



**Mule Deer Winter Habitat  
Improvement on the north Kaibab: *A Partnership Focusing on Increasing,  
Native Shrub Diversity, Monitoring  
Cheatgrass, and Implementing  
Adaptive Management.***



Andi Rogers

*Arizona Game and Fish Department*

Christine Albano

*Grand Canyon Trust*



GRAND CANYON TRUST

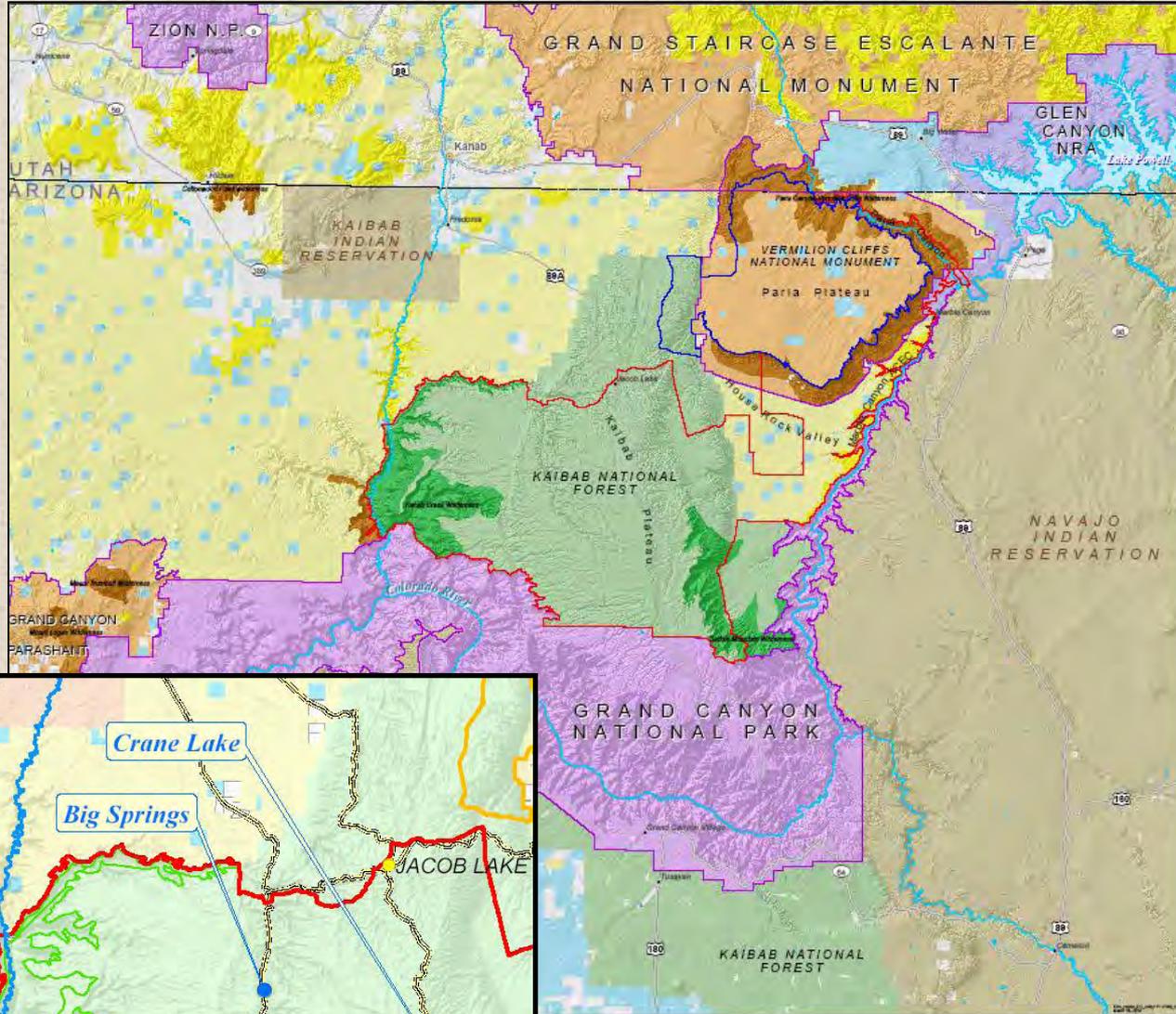
# Talk Overview

- Historical mule deer management and current controversy
- Westside Winter Range Project:
  - current conditions and the disturbances which created current conditions
  - methods of restoration (shrub enhancement) approach
  - results to date
- Collaboration and Adaptive Management



# North Kaibab Ranger District (Westside Project Area)

- Dominated by pinyon juniper woodlands
- Elevation ranges from 4,200-7,200 ft.
- Precipitation ranges from 11-13 inches annually
- Permittee of Kane and Two Mile Ranches is Grand Canyon Trust



# Mule deer (*Odocoileus hemionus*) on the North Kaibab

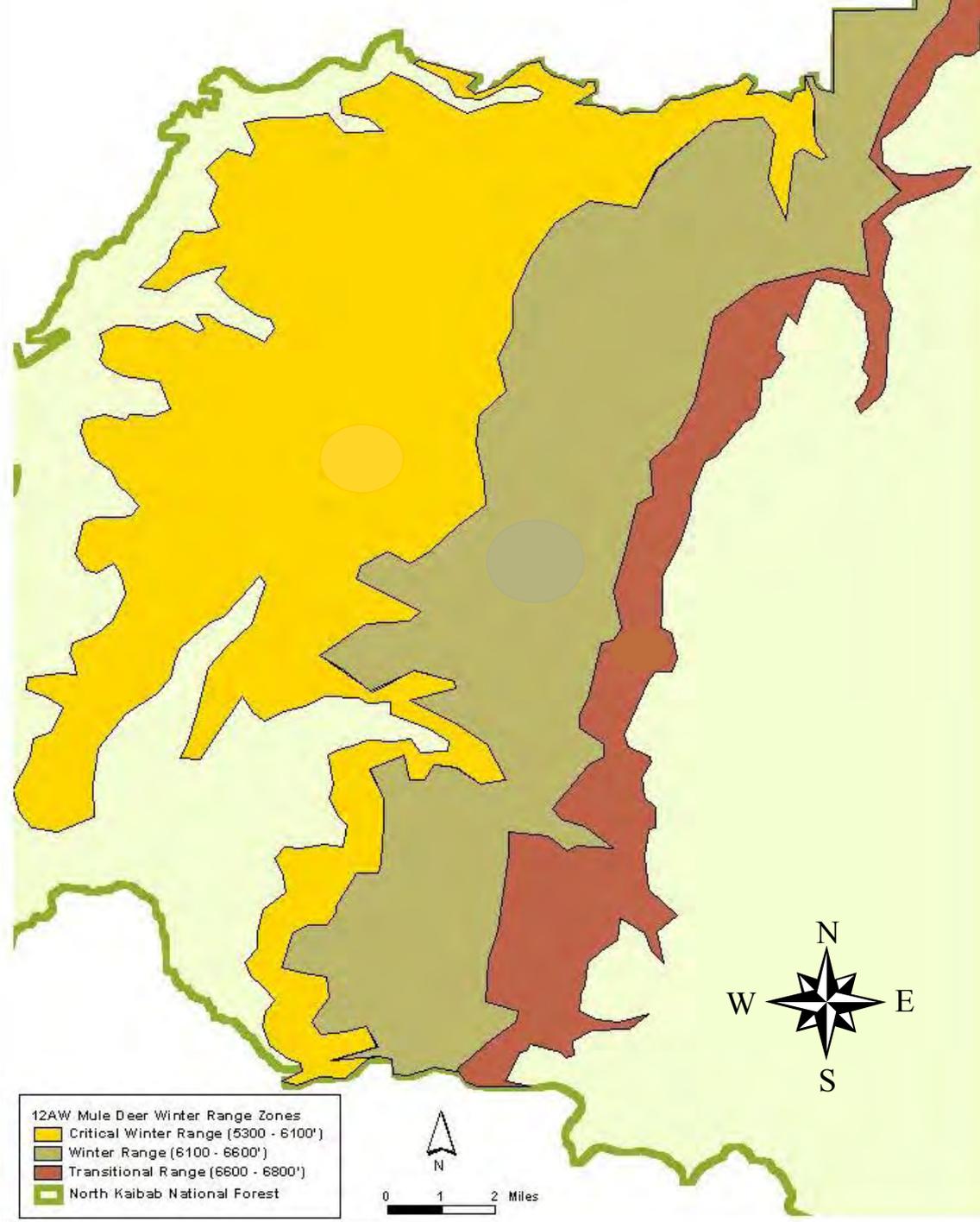
- Highest concentrations of mule deer in the state. Population estimated at ~12,000 deer (8,200 on the west side specifically).
- The North Kaibab lies within the Grand Canyon Game Preserve established in 1906. The game preserve was "*set a side for the protection of game animals and birds,*" and is "*to be recognized as a breeding place therefore.*"
- Wintering diet consists of shrubs constituting 77 % of total diet, grasses at 19%, with forbs amounting to less than 4% (*Miller, 2005*).
- Concern and controversy regarding the status of the population, (too many or too few) and the effect of the population on the habitat.



