

# Manipulating Cheatgrass Seed Dispersal to Benefit Native Plants

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**February 15, 2017**

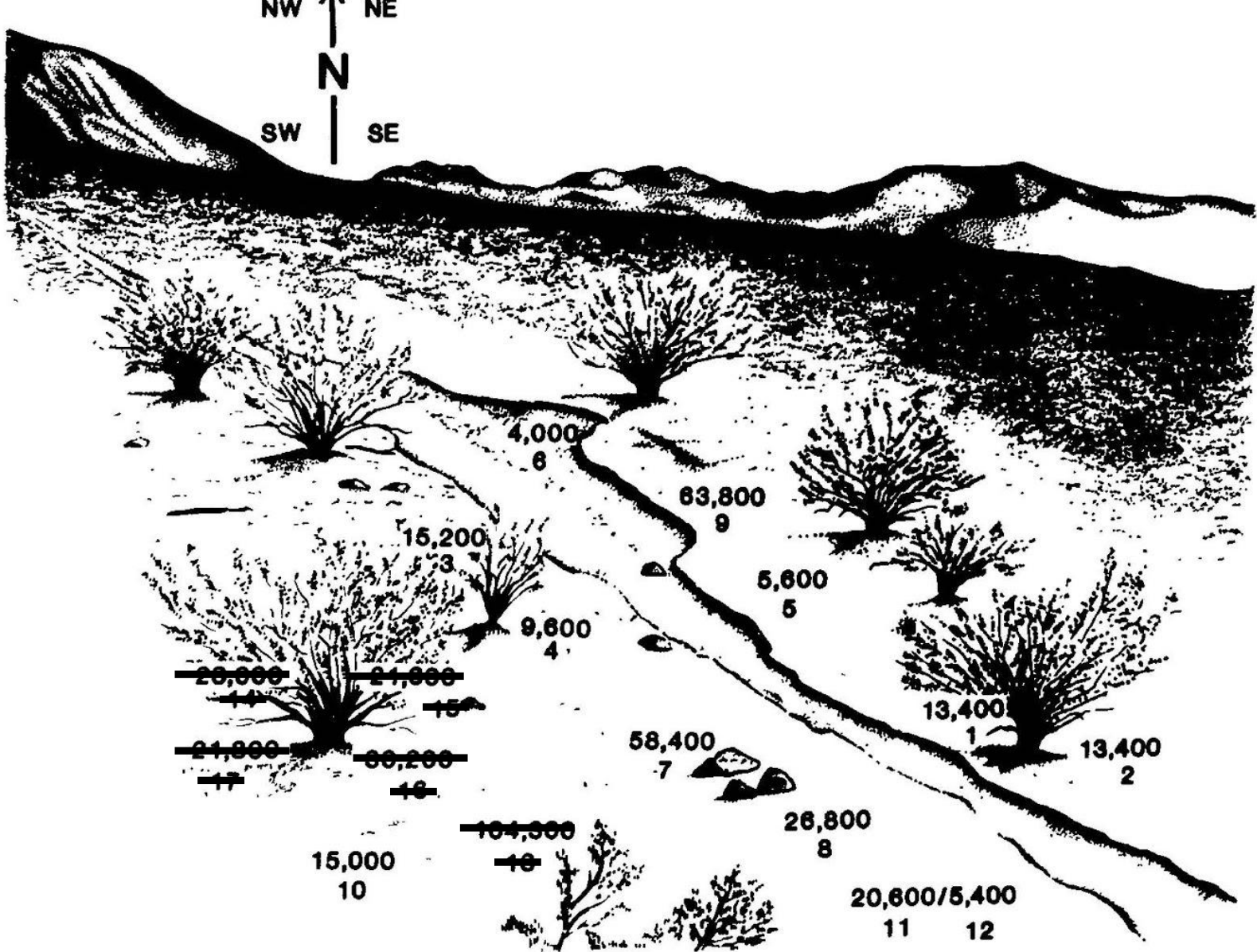


**COLORADO**

**Parks and Wildlife**

Department of Natural Resources





Reichman, O. J. 1984. Spatial and temporal variation of seed distributions in Sonoran desert soils *Journal of Biogeography* 11:1-11.



cheatgrass



Indian ricegrass

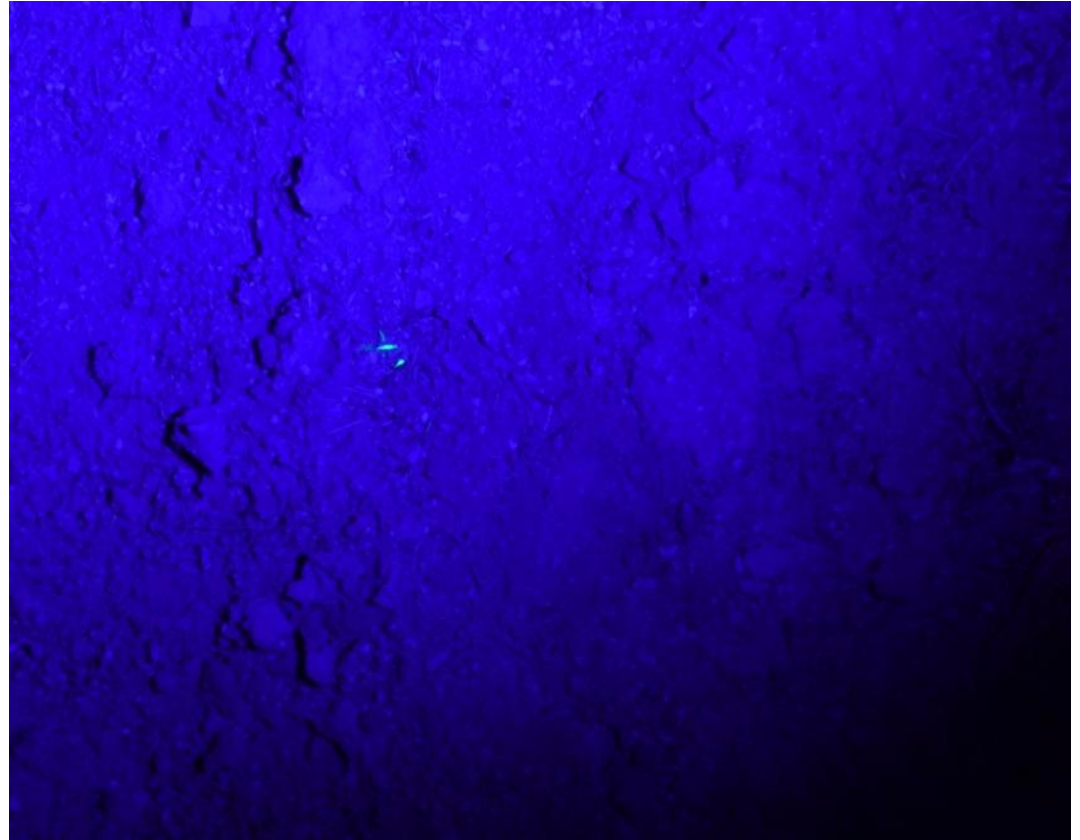


sagebrush

Chambers, J. C. 2000. Seed movements and seedling fates in disturbed sagebrush steppe ecosystems: Implications for restoration. *Ecological Applications* 10:1400-1413.



