

# **Invasive Annual Grasses: Cheatgrass, Japanese Brome, Ventenata, Medusahead**

**Jane Mangold**

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Montana State University, Bozeman, MT**

# Let's get started!

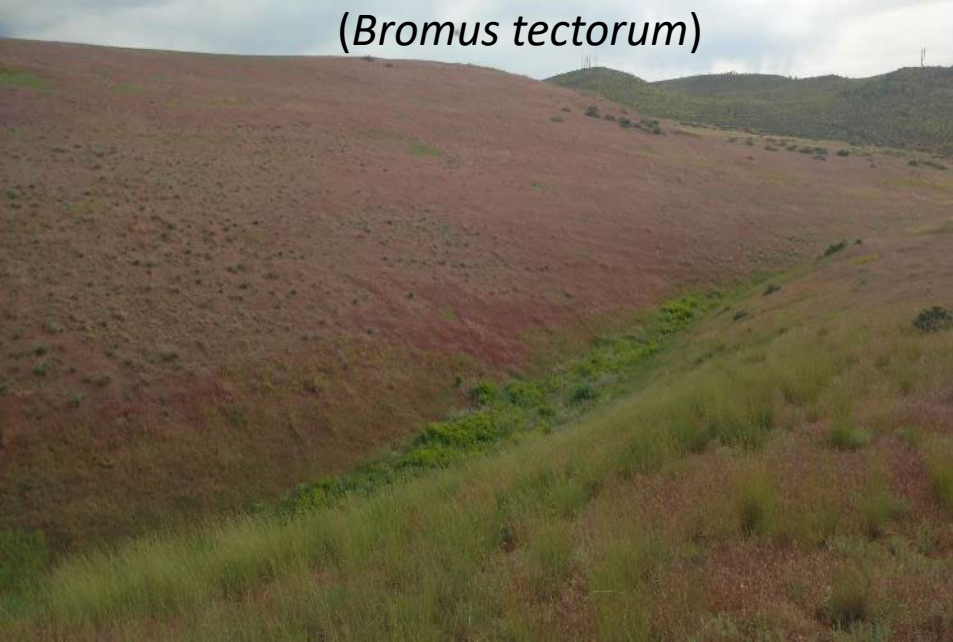
- Find someone sitting near you and share with them:
  - One thing you **already know** about invasive annual grasses
  - One thing you'd **like to know** by the end of the presentation

# Outline

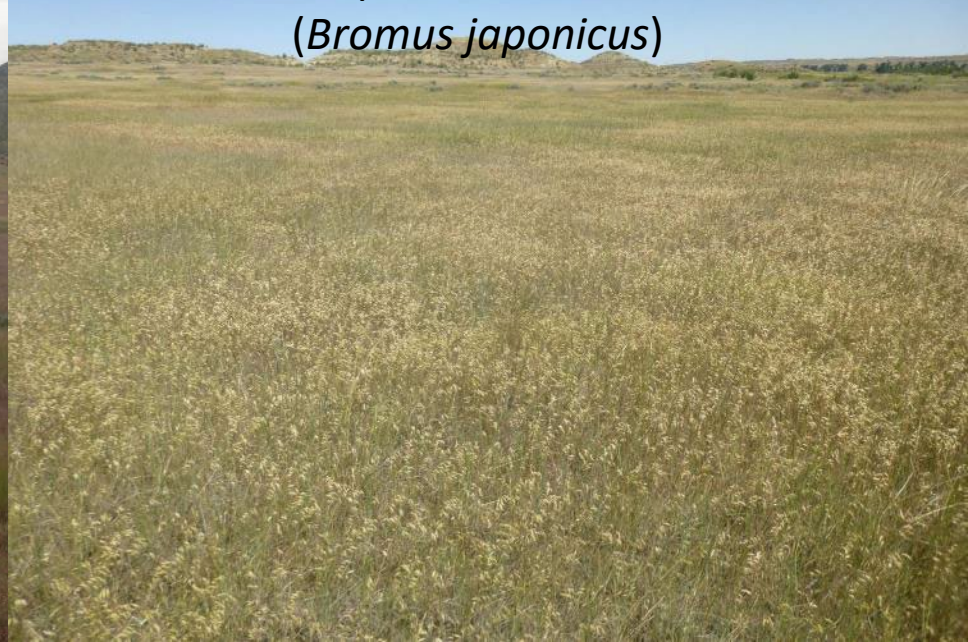
- History and distribution
- Identification
- Biology, ecology, impacts
- Management
  - Prevention
  - Chemical control
    - Imazapic
    - Indaziflam
    - Others
  - Other. . .