# Seasonal Mule Deer Use on the North Kaibab Ranger District

Three zones for winter  
movement (*Haywood et al.*  
*1987*):

-  Critical Winter Range  
(5,300-6,100 ft)
-  Winter Range  
(6,100-6,600 ft)
-  Transitional Range  
(6,600- 6,800 ft)



# Mule Deer Habitat Enhancement Project

Bridger-Knoll

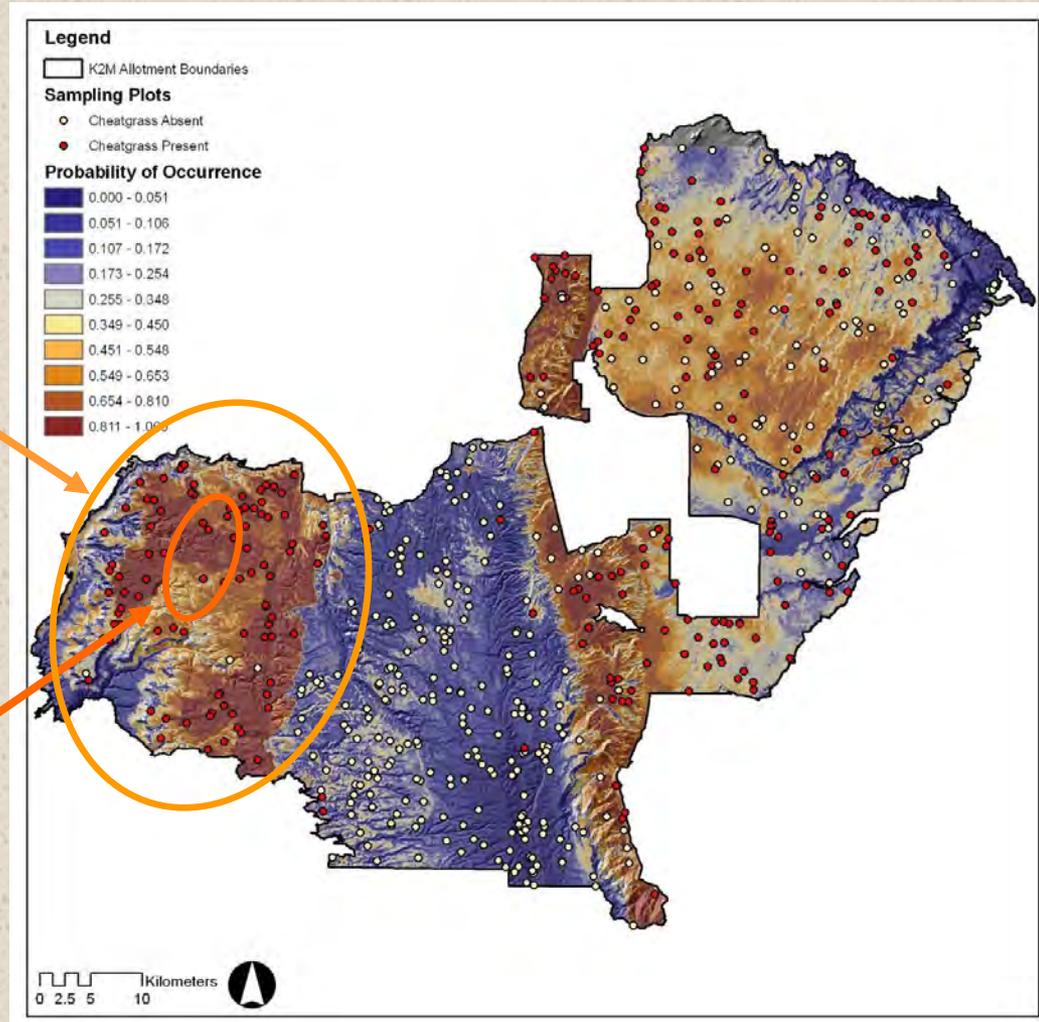
Complex Fire,

1996: 53,000 acres

