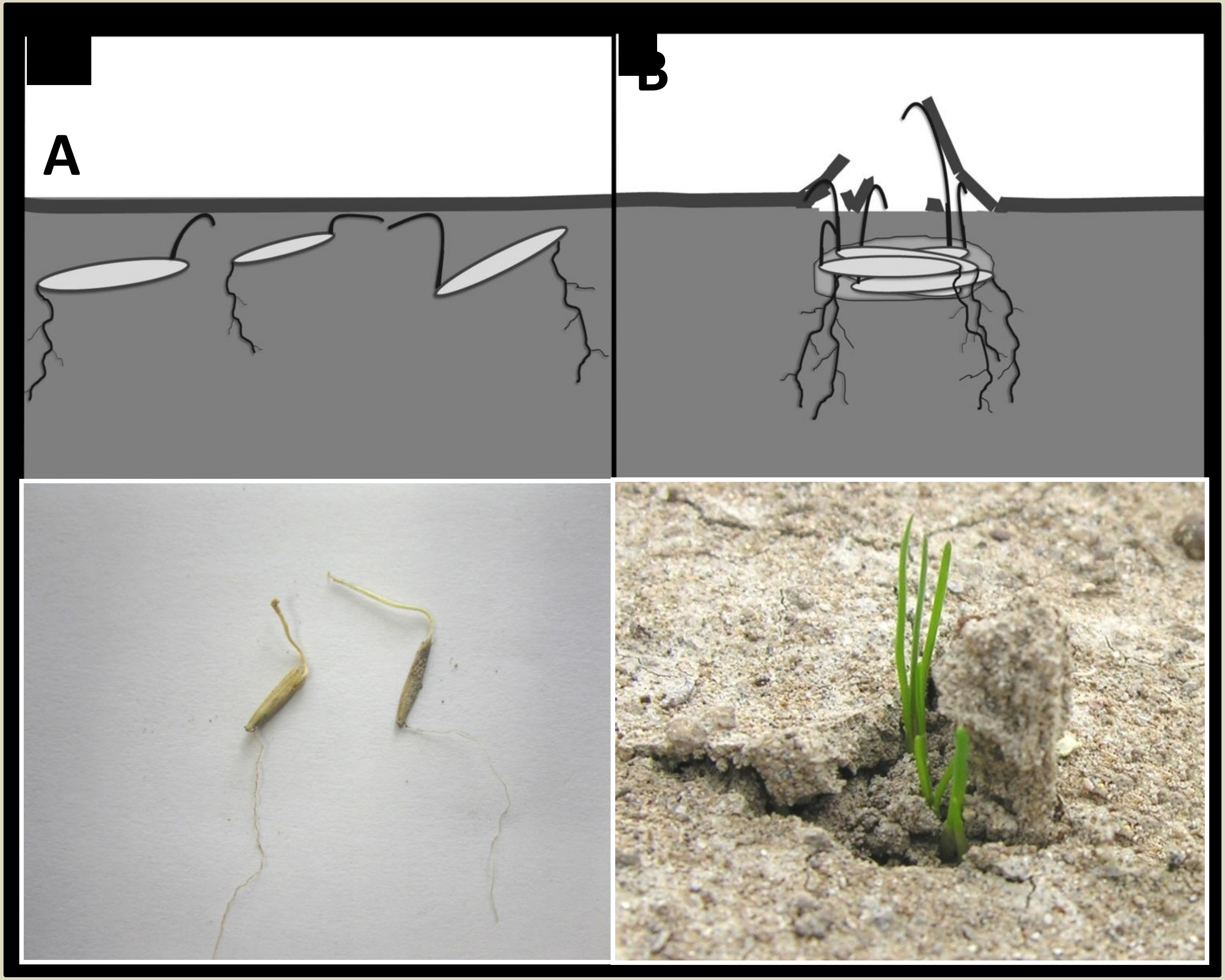
Adult Survival

# When do plants die?



# Seed Coating Lab

# Agglomeration Technology



# Seed Pillow Technology

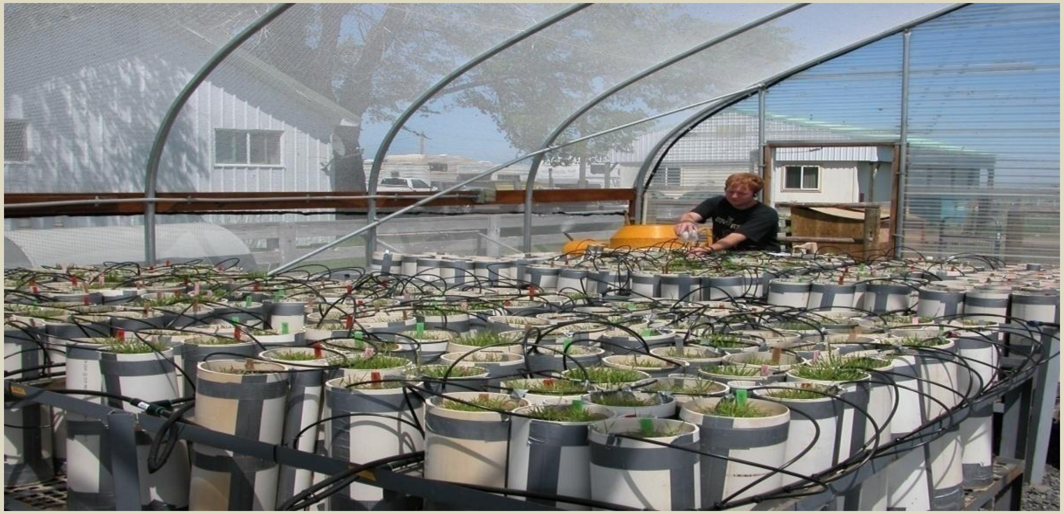
Single seedling

Clustered seedlings

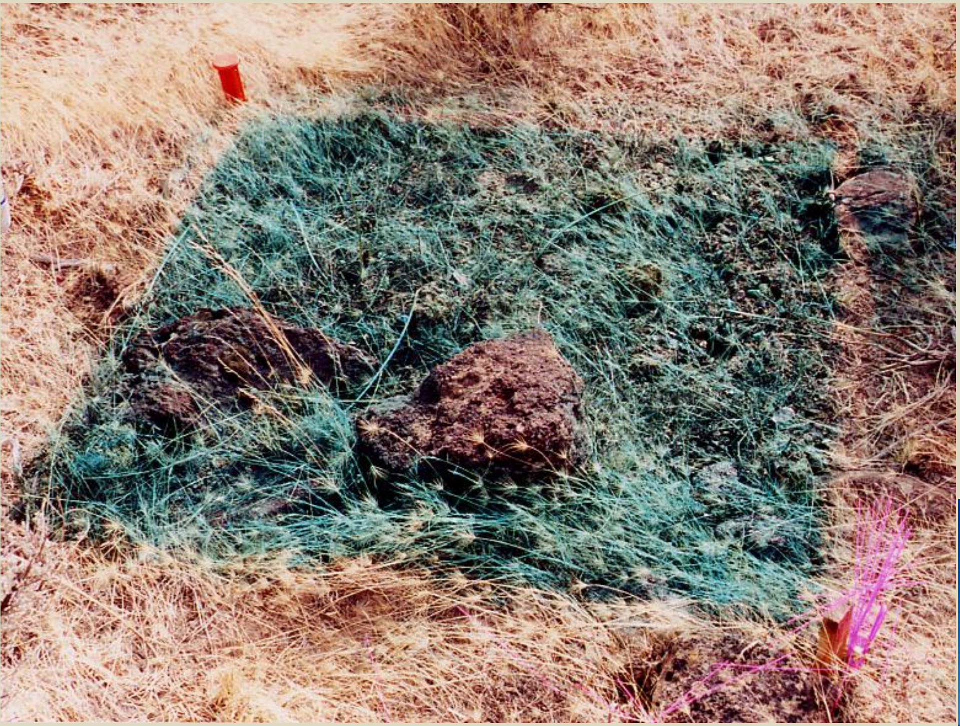