Cheatgrass, Downy brome  
(*Bromus tectorum*)



Japanese brome  
(*Bromus japonicus*)



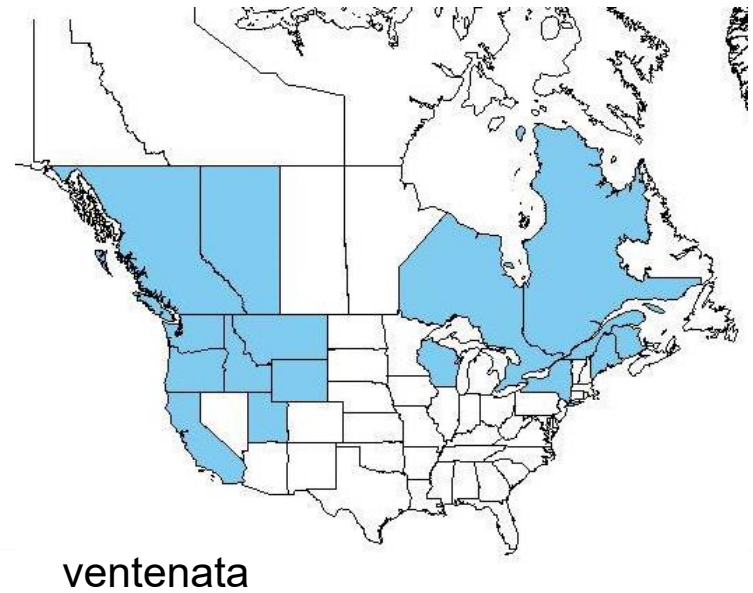
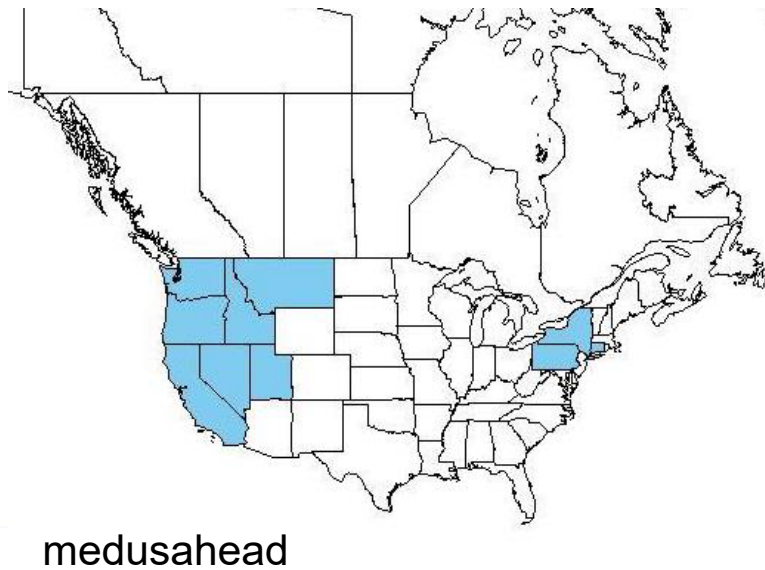
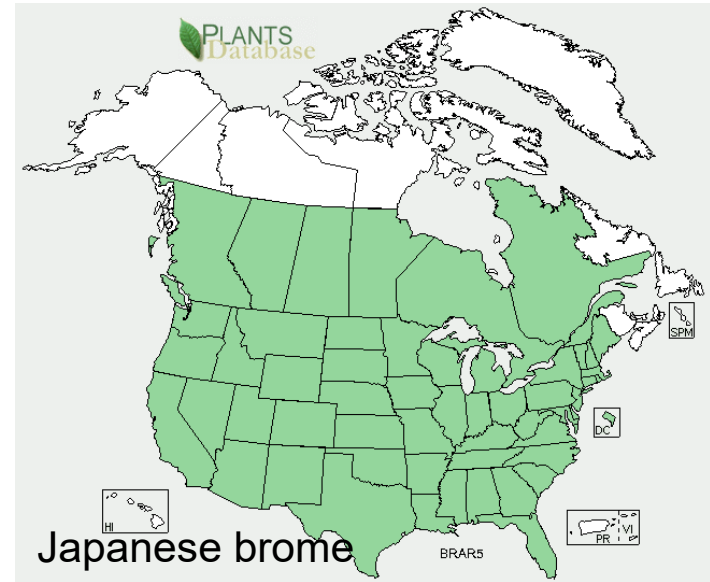
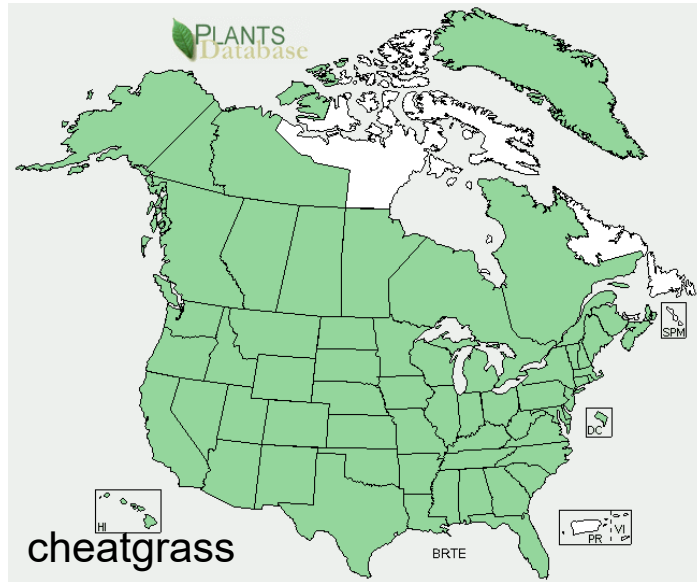
Medusahead  
(*Taeniatherum caput-medusae*)



