Restoring Native Plants to Crested Wheatgrass Stands in Eastern Oregon

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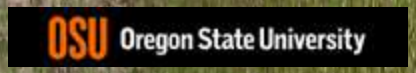


Crested Wheatgrass

- Introduced to North America in 1898
  - Used to
    - Stabilize soils
    - Livestock forage
    - Prevent weed invasion
    - Reduce wildfire hazard
- Occupies more than 5 million hectares in western U.S.

(Pellant and Lysne 2005)

Crested Wheatgrass Legacy

- Dominates seed bank and limits growth of native species
- Native species recruitment unlikely
- To re-establish diversity:
  - Suppression of crested wheatgrass plants and propagules
  - Deliberate introduction of desired species

(Marlette and Anderson 1986, Bakker et al. 1997, Cox and Anderson 2004, Henderson and Naeth 2005)

Benefits of Restoring Natives

- Improves resource capture and cycling
- Increases resilience and resistance to disturbance
- Improves wildlife habitat (esp. sagebrush obligate species)

(USDI USFWS 2001, Kinzig et al. 2002, USDI BLM 2005, USDA USFS 2008)

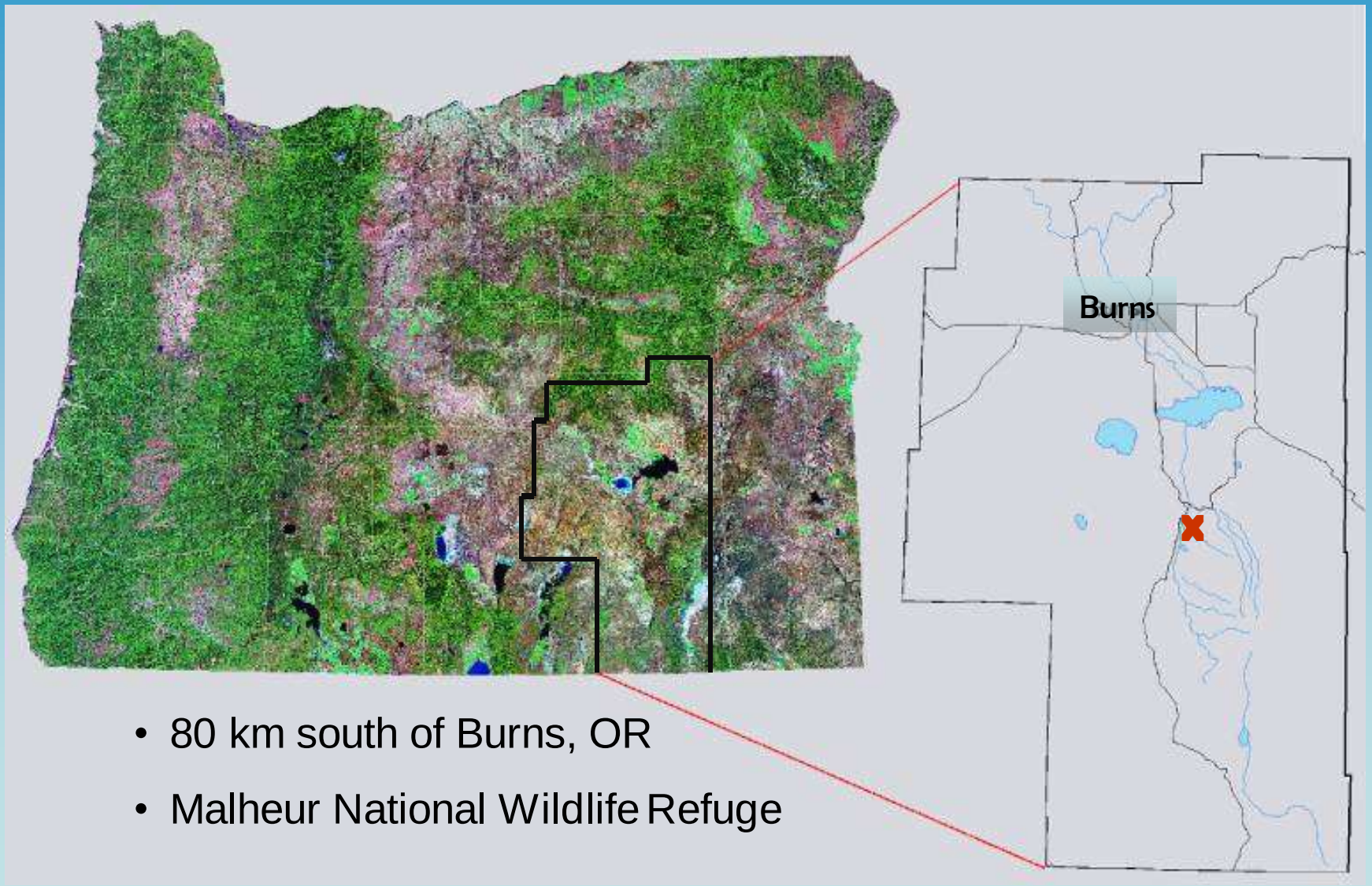
Objective

- Test various strategies for restoring native plant species to crested wheatgrass-dominated rangeland

Hypotheses