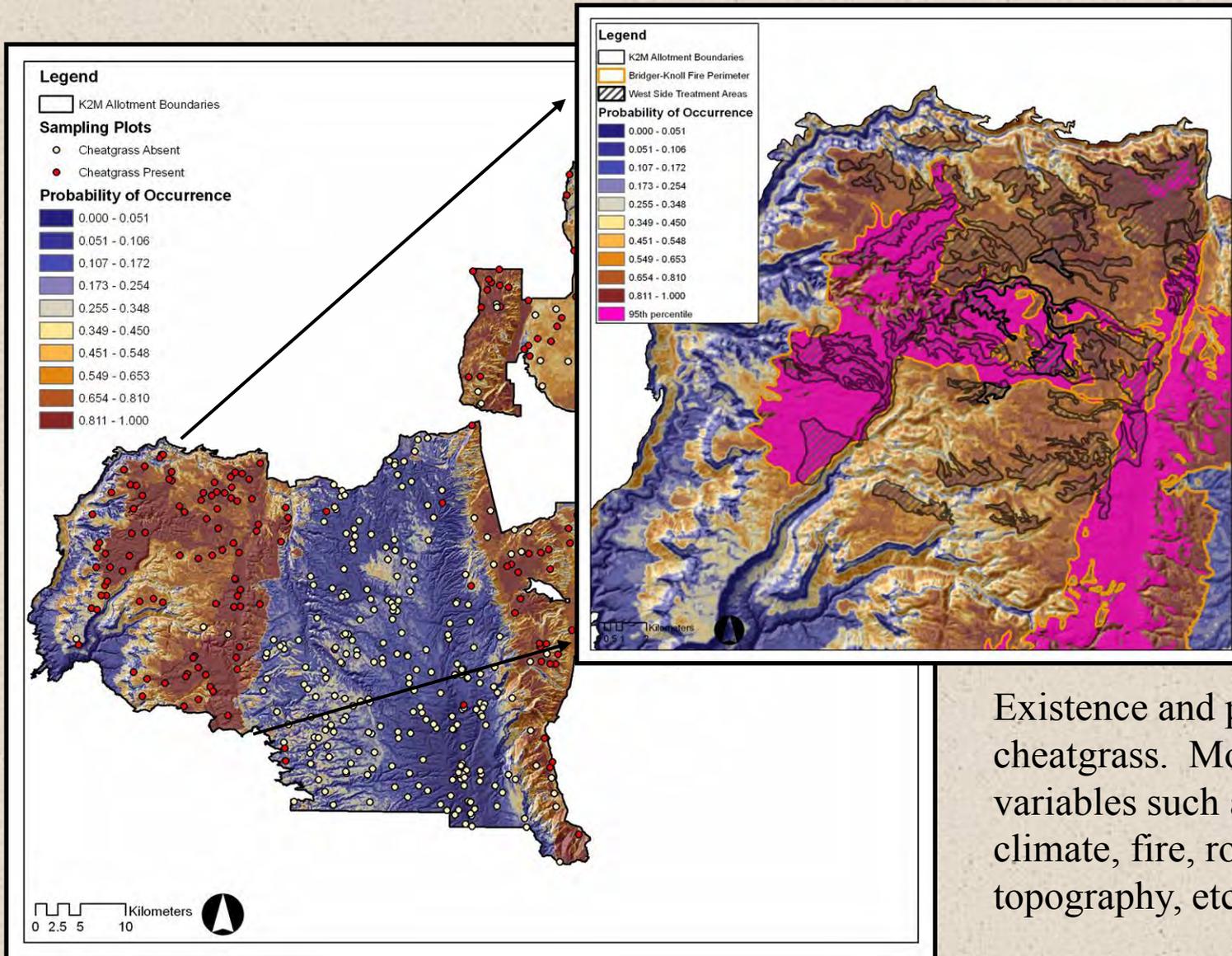


Slide Fire,

2007 : 6,000 Acres



# Cheatgrass Model- Grand Canyon Trust



Existence and probability of cheatgrass. Model based variables such as soil texture, climate, fire, roads, grazing, topography, etc

# Habitat Conditions on the Westside in some areas

“Worst Case”

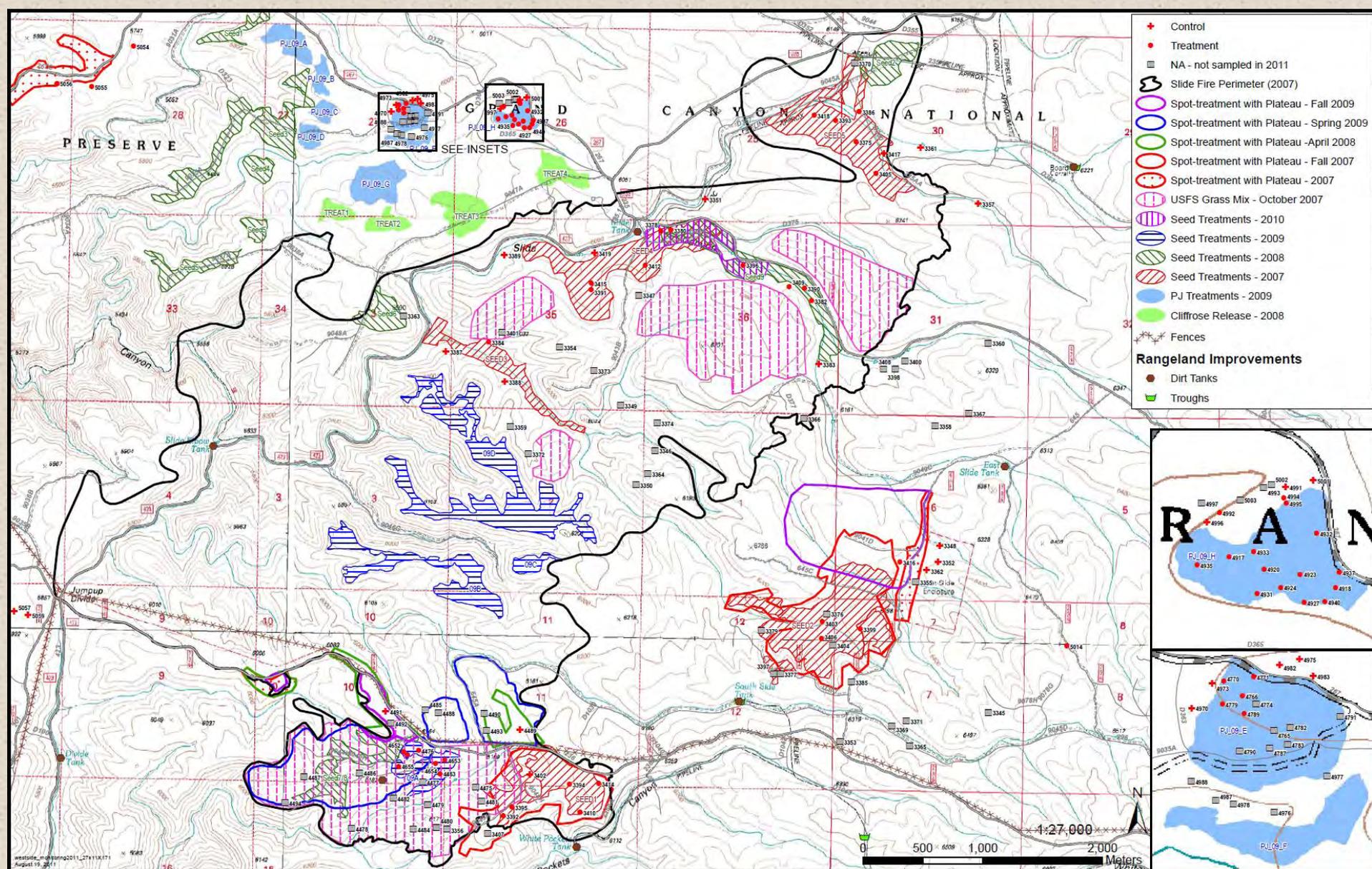


“Best Case”