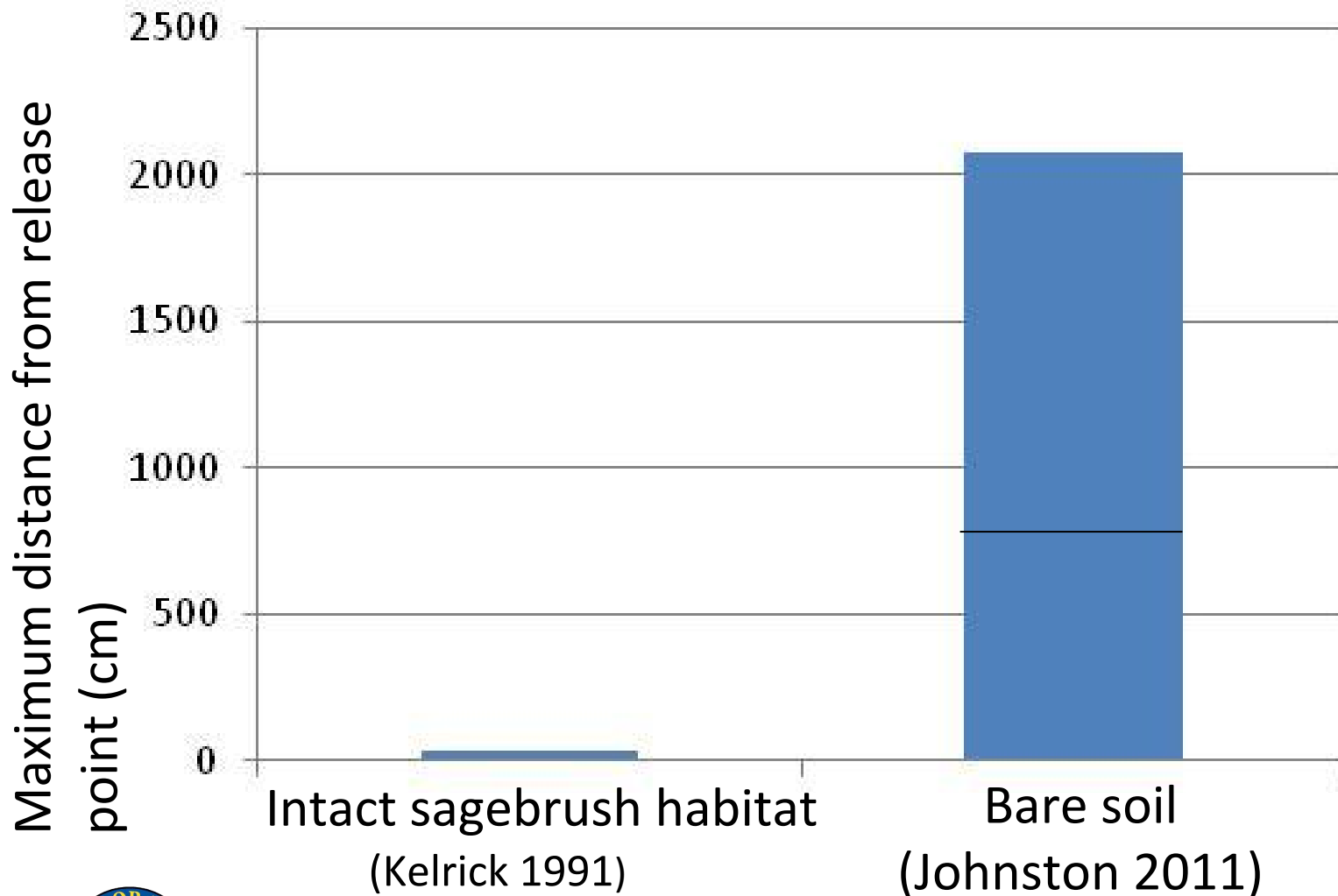
# Cheatgrass dispersal over bare soil



Johnston, D. B. (2011). "Movement of weed seeds in reclamation areas." Restoration Ecology **19(4)**: 446-449.