Ventenata  
(*Ventenata dubia*)



# Continental Distribution



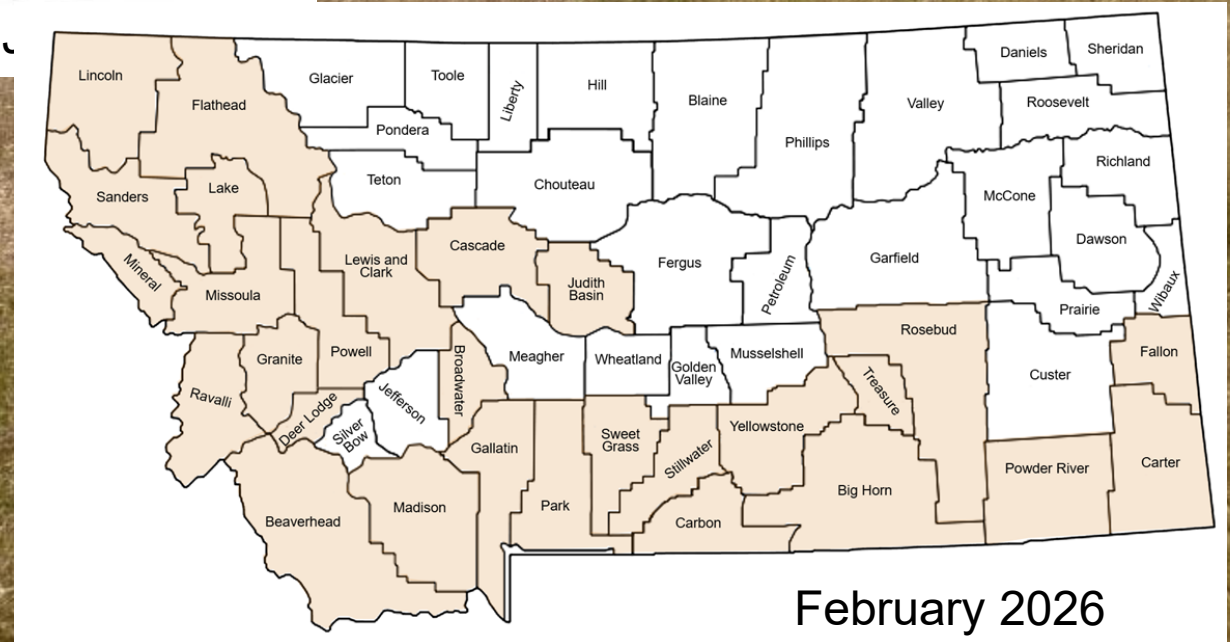
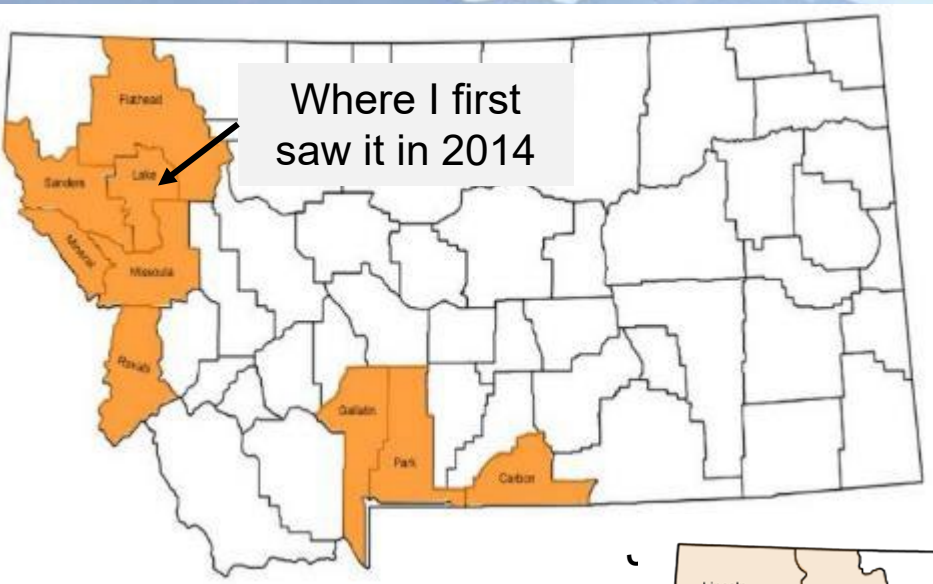
# Medusahead