# Weeds In Sagebrush Habitat

- Cheatgrass -- 40-60 millions acres

# Competitive Ability of Cheatgrass Relative to Native Grasses



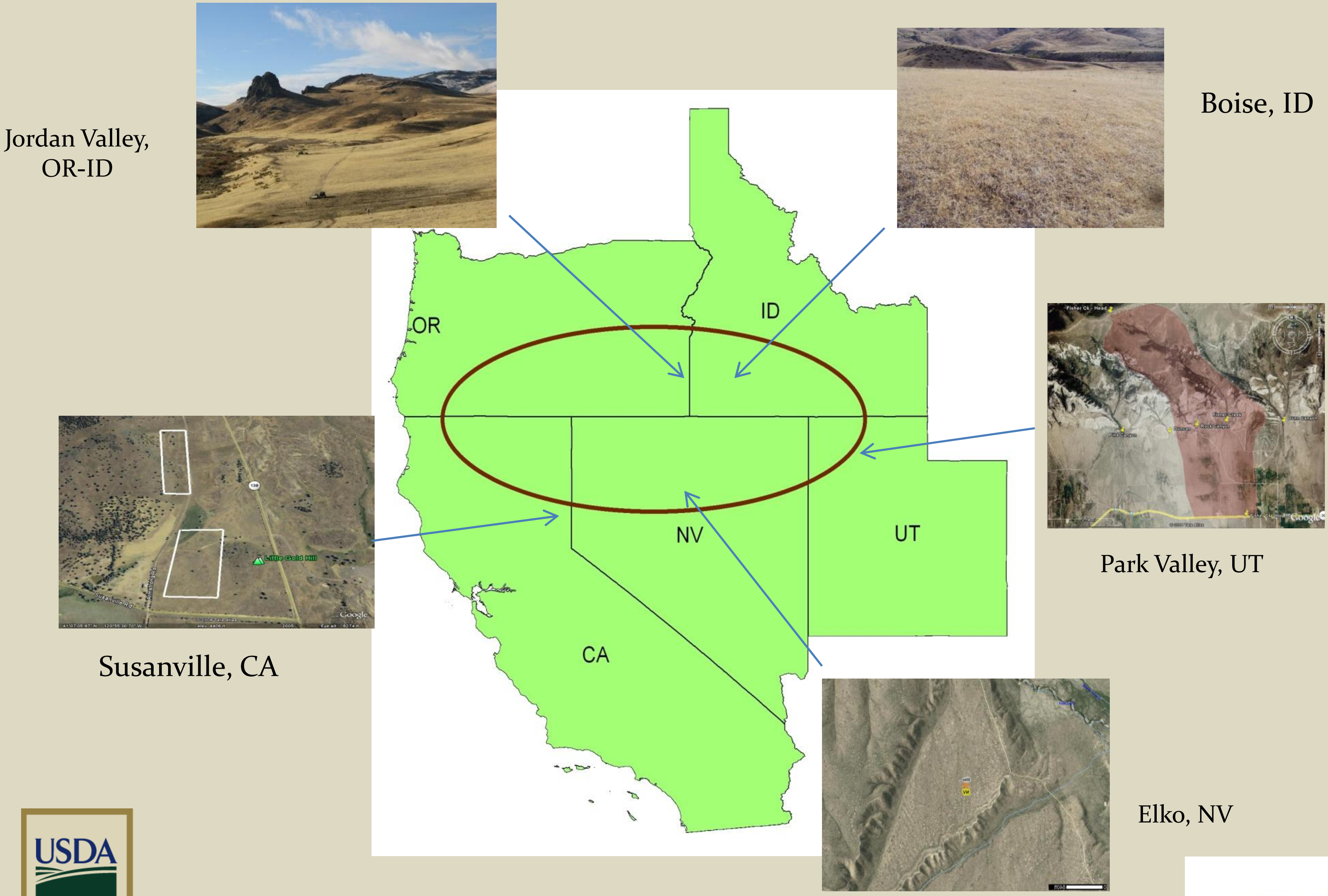
# Medusahead



**Controlling medusahead while maintaining native rangeland species.