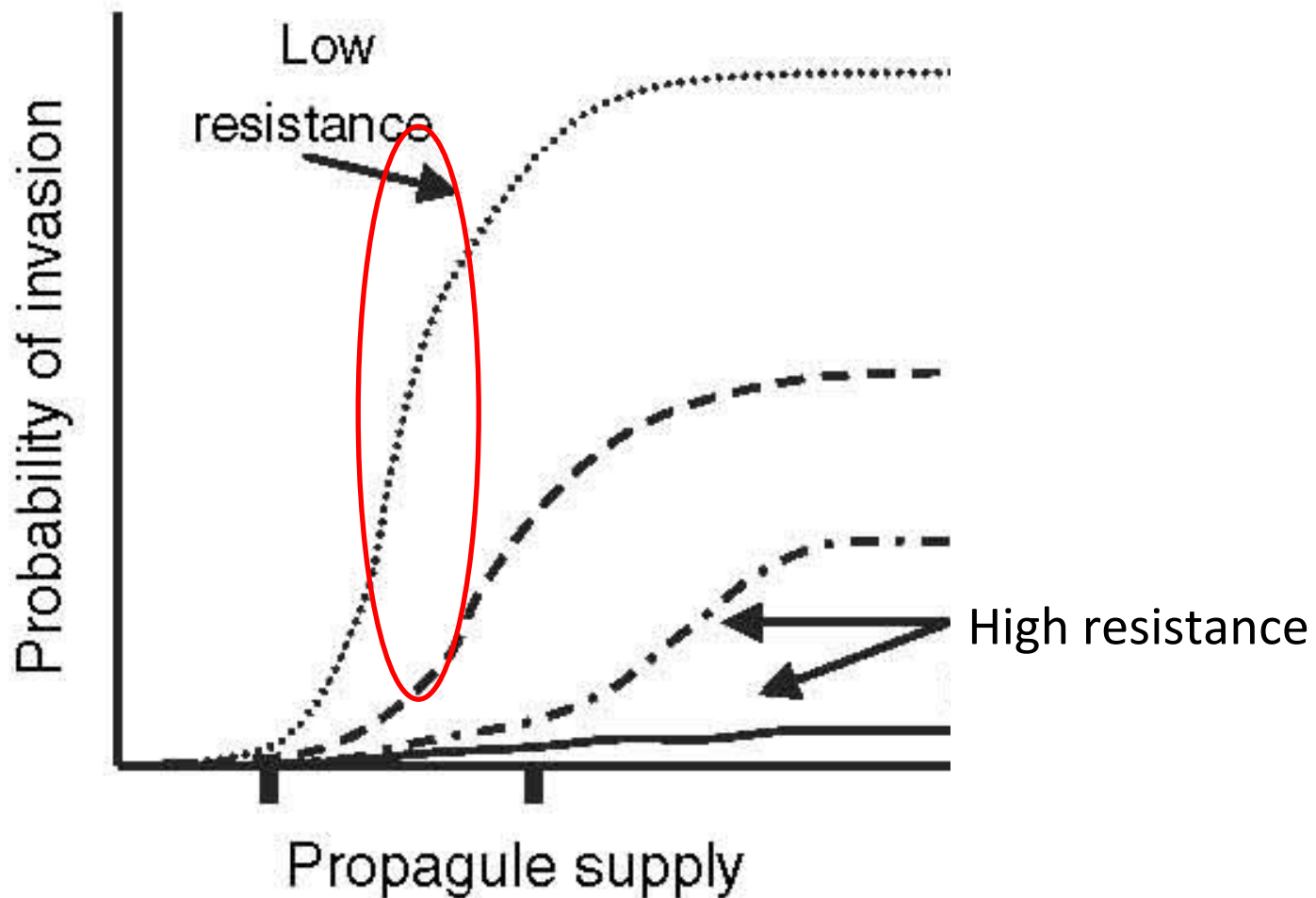


# Cheatgrass dispersal and environment



Factors affecting seeds in a sagebrush-steppe ecosystem and implications for the dispersion of an annual plant species, cheatgrass (*Bromus tectorum* L.). Utah State University, Logan, UT.

# Propagule supply and weed invasion

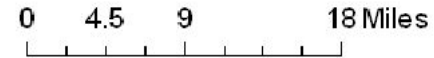
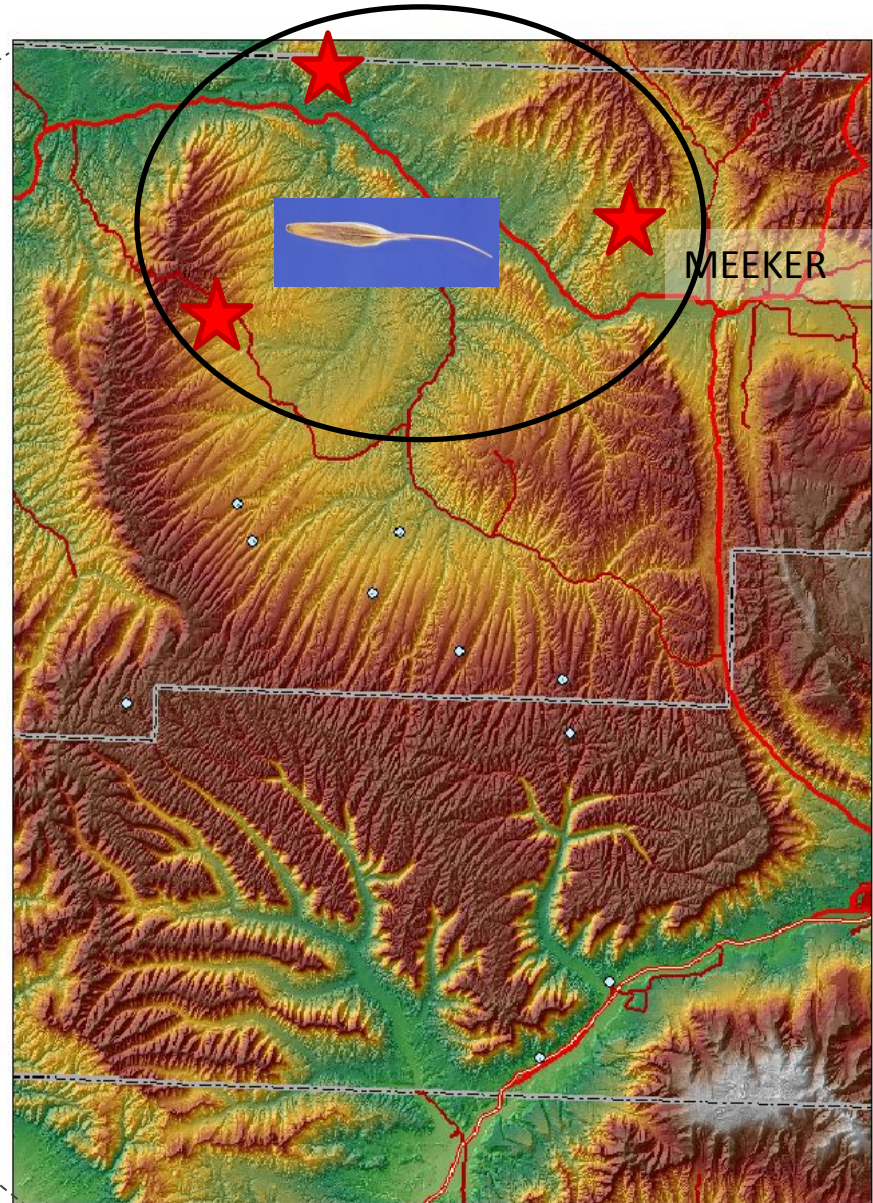
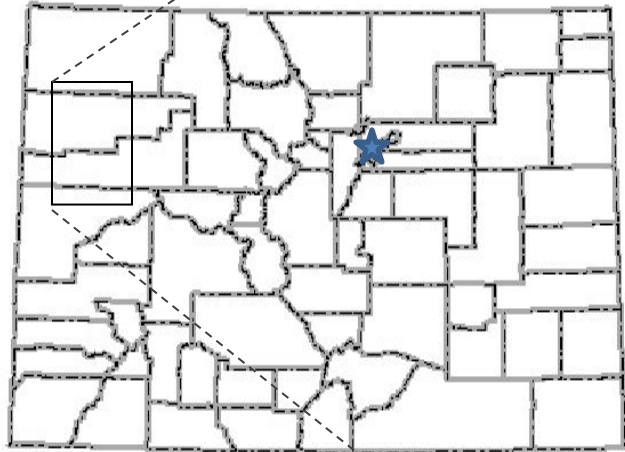


Thomsen, M. A., C. M. D'Antonio, K. B. Suttle, and W. P. Sousa. 2006. Ecological resistance, seed density and their interactions determine patterns of invasion in a California coastal grassland. *Ecology Letters* 9:160-170.