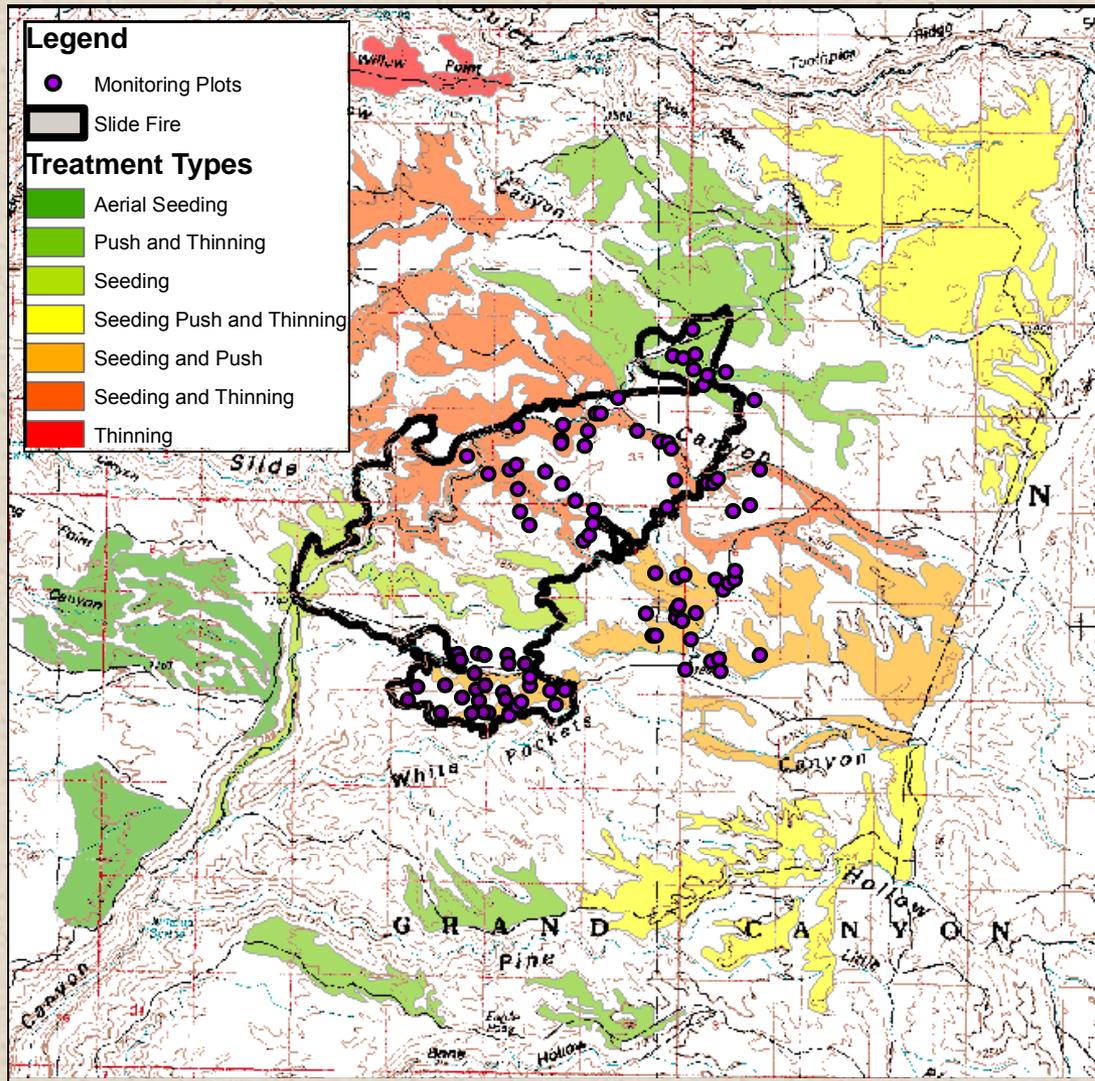


= **NEED** + \$\$ to do the work.

# 2007-present: Seeding, and herbiciding, and thinning... oh my



# West Side Mule Deer Habitat Enhancement Project



- AZGFD, USFS, and Grand Canyon Trust
- Initiated in 2007
- 30,000 planned acres total (focused in Slide Fire area)
  - Seeding select shrub and grass species
  - PJ Thinning
  - Herbicide application

## MAIN AGFD GOAL:

Reestablish important browse species lost to fire, meanwhile not increasing cheat grass prevalence.

# Treatments within the Westside Project

- Seed locally collected shrubs using a rangeland drill (with and without Plateau™ herbicide)
- Shrubs include cliffrose (*Purshia mexicana* var. *stansburiana*), Sagebrush (*Artemesia*), 4-wing saltbush (*Atriplex canescens*), Winterfat *Krascheninnikovia lanata*



# Treatments within the Westside Project

Pinyon and juniper thinning/grinding/seeding in order to promote vigor of existing shrubs and reestablishment of new species. Primary grass species seeded in association with PJ treatment were needle and thread grass and squirrel tail.