- Suppression treatments would decrease crested wheatgrass density and cover
- Suppression treatment and revegetation would interact to increase native species density

Study Site



- 80 km south of Burns, OR
- Malheur National Wildlife Refuge

- Seeded to crested wheatgrass in 1981 following wildfire

Crested Wheatgrass Suppression Treatments

- Mechanical
  - One pass with disk (1M)
  - Two passes with disk (2M)
- Herbicide (glyphosate)
  - Low rate (LH)
    - 0.25X recommended rate
  - High rate (HH)
    - 1.0X recommended rate
- Undisturbed (UD)

Revegetation Treatments

- Seeded
- Non-seeded

- Truax™ Rough Rider no-till drill
- Cool season and fluffy seed boxes
- 31 Oct. – 1 Nov. 2005 (Trial 1)
- 30-31 Oct. 2006 (Trial 2)

Native Seed Mix

- 4 grasses
  - bluebunch wheatgrass *(L)*
  - Sandberg's bluegrass *(S)*
  - Indian ricegrass *(L)*
  - Squirreltail *(L)*
- 3 forbs
  - western yarrow *(S)*
  - Lewis flax *(L)*
  - Munro globemallow *(L)*
- 3 shrubs
  - Wyoming big sagebrush *(S)*
  - four-wing saltbush *(L)*
  - white-stemmed rabbitbrush *(S)*

Experimental Design

- Randomized block, split-split-plot
- Whole-plot = suppression treatment (30m x 140m)
- Split-plot = seeding treatment (30m x 70m)
- Split-split-plot = year (2 trials)
- 5 replications