**

**Post-fire chemical control and revegetation to restore infested range and pastures. We have to fill the niches.**

# An Area-wide Demonstration of Ecologically-based IPM of Annual Grasses in the Great Basin Ecosystem



# Greenhouse Screening

**1% of *Pseudomonas* spp. suppressed cheatgrass, but not native grasses in the greenhouse.**

**Control + Bacteria**

## Cheatgrass

***Cheatgrass is suppressed by these bacteria, but most perennial grasses are not.***

**Control + Bacteria**

# Geese and Golden Eggs

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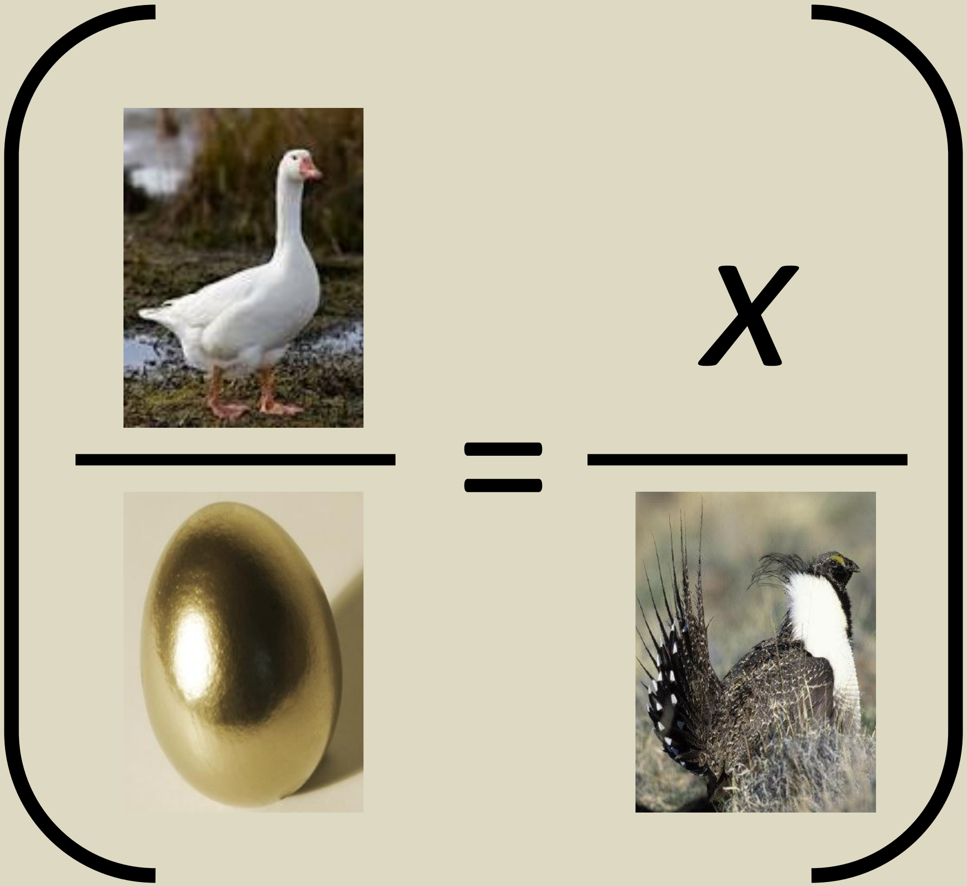