- 1884 southwestern OR
- Problematic in eastern OR, southwestern ID, northern CA
- Found in Montana in 2013, 2019, 2022
  - **Lake, Missoula, Sanders (2013)—Several hundred acres**
  - Gallatin (2019)—Eradicated
  - **Lincoln (2022)—1.5 acre**
- Listed as noxious weed 2017

# Ventenata (wiregrass)

- First documented in 1952 in WA
- First documented in MT in early 1990s
- Problematic in ID, eastern WA and OR over last 15 years
  - 30% increase in cover, 50% increase in frequency on prairie systems (Ridder et al. 2022)
- Rapidly increasing, moving eastward
- Listed as noxious weed 2019

# Rapid Spread in Montana



February 2026

MSU Extension YouTube annual grass identification  
<https://www.youtube.com/watch?v=if2wKRfdWYY>

# IDENTIFICATION



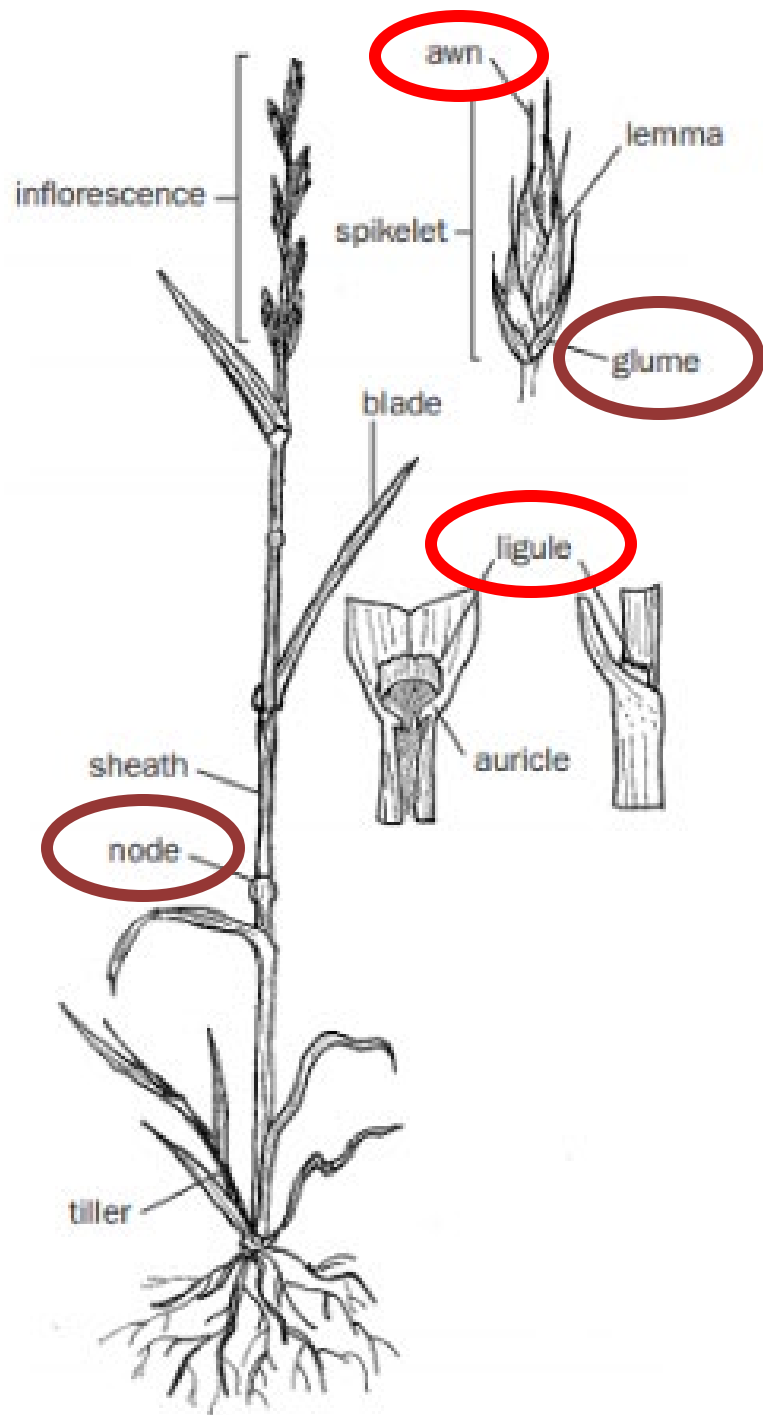
Invasive Grasses  
in Montana



Photo: University of Wyoming State University

# Grass

## Identification



Japanese brome

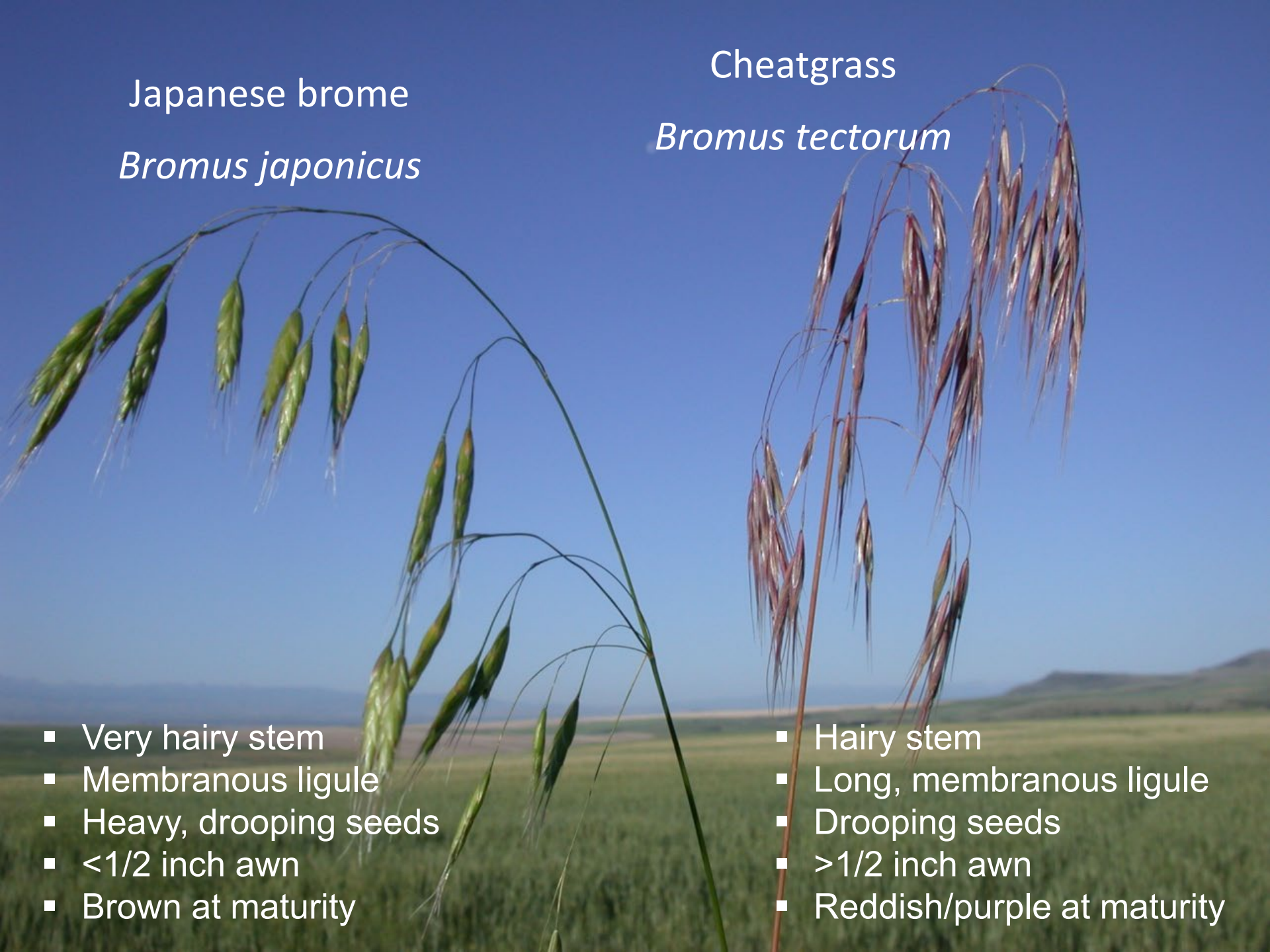
*Bromus japonicus*

Cheatgrass

*Bromus tectorum*

- Very hairy stem
- Membranous ligule
- Heavy, drooping seeds
- <1/2 inch awn
- Brown at maturity