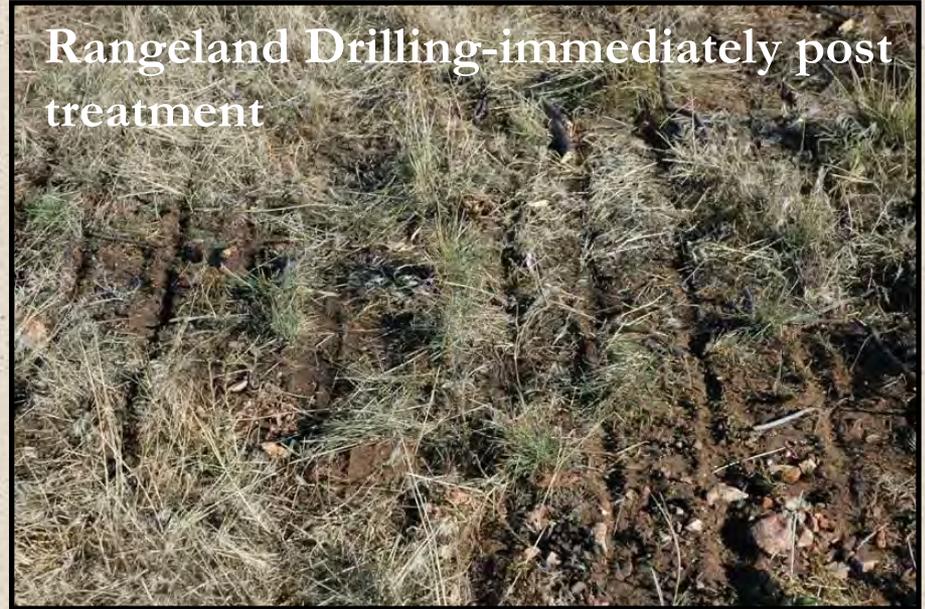


# Treatment Photos- Grinding and drill seeding

**PJ Grinding-immediately post treatment**



**Rangeland Drilling-immediately post treatment**



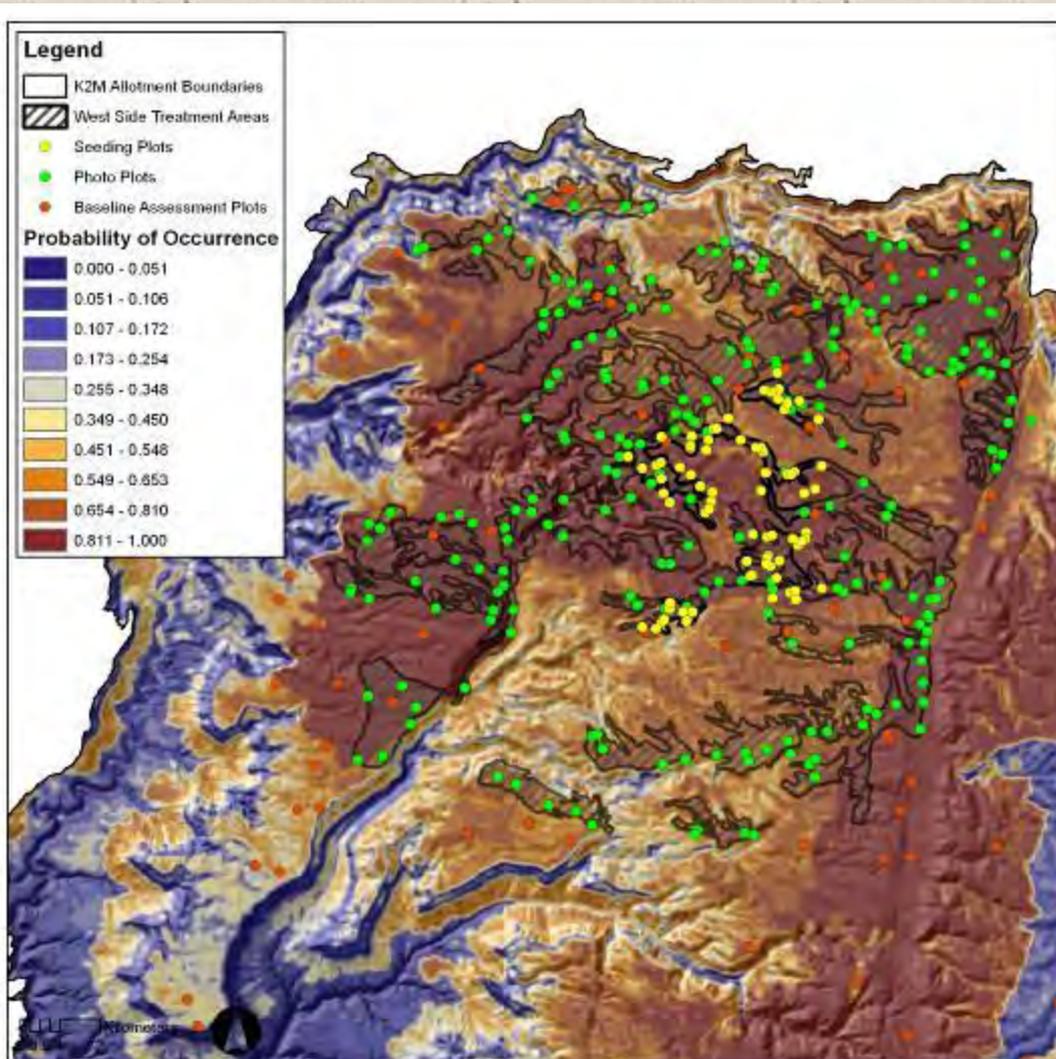
**PJ Grinding- one year later**



**Rangeland Drilling- one year later**



# Monitoring Locations on West Side Habitat Enhancement Project Area



- Model Refinement and Validation
- Risk Assessment
- Adaptive Management

# Mule Deer Habitat Enhancement Project

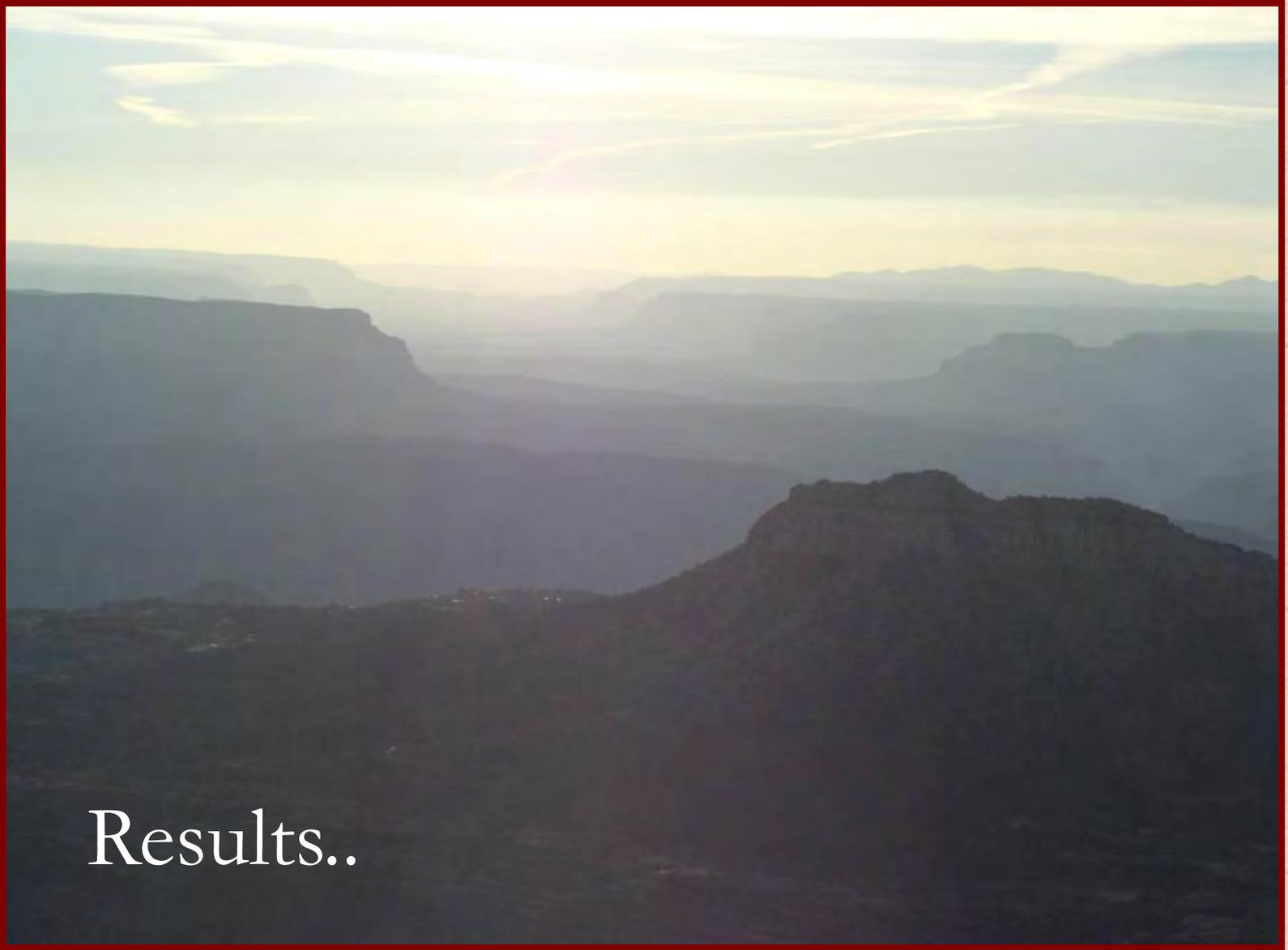
## Monitoring

- Covered 3 main soil types, including Cumulic Haplustolls, Typic Haplustalfs, and Typic Ustochrepts.