Sampling

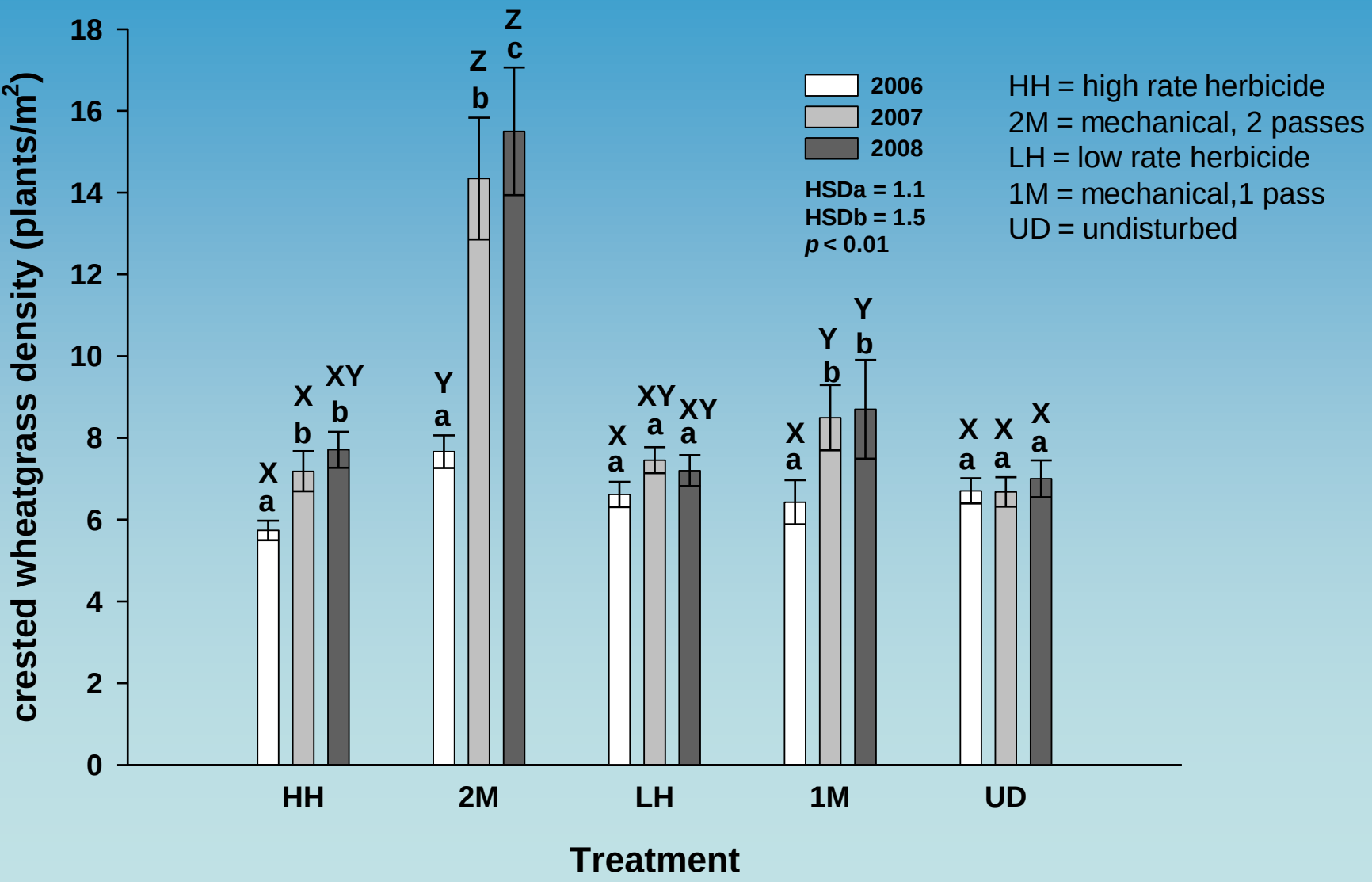
- Density and canopy cover
  - Crested wheatgrass
  - Other perennial species
  - Cheatgrass
- Density
  - Seeded species
- 50, 0.25m^2 frames/plot
- Trial 1
  - 2006-2008
- Trial 2
  - 2007-2008