# Piceance Basin Research Locations

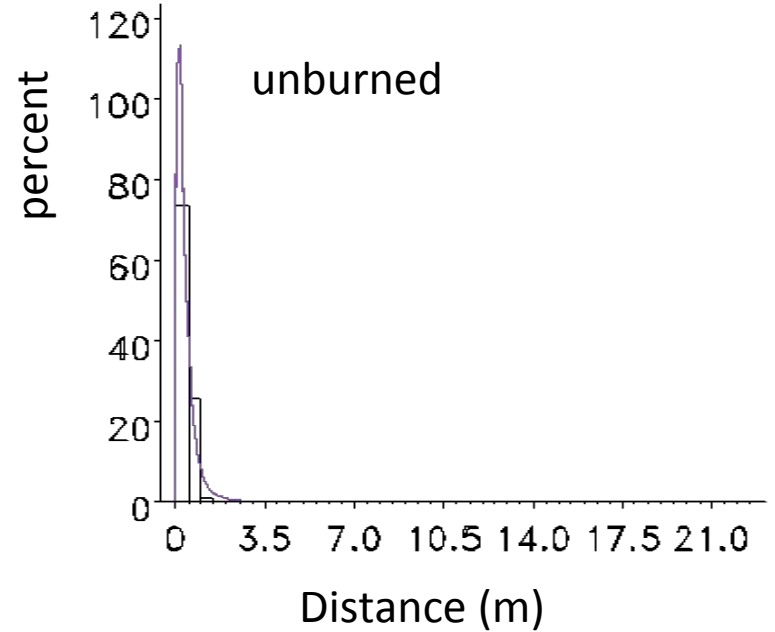
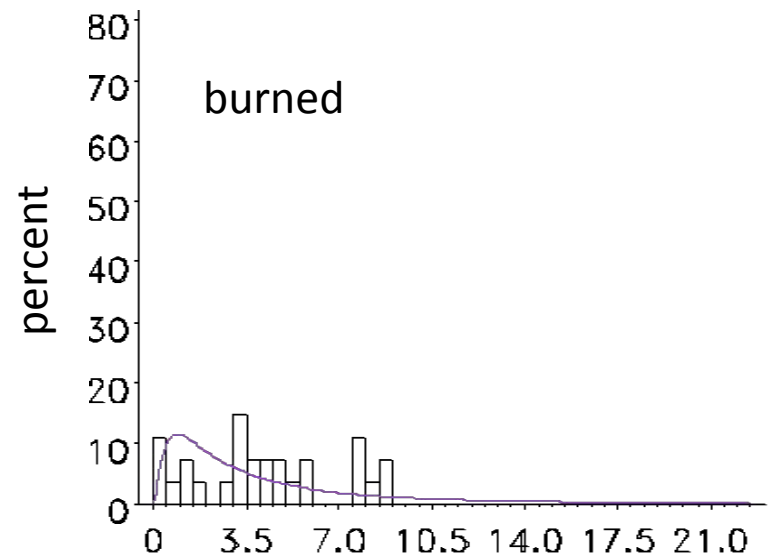






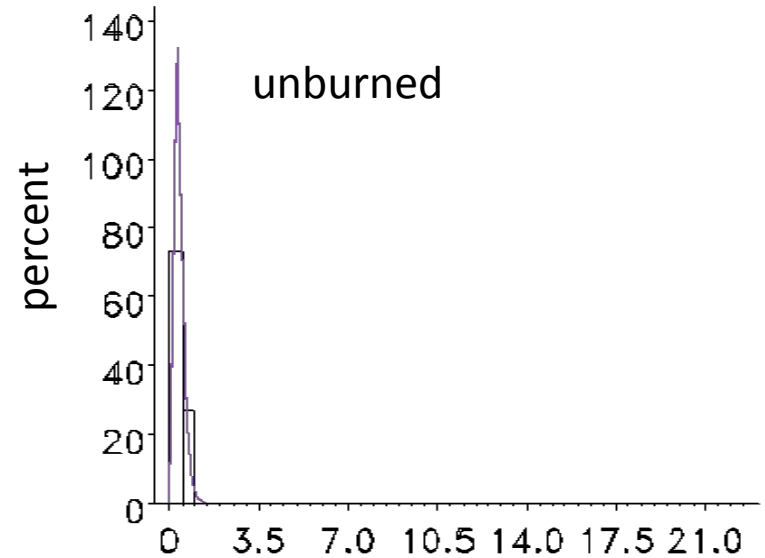
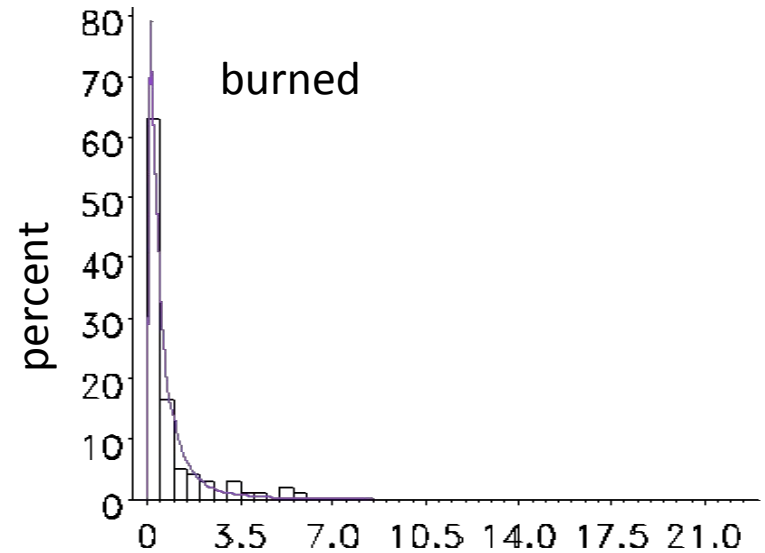
# Cheatgrass dispersal after fire