- Hairy stem
- Long, membranous ligule
- Drooping seeds
- >1/2 inch awn
- Reddish/purple at maturity





Cheatgrass,  
downy brome



Japanese Brome

# Medusahead

- Long-awned spike
- 1-4" awns, twisted, stiff, minutely barbed
  - Long glumes too
- Shiny yellow-green



Steve Dewey, Utah State University



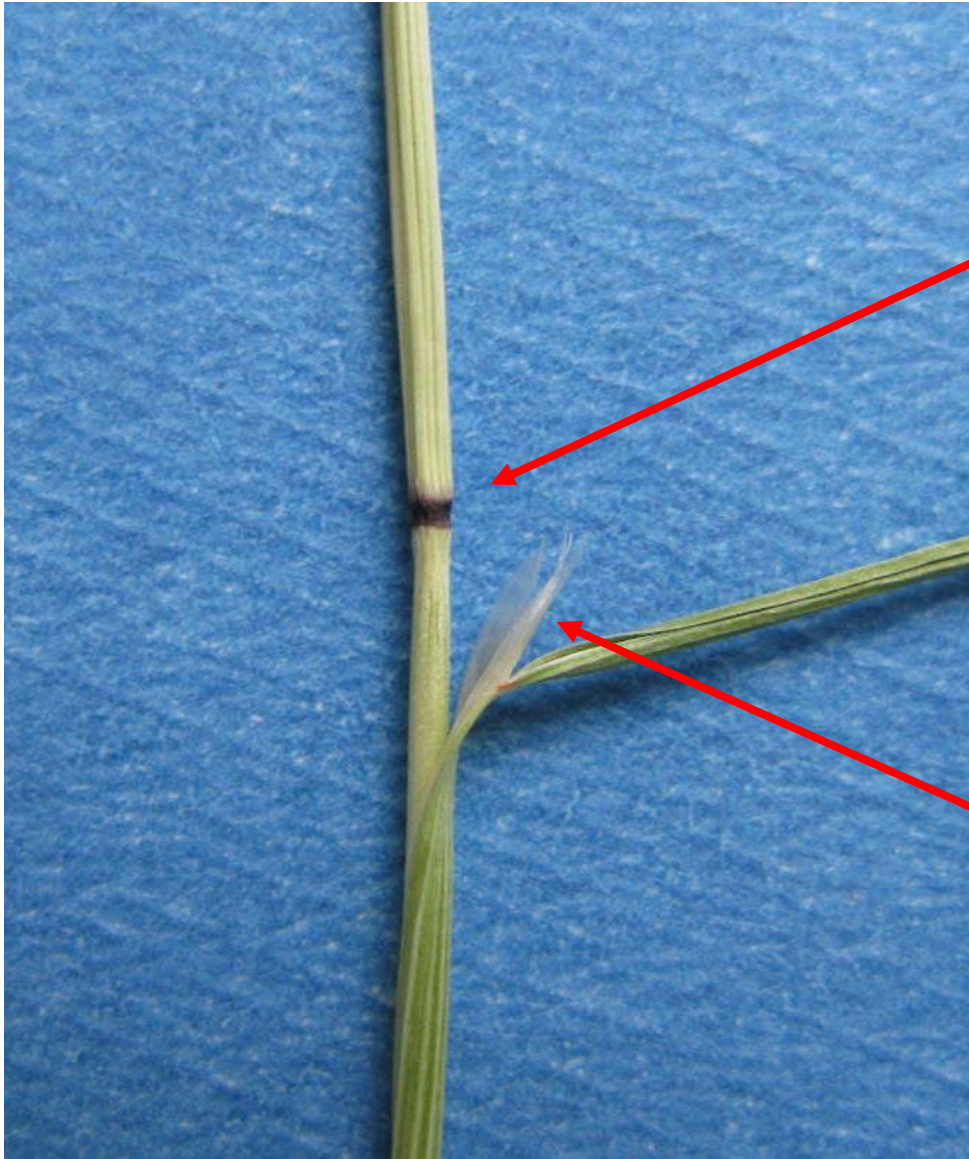
# Ventenata



# Seedlings



Seedling leaves are fine and nearly hairless  
(in contrast to cheatgrass)