# Geese and Golden Eggs

= X /

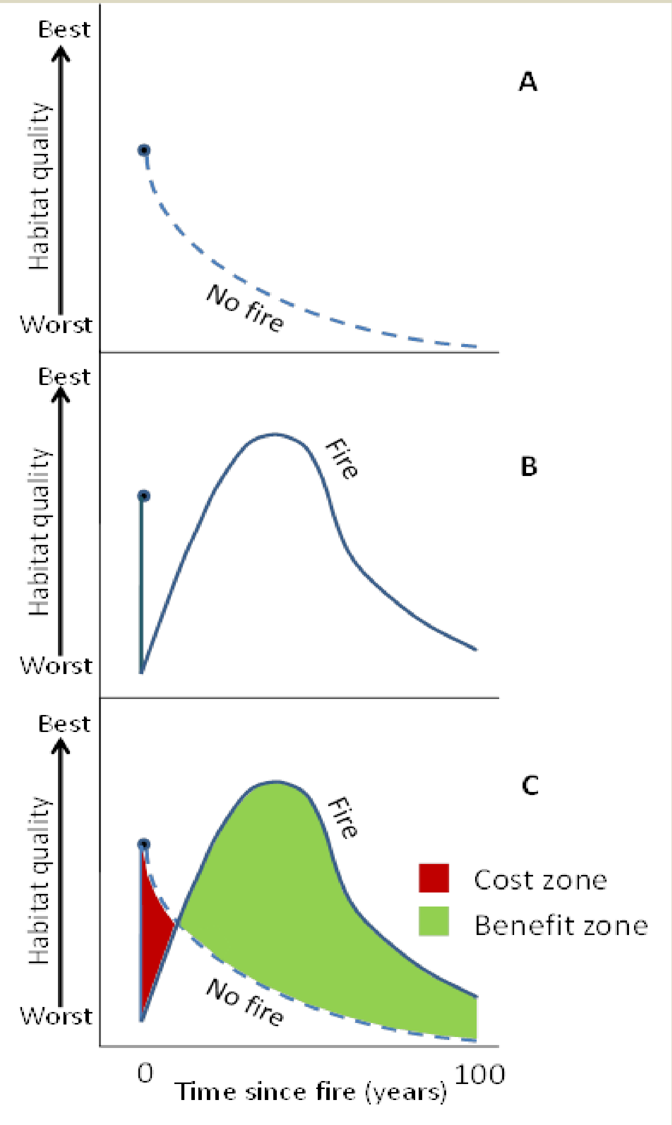
X =

# Threats to sage-grouse

- Primary threat in 2010 finding: Habitat fragmentation and loss (ecosystem problem)
  - Widespread threat to 33 of the 39 populations

- Step down to Harney Co./SE Oregon
  - Juniper encroachment & Exotic annual grasses

# Species centric vs. Ecosystem problems … why it matters




- Species problem:

  *focus = No Fire*

- Ecosystem problem:

  *focus = Restore fire cycle*

# Species centric vs. Ecosystem problems

**<u>Ecosystem Problem</u>**


*Example = conifer encroachment into sage-grouse habitat*

# Historic Conservation Challenges

# Historical Conservation Challenges

- Commonalities of historic challenges:
  - ✓ Easily defined problems
  - ✓ Components of problem similar over broad geographic areas
  - ✓ Components didn’t change much over time

# Fixing Historical Problems

- Point Source Pollution = Clean Water Act
- Overgrazing = Taylor Grazing Act
- Overuse of Forest Resources = National Forest Reserves

# Modern Conservation Challenges

# Fixing Modern Problems

*“History doesn’t repeat itself…but it does rhyme”*

*Mark Twain*

# Primary Challenges

- Accurately define the problem.
- Don’t shy away from a leadership role.
- Think beyond 2015…have a bold vision.

# Thinking about sage-grouse

- What is the most critical spatial scale?

- We tend to characterize sage-grouse habitat at the patch level (especially nesting sites).

- Yet we know sage-grouse require large tracts of land (on the order of 10,000s of acres).