## Pinyon Ridge Site



# Cheatgrass dispersal after fire

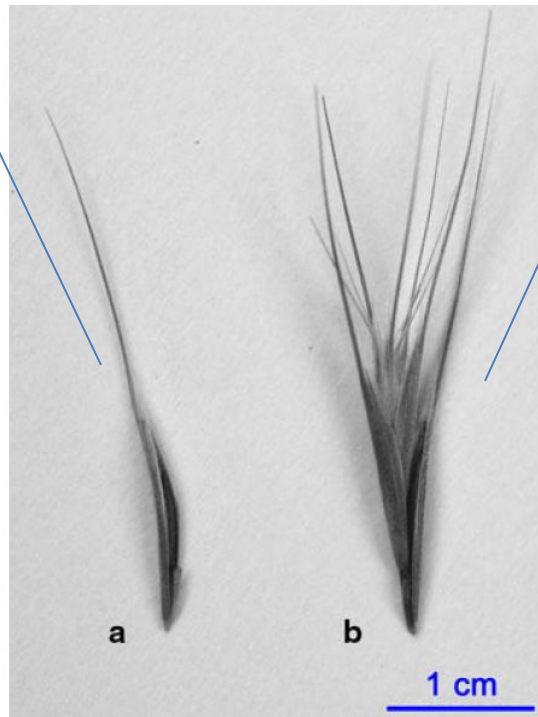
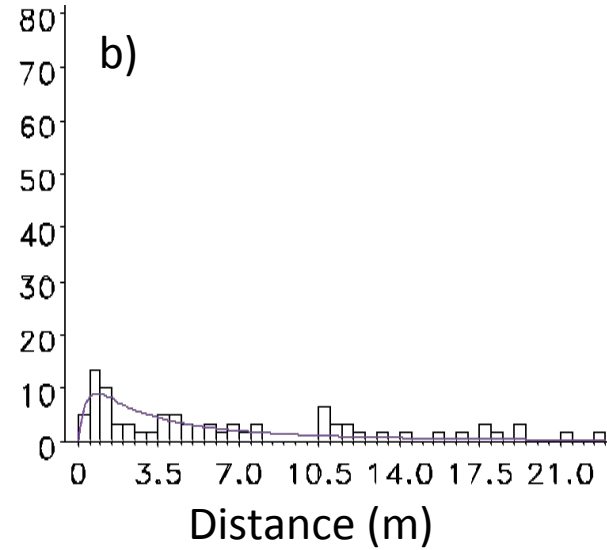
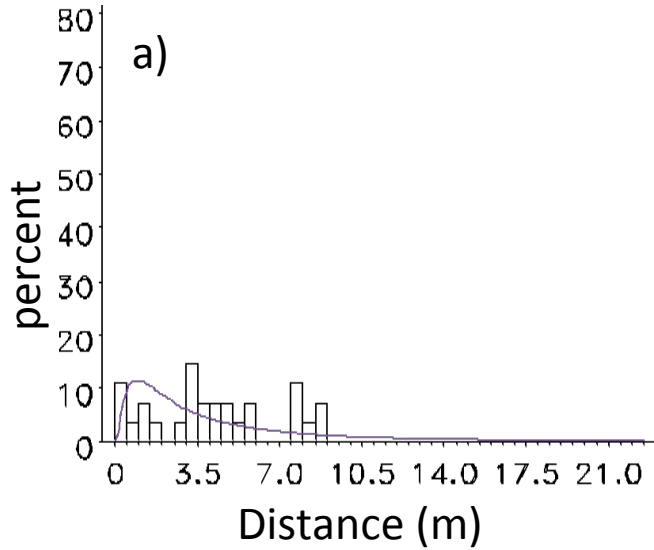
Scenery Gulch site



Distance (m)



# Cheatgrass dispersal after fire



Monty, A., Brown, C. S., and D. B. Johnston (2013). "Fire promotes downy brome (*B. tectorum*) seed dispersal." *Biological Invasions* **15(5)**: 1113-1123.



# Cheatgrass is a loner

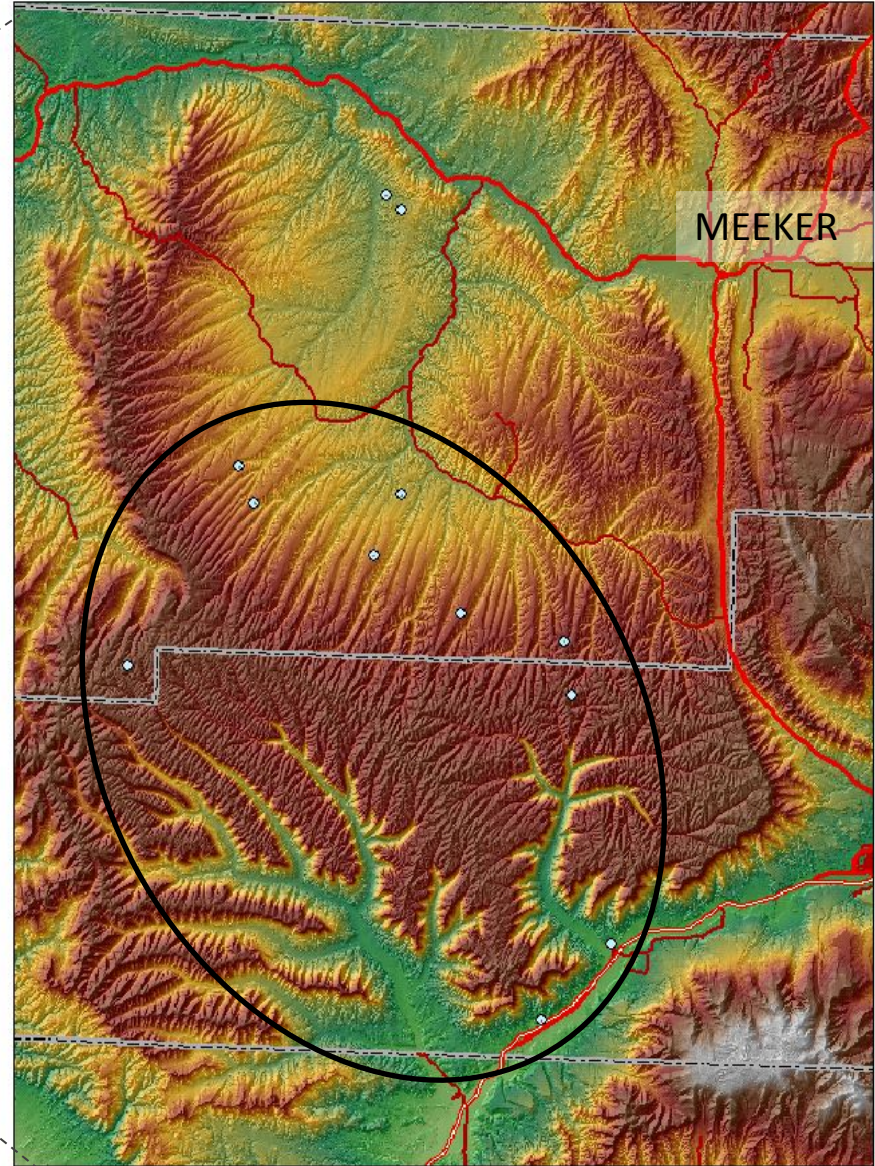
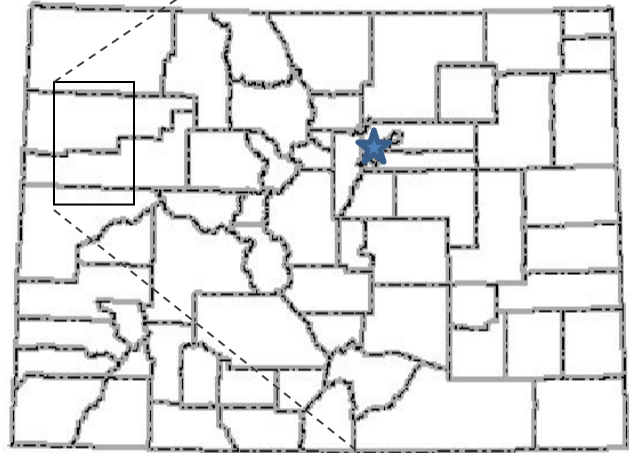


1 isolated cheatgrass plant = 40 plants within a stand

Hulbert, L. C. 1955. Ecological studies of *Bromus tectorum* and other annual brome grasses. Ecological Monographs **25**:181-213.