### Objectives

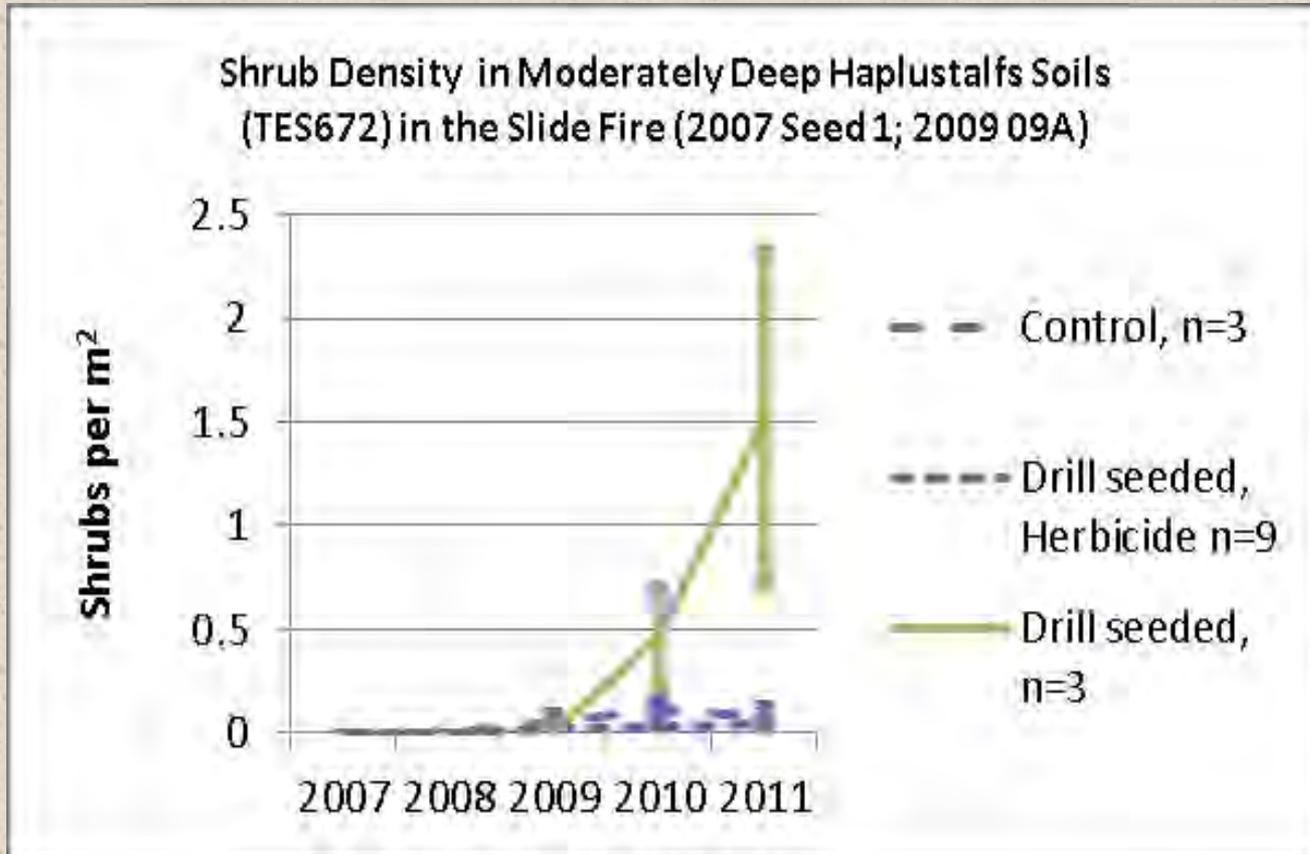
- Quantify success of seeding shrubs in achieving increased forage for mule deer
- Quantify effect of drill seeding on cheatgrass invasion
- Quantify success of pinyon juniper treatments
- Quantify effect of treatments with and without herbicide when possible.





Results..

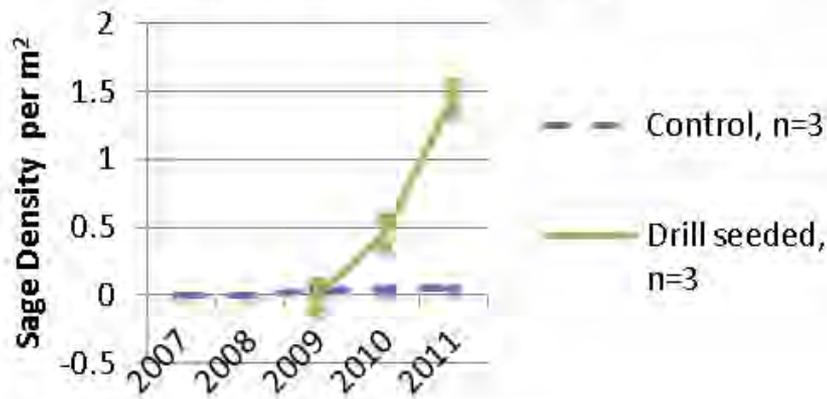
# Drill seeding effectiveness on shrub density



Drill seeding has significantly increased the density of shrubs in some, but not in all treatment areas

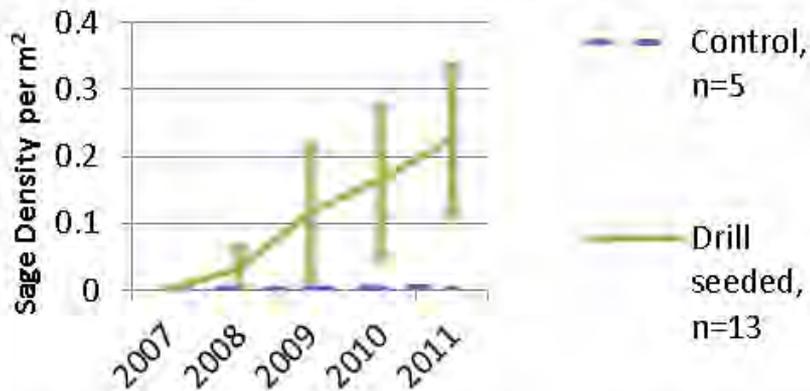
# Drill seeding effectiveness on shrub density