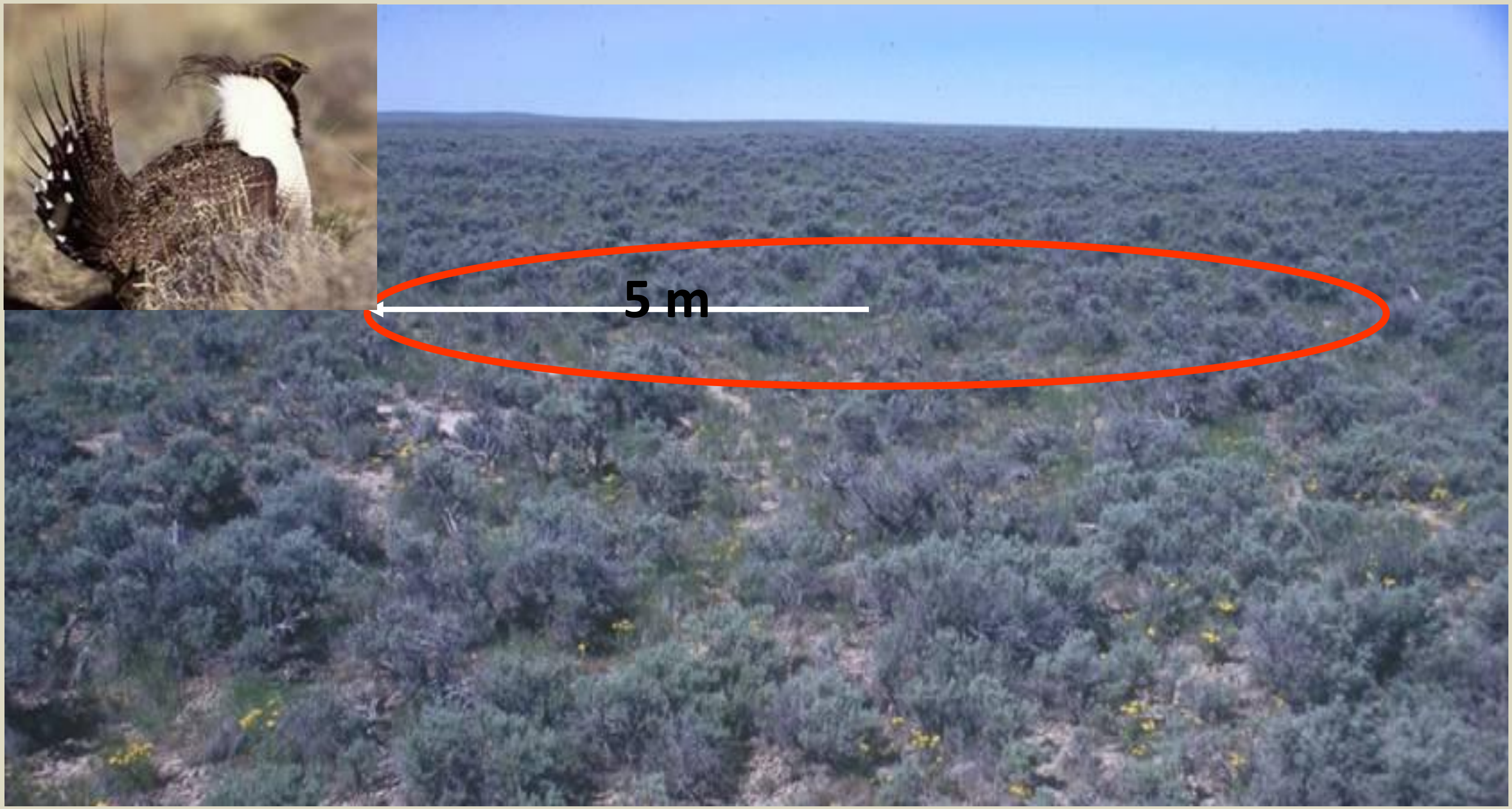
# Measuring Habitat Structure and Composition

- Line transect
- Transect number, length and placement influence cover estimates

# Measuring Habitat Structure and Composition

## 2 to 5, 50m lines ± 5% of the mean

# Measuring Habitat Structure and Composition



# Measuring Habitat Structure and Composition

- Small and large scale methods can give different answers.

% Shrub Canopy Cover

| 50m | 10 x 10m |
|---|---|
| 5 | 13.5 |
| 5.3 | 13 |
| 10.7 | 19.1 |
| 10.9 | 19.3 |
| 11.7 | 16.8 |
| 12.8 | 23.4 |
| 12.9 | 20 |
| 14.8 | 20.6 |
| 17.3 | 25.2 |
| 27.8 | 38.7 |
| 53.4 | 56.4 |

# Why would small-scale measurements yield higher values?

Remember that the measurements are taken around known nesting sites.

# Reasons

- Maybe the grouse are actually good at selecting dense sagebrush.
- Some of the sampling techniques are biased upward by their nature.
- Sagebrush sites are naturally variable.

# Measuring Habitat Structure and Composition

- Need for agreement in methods
- Larger scales for management

# Spatial scale matters – especially given the treats for sage-grouse