# Piceance Basin Research Locations



Elevation (m)

DEM (10m)

Value

High : 4396

Low : 998.0

0 4.5 9 18 Miles





*Photo credit: wilderness workshop*







# Pothole Seeding Experiments in Piceance

Strategy Choice Experiment (2008- 2012):

Potholing crossed with Plateau and seed mix

- GVM, 5500 ft
- SGE, 6600 ft
- MTN, 7200 ft
- WRR, 7300 ft



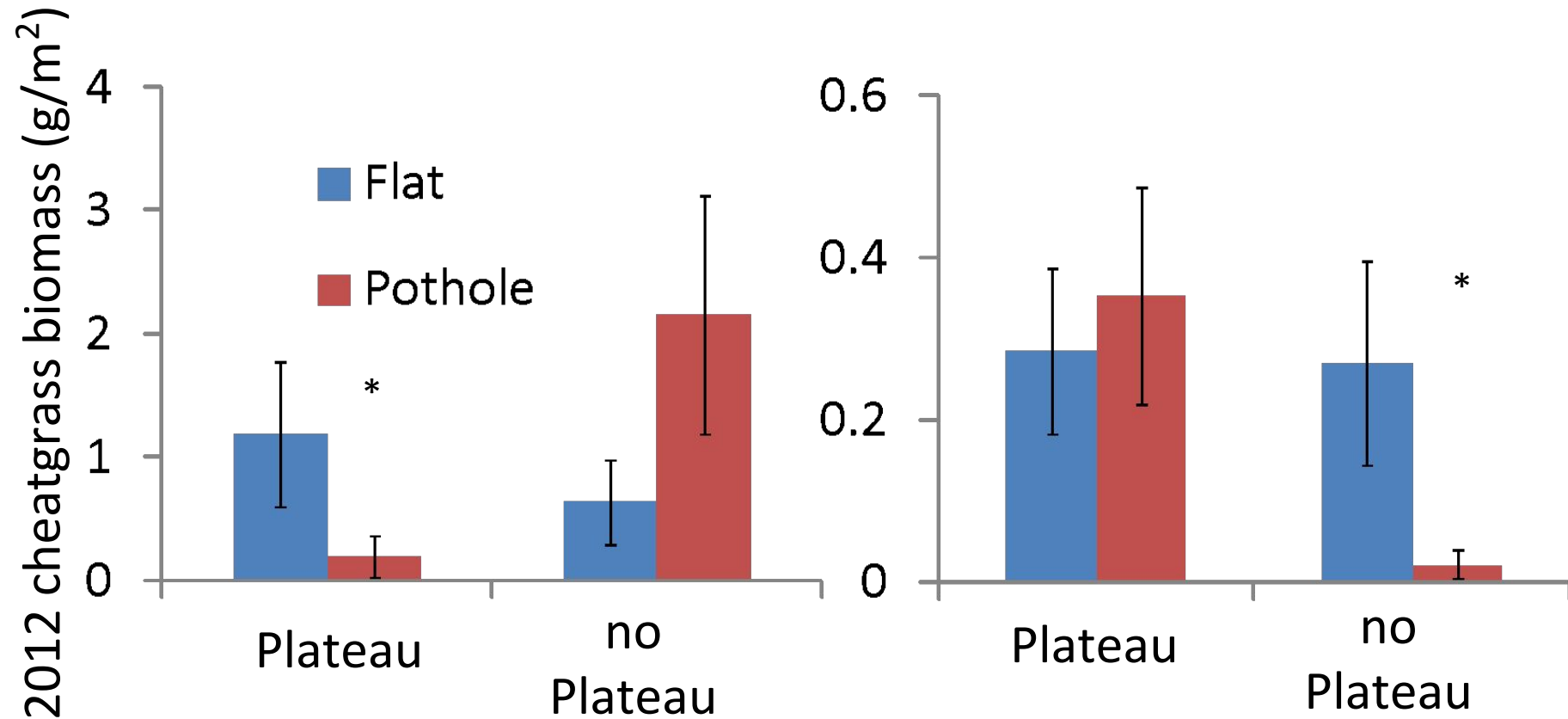
Mountain top Experiment (2008- 2014):