Dark red/black nodes

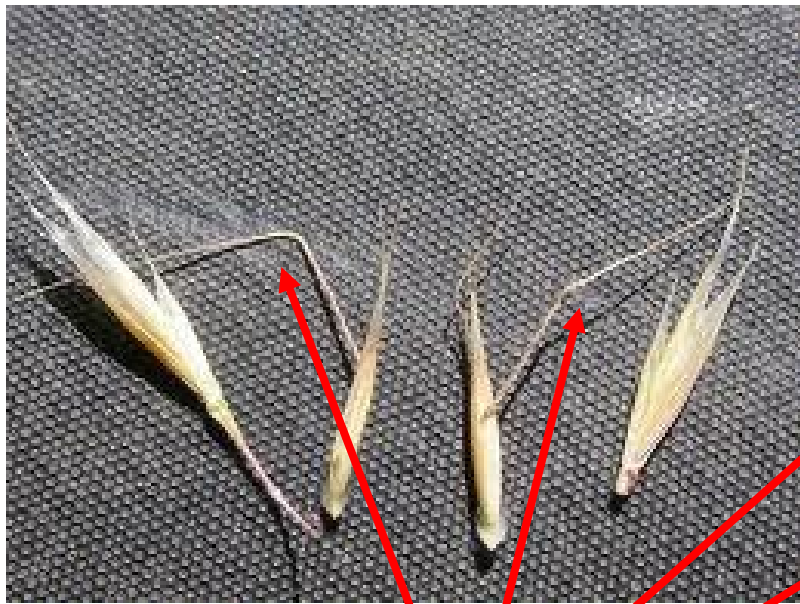
Unusually long ligule



# Open panicle



Inna Smith



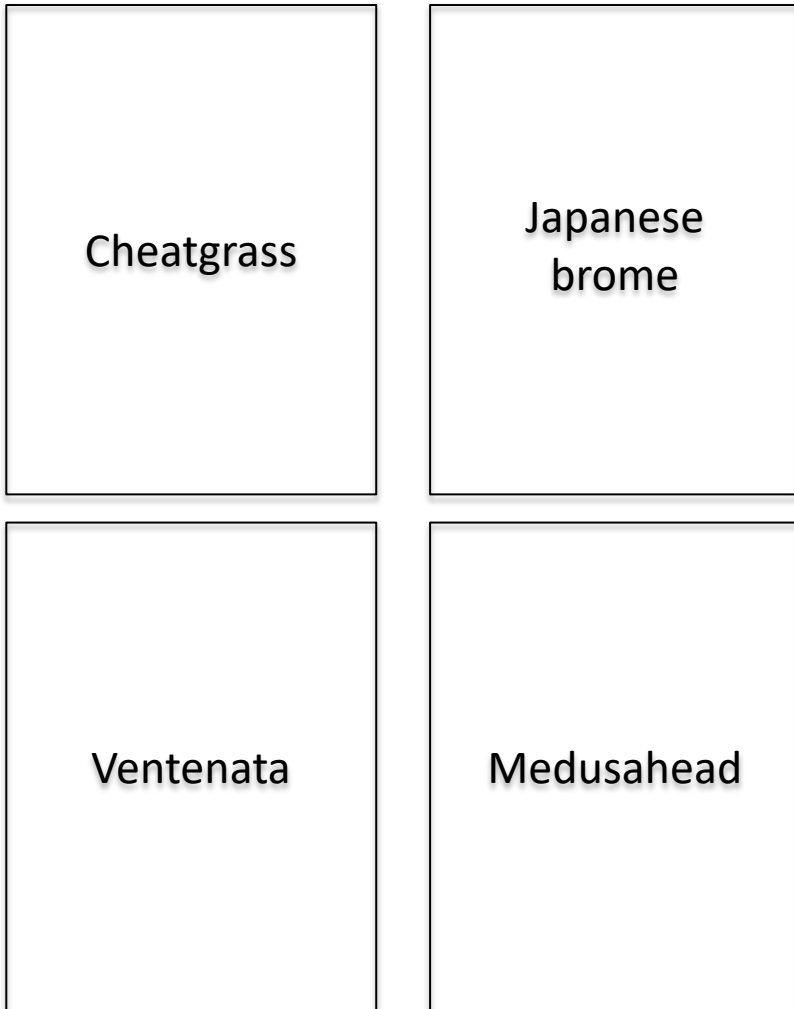
Bent awns



### Lower florets

- Staminate, infertile
- Straight awn
- Typically remain after fertile florets have detached

# Annual Grass I.D. Card Game



- Work in small groups
- Each group has a set of 20 cards:
  - 4 species cards
  - 16 feature cards
- Sort feature cards to match their correct species card (4 feature cards per species card)

# Outline

- History and distribution
- Identification
- **Biology, ecology, impacts**
- Management
  - Prevention
  - Chemical control
    - Imazapic
    - Indaziflam
    - Others
  - Other. . .