Data Analysis

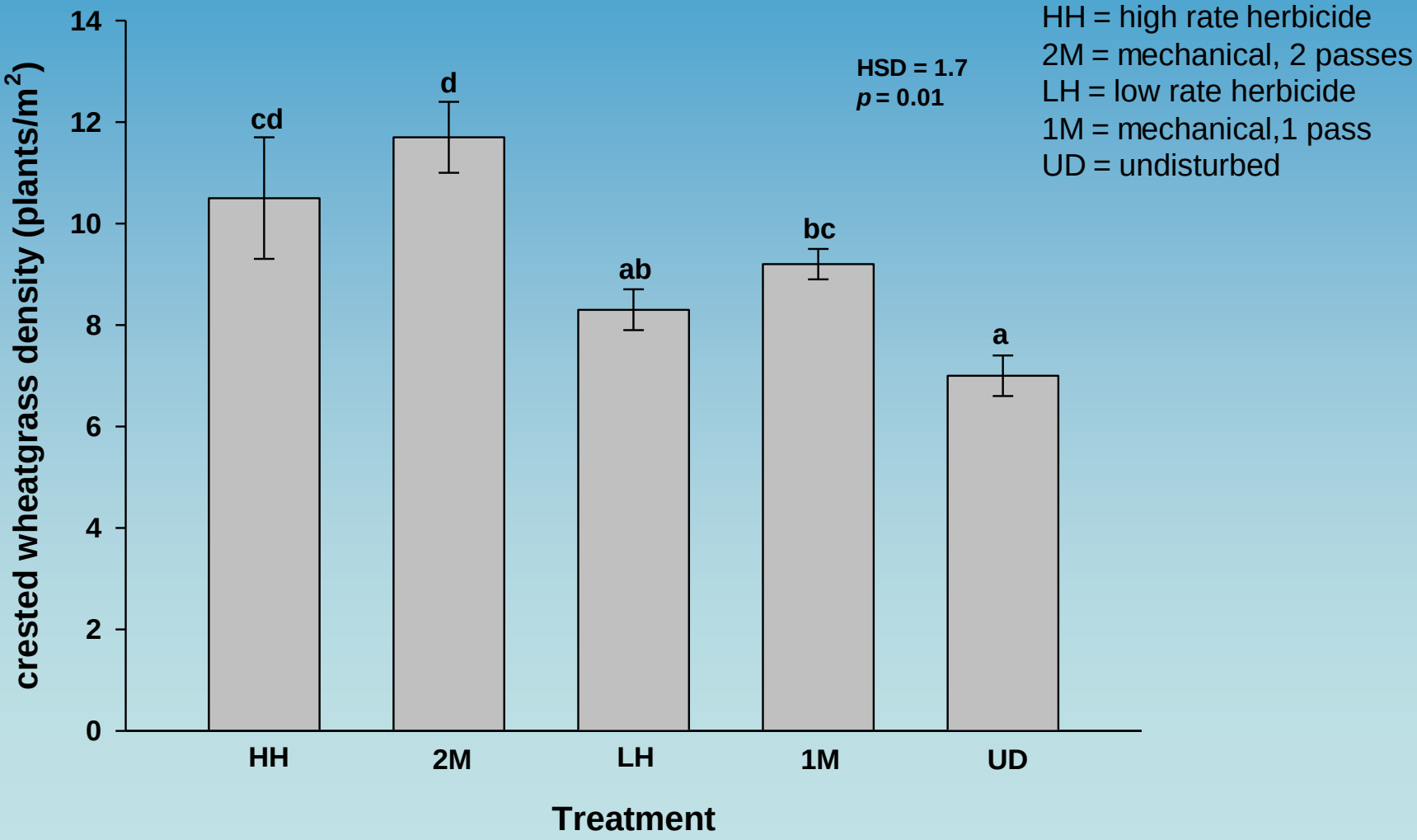
- Mixed effect split-split plot analysis
  - Fixed effects = suppression treatment, seeding treatment, year
  - Random effects = block
- Means separated using Tukey's Honestly Significant Difference (HSD)

(Ramsey and Schafer 2002)