Potholing crossed with brush and seeding

- SCD, 7700 ft
- SPG, 8000 ft
- TGC, 8300 ft
- SQS, 8800 ft



# Pothole seeding X Plateau

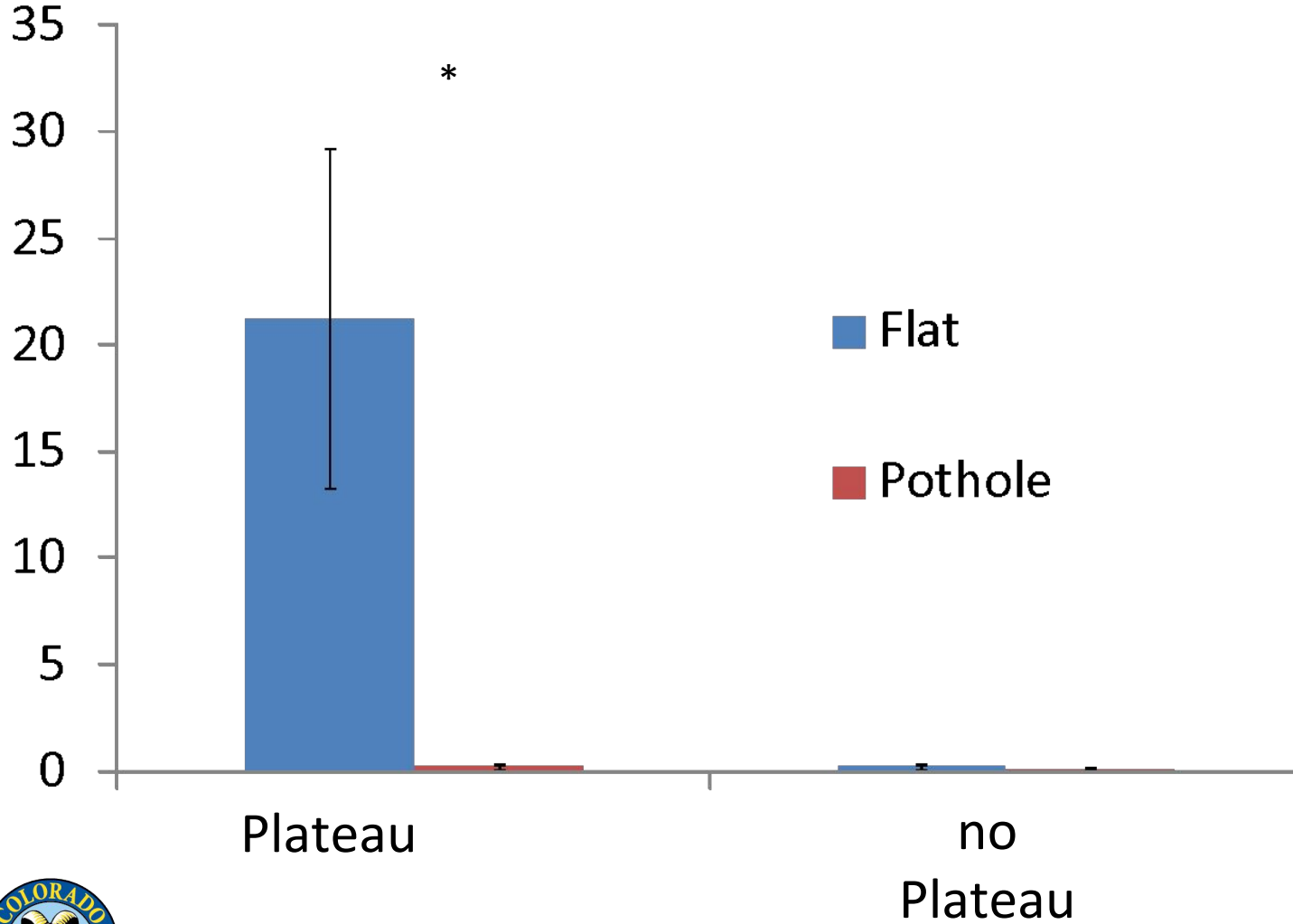


GVM

MTN

# Pothole seeding X Plateau

2012 annual forb biomass (g/m<sup>2</sup>)