Sage Density in Moderately Deep Haplustalfs Soils in the Slide Fire (2009 Seed 09A)



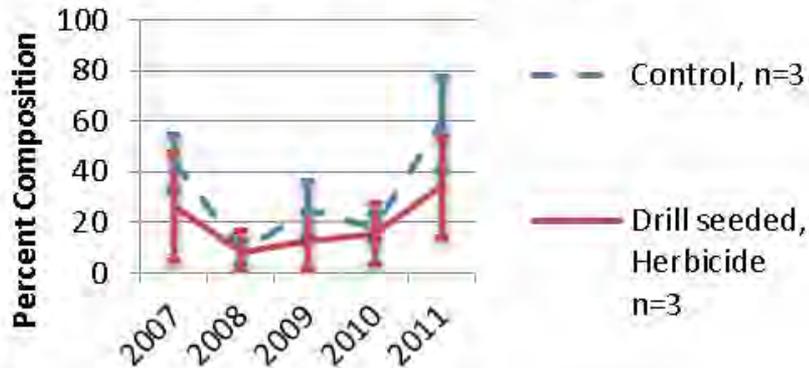
Sage, is the main species showing a positive response to treatments in both deep and moderately deep Haplustolls soils

Sage Density in Deep Haplustolls Soils in the Slide Fire (2007 Seed 4,5; 2008 Seed 9)

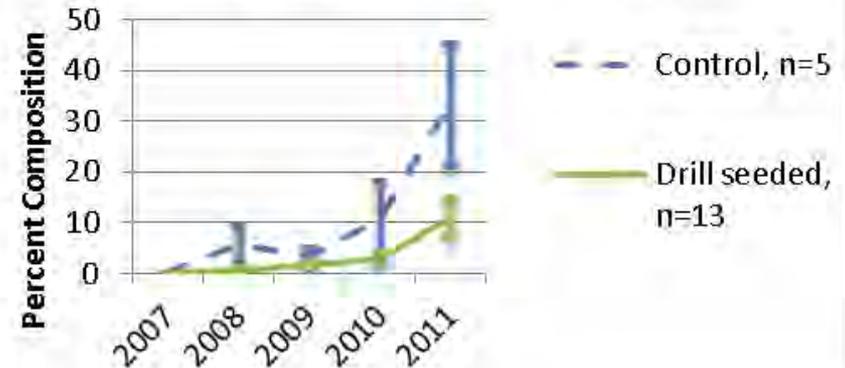


# Effect of drill seeding on percent cheatgrass composition

Cheatgrass Composition in Mod. Deep Ustochrepts Soils in Bridger Knoll burn area (2007 Seed 2)

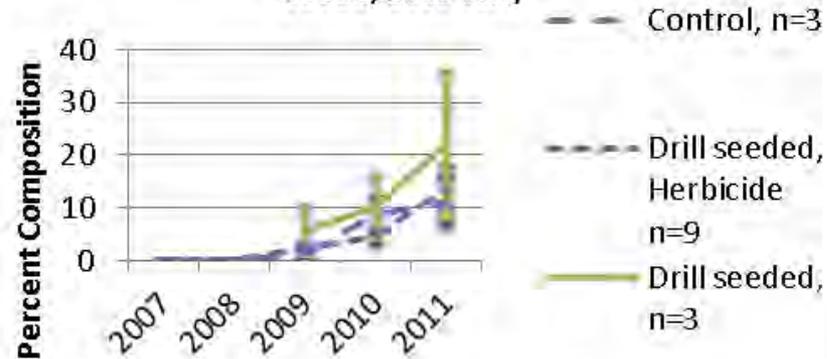


Cheatgrass Composition in Deep Haplustolls Soils in the Slide Fire (2007 Seed 4,5; 2008 Seed 9)

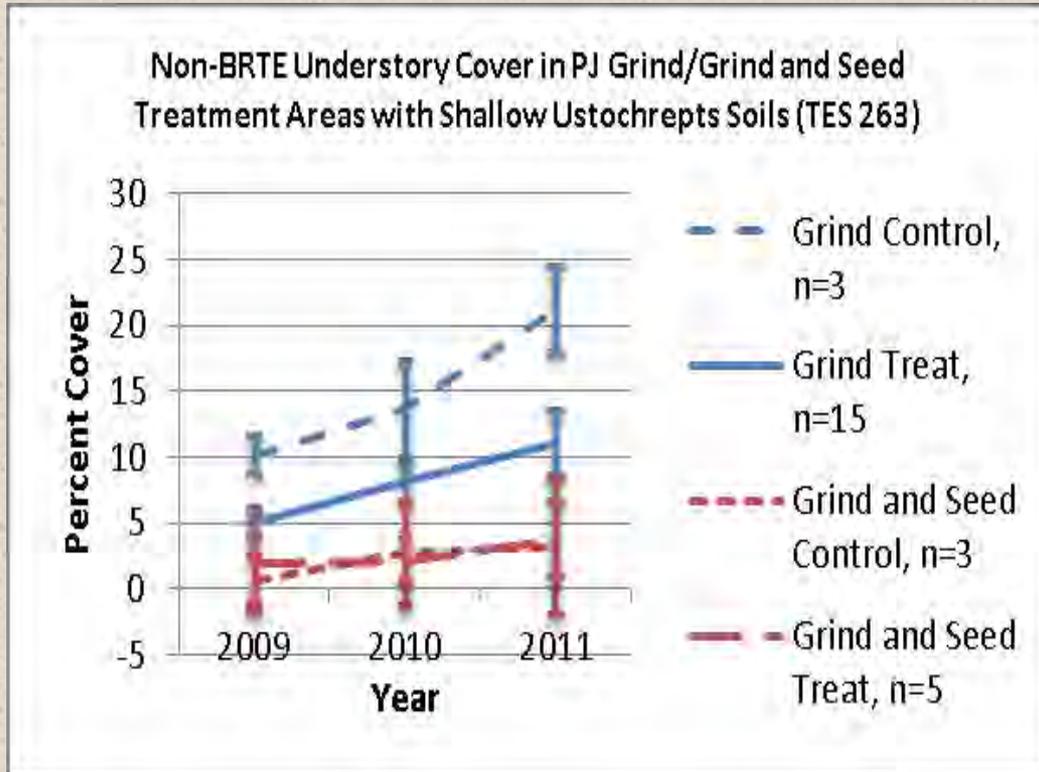


Drill seeding treatments have not had a significant effect on cheatgrass composition relative to untreated areas in any of the soil types or treatments that were monitored.