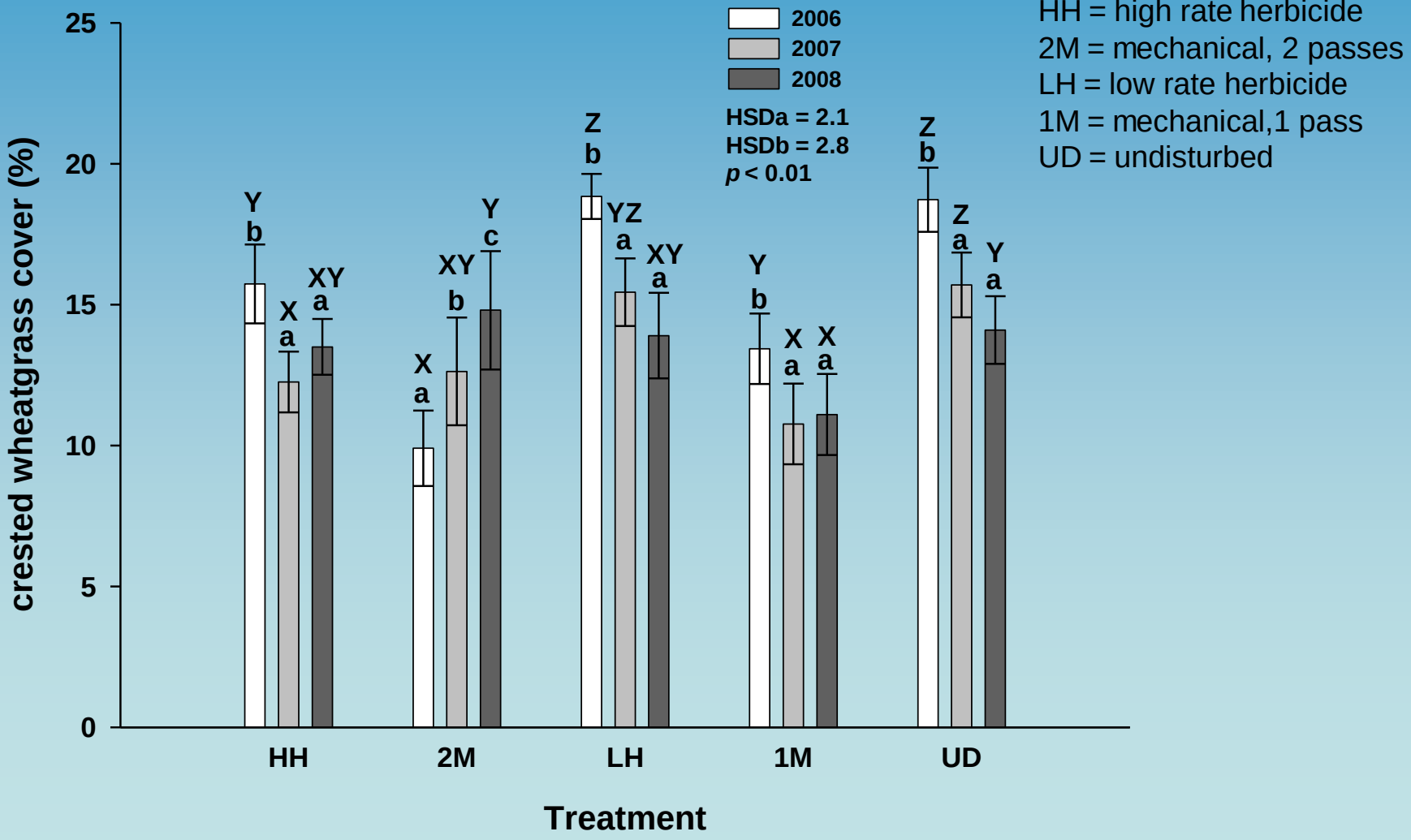
Treatment x Year Effect on Crested Wheatgrass Density -Trial 1