MTN

# Pothole seeding, 3-years post treatment

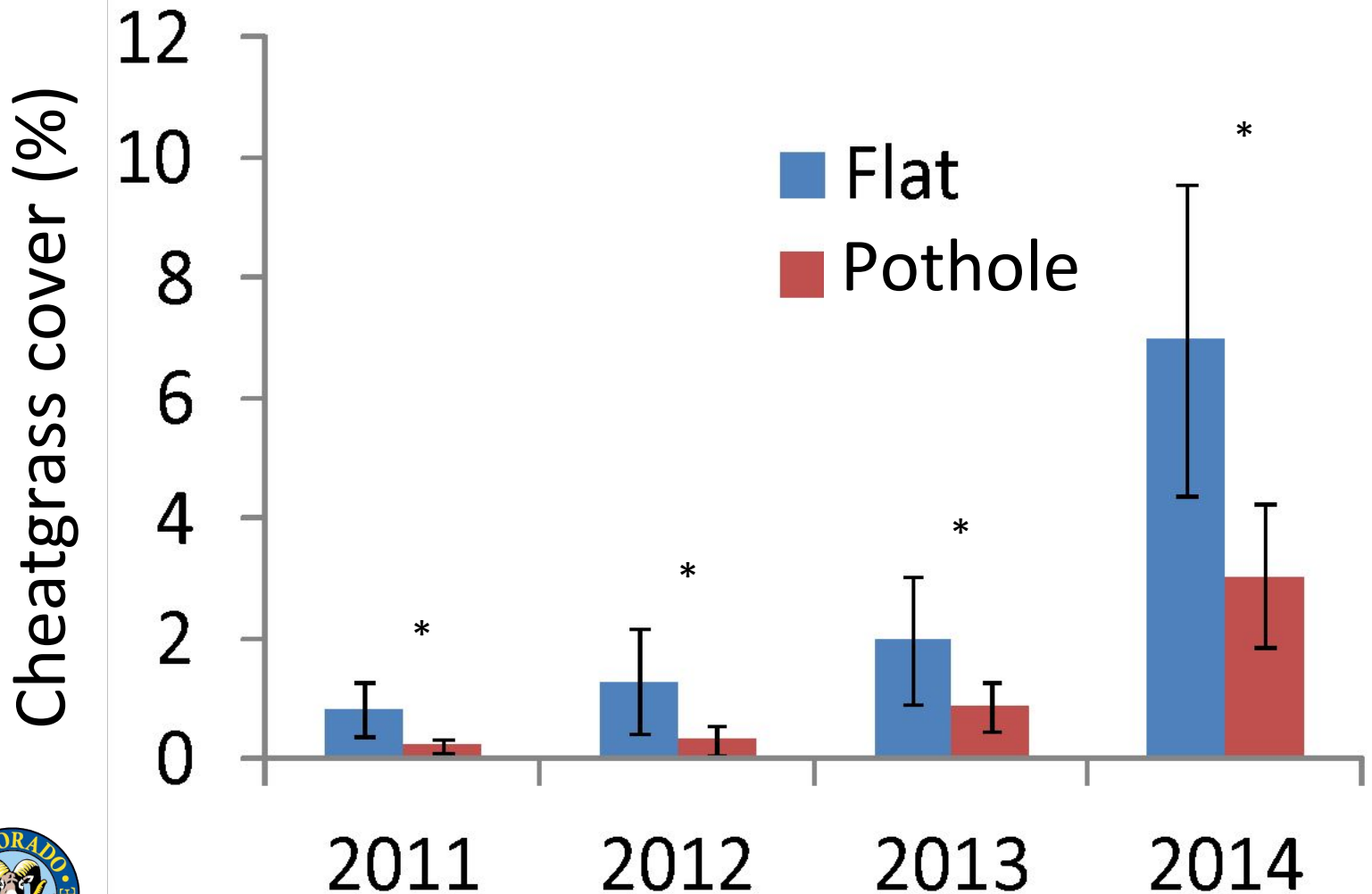


Flat

pothole

# Pothole seeding over time

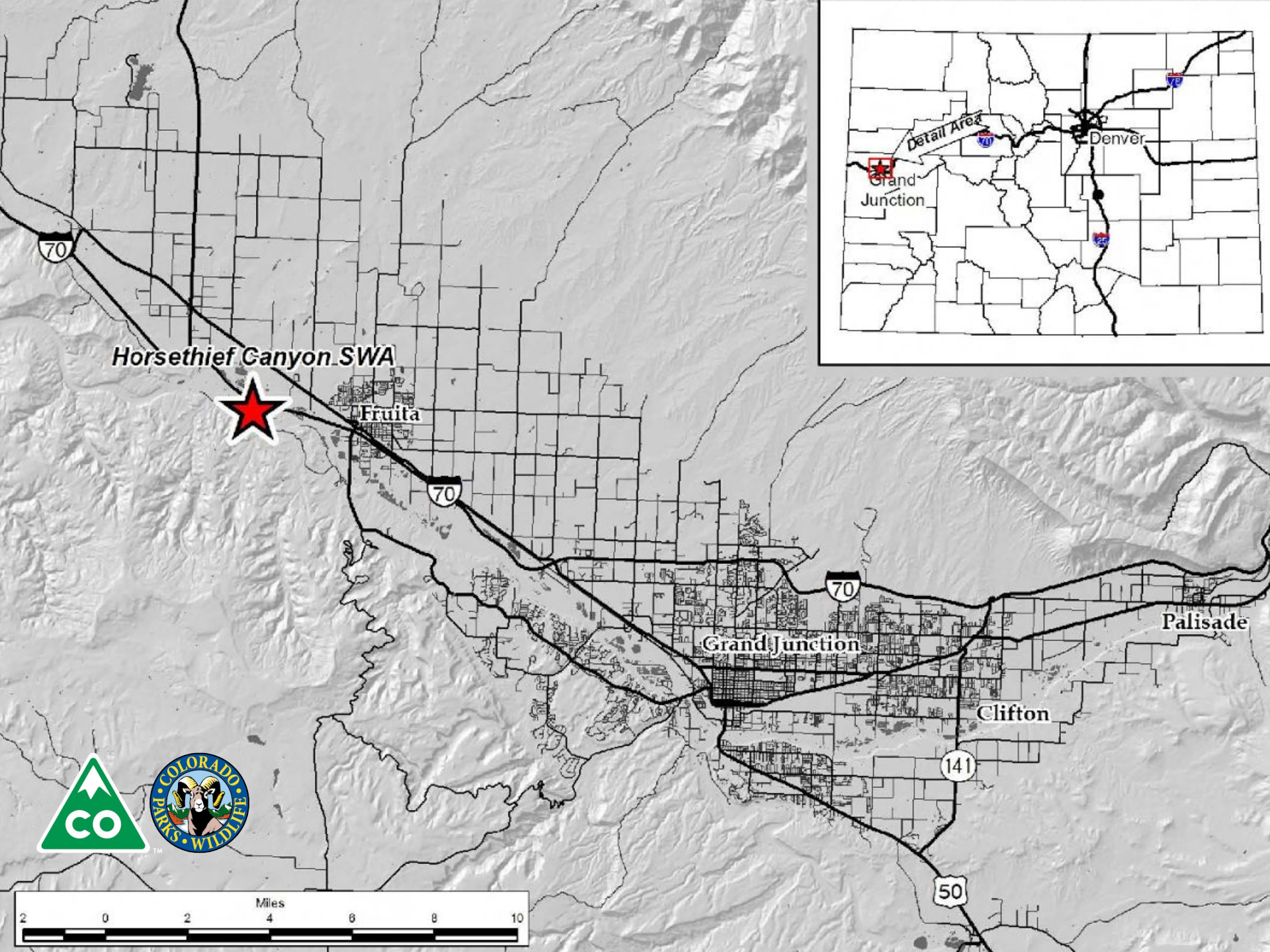
(Mountain Top Experiment)











Horsethief Canyon SWA

Fruita

Grand Junction

Clifton

Palisade



Miles

2 0 2 4 6 8 10

Detail Area

Grand Junction

Denver

# Pothole seeding at Horsethief State Wildlife Area 2012

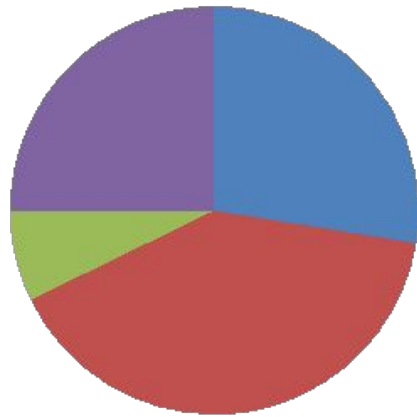


# Pothole seeding at Horsethief State Wildlife Area 2012



# Horsethief Project

- forb
- bunchgrass
- rhizomatous grass
- shrub



1100 seeds/m<sup>2</sup>

22 PLS



common name	Genus	Species	Seeds /m <sup>2</sup>	PLS/acre
Western yarrow	Achillea	millefolium	30	0.04
Indian ricegrass	Achnatherum	hymenoides	60	1.67
Wyoming Sagebrush	Artemisia	tridentata	120	0.32
Fourwing saltbush	Atriplex	canescens	40	5.89
Blue Gramma	Bouteloua	gracilis	100	0.56
yellow rabbitbrush	Chrysothamnus	viscidiflorus	50	0.31
bottlebrush squirreltail	Elymus	elymoides	60	1.26
Streambank wheatgrass	Elymus	lanceolatus ssp. psamm.	40	0.95
slender wheatgrass	Elymus	trachycalus	40	1.22
Thickspike wheatgrass	Elymus	lanceolatus ssp. lance.	50	1.30
rubber rabbitbrush	Ericameria	nauseosa	60	0.40
* Aspen fleabane	Erigeron	speciosus	50	0.13
* Sulfur flower buckwheat	Eriogonum	umbellatum	23	0.45
Utah sweetvetch	Hedysarum	boreale	15	1.81
needle and thread	Hesperostipa	commata	30	1.06
winterfat	Krascheninnikovia	lanata	10	0.36
Lewis flax	linum	lewsii	40	0.54
western wheatgrass	Pascopyrum	smithii	30	1.07
* Dusty Penstemon	Penstemon	comarrhenus	90	0.61
Palmer penstemon	pestemon	palmeri	60	0.40
Sandberg Bluegrass	Poa	sandbergii	60	0.26
bluebunch wheatgrass	Pseudoroegneria	spicata	60	1.73

# Pothole seeding at Horsethief State Wildlife Area 2014



# Pothole seeding at Horsethief State Wildlife Area

2015



6/24/15  
Horse Thief  
P4SB



6/24/15  
Horse Thief  
P5SC

6/23/2015

Horse Thief

Indian ricegrass

blue bunch  
wheatgrass

Galleta

needle  
&  
thread



# Pothole seeding at Horsethief State Wildlife Area 2016





# Why do potholes help with cheatgrass?

Potholes:

- Trap seeds
- Bury seeds
- Force seeds to compete in wetter conditions
- reduce second generation seed production



# Future work

- build second potholer
- Try potholing after fire
- Seed dispersal work to investigate 2<sup>nd</sup> generation seed production hypothesis



# Acknowledgements

## *Funding:*


**Exxon Mobil Corp., WPX Energy, Encana Oil and Gas (USA) Inc., Shell Oil Company, Marathon Oil Corp.**

## *Access:*

**ConocoPhillips, BLM White River (Ed Hollowed, Lisa Belmonte), BLM Colorado River Valley**

**CPW: Jim Gammonley, Sandy Billings, JC Rivale, Ivan Archer, Derek Lovoi**

**CSU: Cynthia (Cini) Brown, Phil Chapman, Magda Garbowski**



***technicians:*** Ruth Bennett, Robert Wayne, Neil LaFleur, Katie Kain, Noelle Guernsey, John Giezentanner, Anna Mangan, Daniel Jarmolowicz, Chad Young, Alicia Lucero, Magda Garbowski, Nathan Hoover, Lauren Gallo, Eddie Richter, Mary Cole, Shelby Ruettiger, Collin Peterson, Katharine Lynch, Edward Trowbridge



The preceding presentation was delivered at the

# **2017 National Native Seed Conference**

Washington, D.C. February 13-16, 2017

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