Cheatgrass Composition in Moderately Deep Haplustalfs Soils (TES 672) in the Slide Fire (2007 Seed 1; 2009 09A)

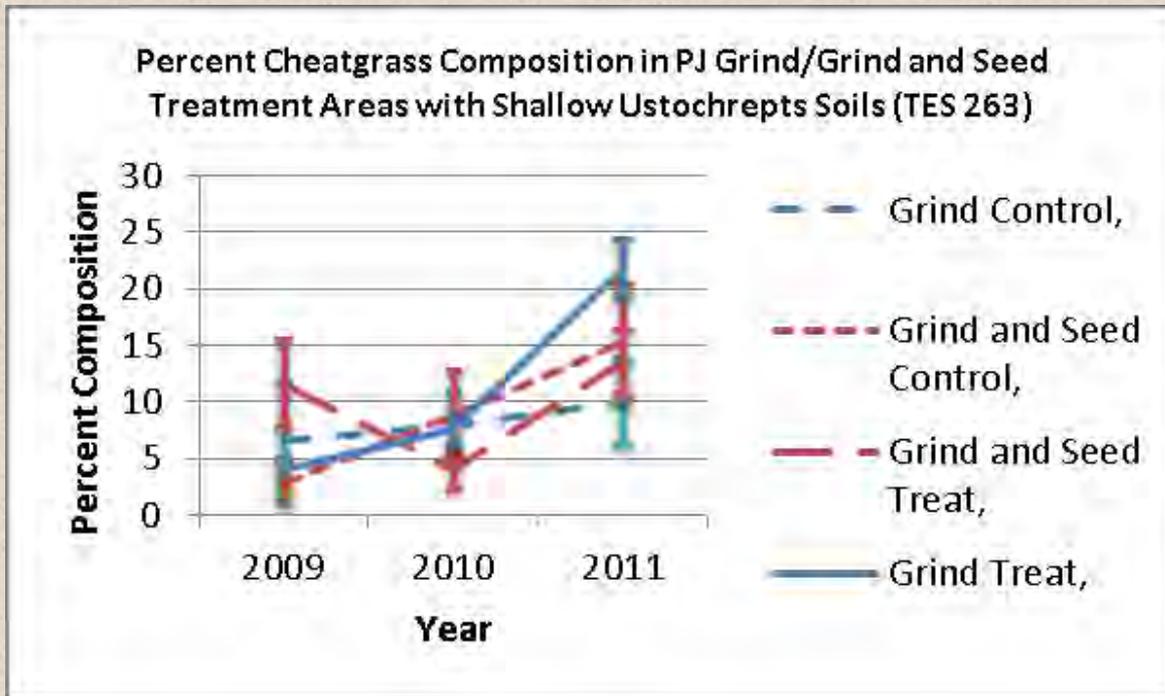


# Effect of juniper thinning treatments on understory cover



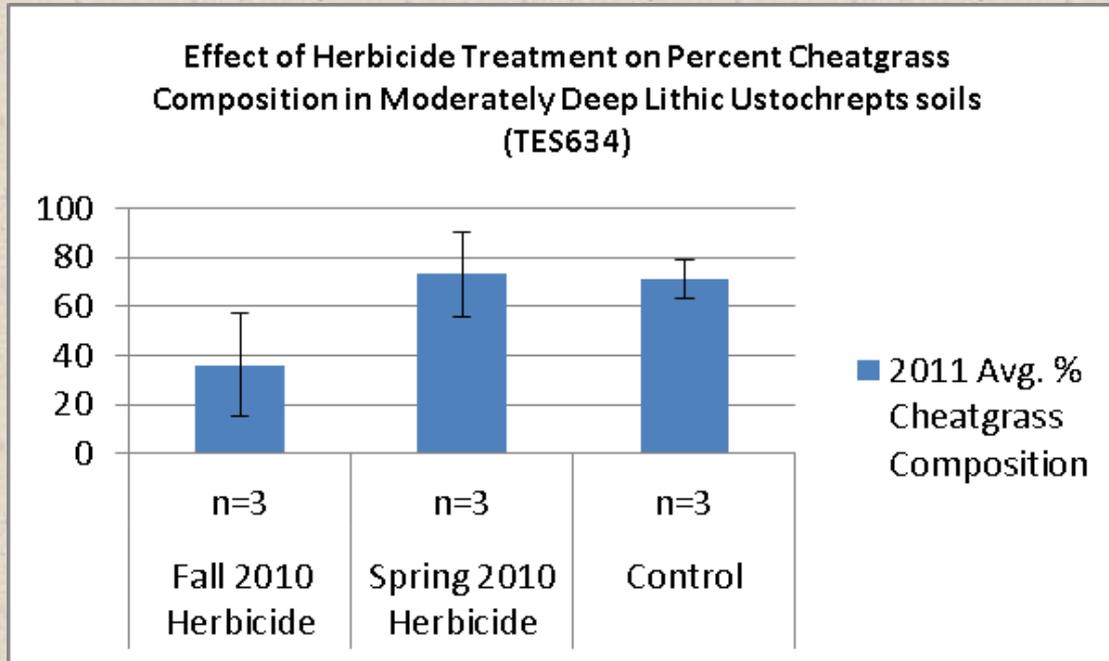
Non-cheatgrass understory cover in juniper grinding and grinding/seeding treatments did not increase significantly more than in similar untreated areas

# Effect of juniper thinning treatments on percent cheatgrass composition



Cheatgrass composition (percentage of total plant cover comprised of cheatgrass) increased in the juniper grinding treatment plots significantly more than in the associated untreated plots, but this was not the case with the grinding/seeding treatment and control plots

# Herbicide treatments



- Fall 2010 treatment somewhat effective, although not statistically.
- However, there was no difference in cheatgrass composition between Spring 2010 treatment plots and control plots, indicating that the herbicide treatment effect was short-term (< 1.5 years).
- It is unclear whether the difference between spring and fall treatments is due to the effectiveness of herbicide in spring vs. fall, or if the results simply reflect the effect of time since treatment

## TAKE HOME

**Shrubs are responding:** Sage is the main species showing a positive response to treatments and positive results have taken 5 years.

- It is important to note that while the monitoring plots have not exhibited substantial establishment of cliffrose, four wing saltbush, or winterfat, these species were observed in high abundance in a few plots within the study area.

**Soil type/depth matters:** Shrub treatments were most successful in moderately deep Typic Haplustalfs soil in the treatment type that did not include herbicide. Seeded areas also treated with herbicide did not respond as well.

**Cheatgrass is prevelant:** Percent cheatgrass composition (percentage of total plant cover comprised of cheatgrass) has steadily increased across the project area since 2007, but does not seem to be increasing due to drill seeding alone.

## TAKE HOME

**PJ grinding is complicated:** Pinyon juniper treatments successfully reduce tree density, however, existing native vegetation does not seem to increase as a result (at this time). In addition, cheatgrass may increase if PJ treatments do not also include a simultaneous seeding treatment.

**Herbicide works sometimes, but there are tradeoffs:** Herbicide may reduce cheatgrass temporarily, but more data is needed to determine long term effectiveness. Also, herbicide may impact non-target species as seen in the lab and in the field (Owen et al 2011, Baker et al 2009).



## Lessons learned...

- “Landscape Experiments” are rare..
- Multiple partners bring strength in funding, but multiple objectives/targets can be difficult.
- Adaptive management can drive better decision making processes
  - Incorporate results of westside project to help draft new livestock allotment management plan for this area
  - Use results to facilitate decisions about future treatments, and whether to continue funding
  - Long term monitoring indicates there are positives and negatives to continued treatments.





Questions?