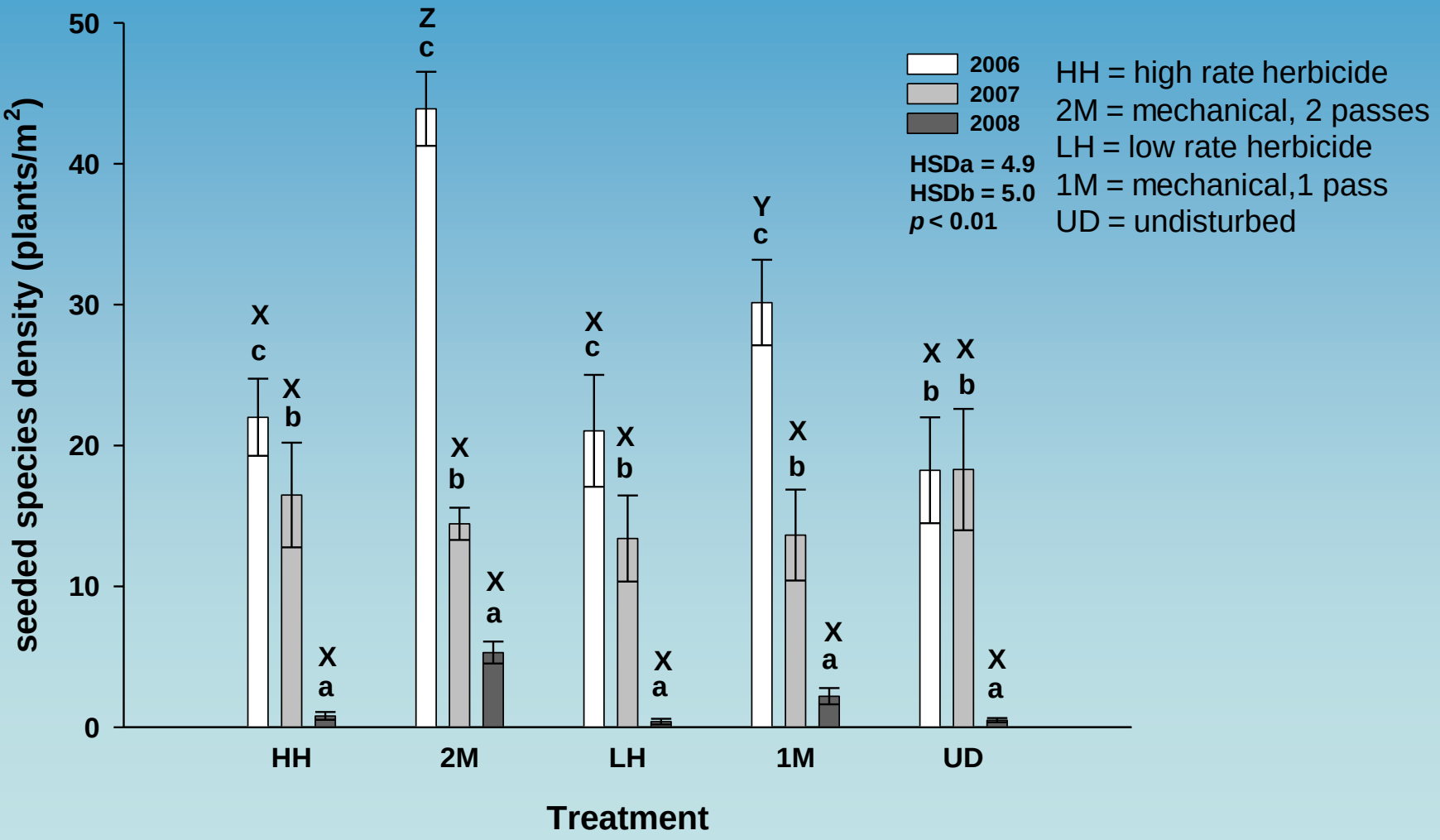
Treatment Effect on Crested Wheatgrass Density -Trial 2



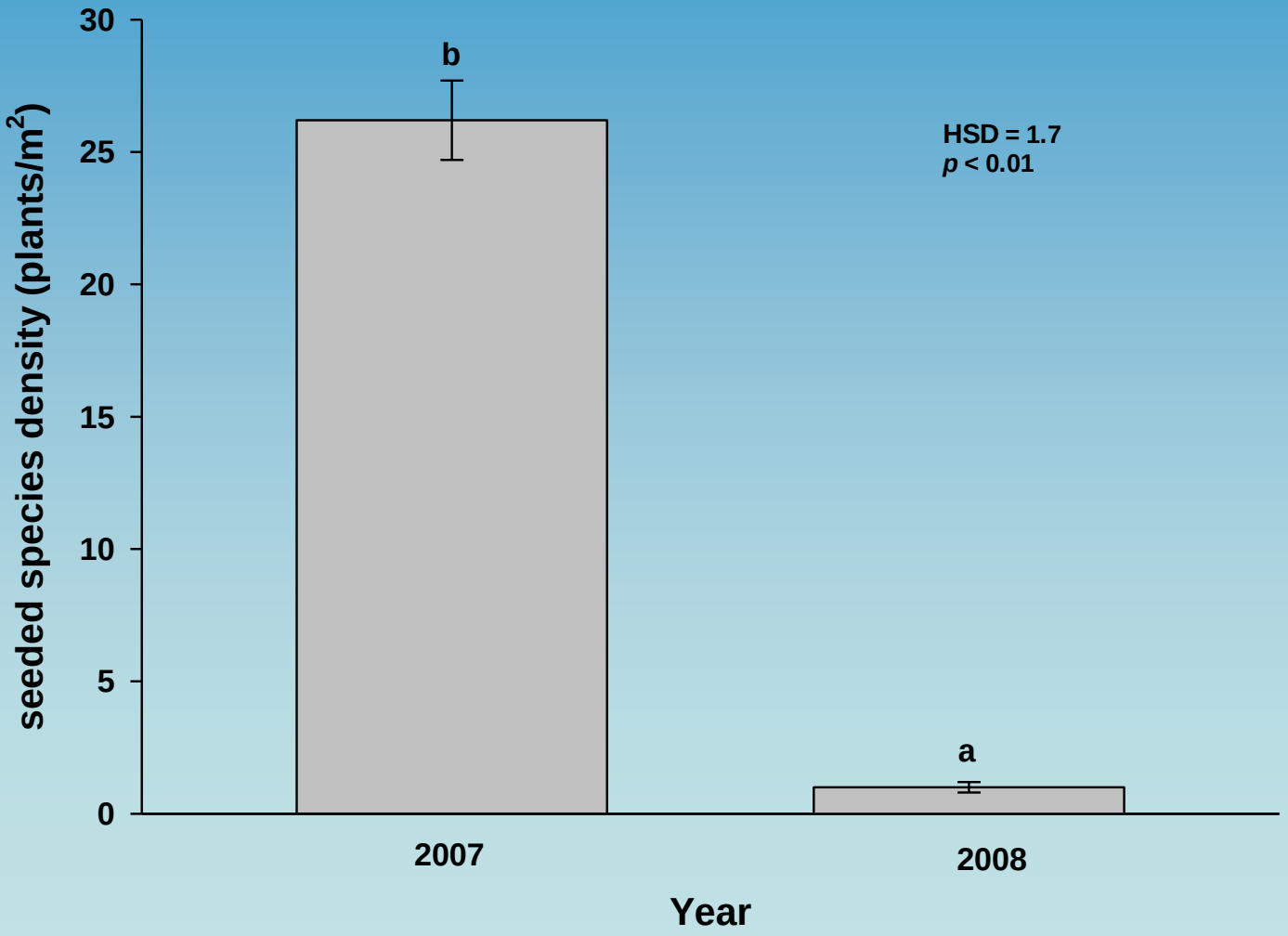
Treatment x Year Effect on Crested Wheatgrass Cover-Trial 1



Treatment x Year Effect on Seeded Species Density – Trial 1



Year Effect on Seeded Species Density – Trial 2



Conclusions—Eastern Oregon

- Suppression treatments not effective
- Mechanical suppression treatments increased crested wheatgrass
- Seeded species
  - High initial establishment in spite of poor suppression
  - Decreased over time

Implications

- Successive suppression treatments prior to seeding natives
- Subsequent management to favor persistence of native species

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Questions