# **BIOLOGY, ECOLOGY, IMPACTS**

# Life Cycle “winter annuals”



mid- to late summer

Plants die after making seed



fall

winter to early spring



spring to  
early summer



# Seed Longevity

- Most seeds (85-95%) germinate in first year
- Small % may live up to 5 years



# Spread

Photo: Bob Demery, BIA



# Impacts

- Reduce forage for livestock and wildlife
  - Medusahead and ventenata unpalatable, ~9-12% silica content
- Displace native species, forming monocultures
- Litter accumulation
- Fire hazard

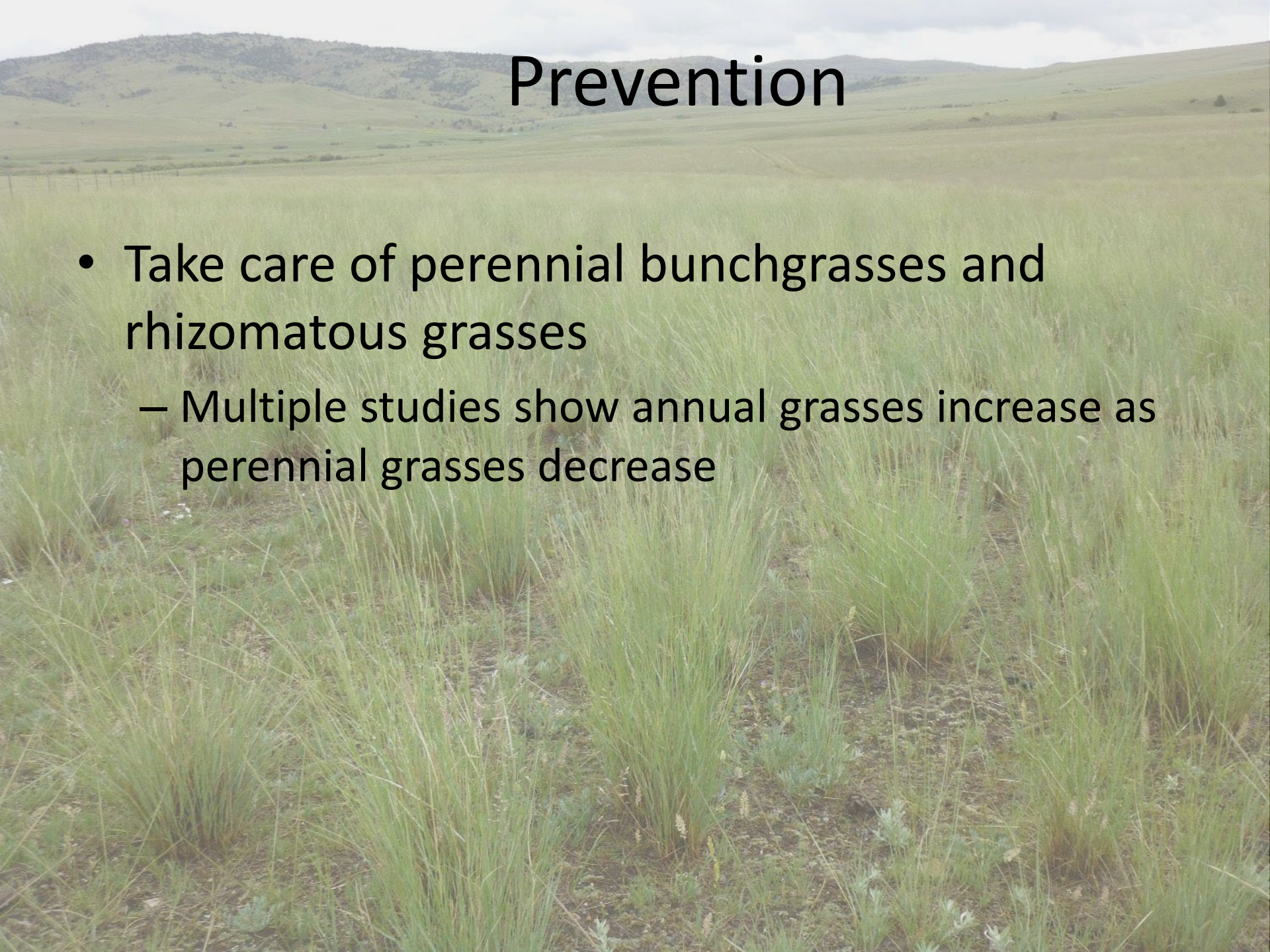
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- History and distribution
- Identification
- Biology and impacts
- **Management**
  - **Prevention**
  - **Chemical control**
    - **Imazapic**
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# Prevention

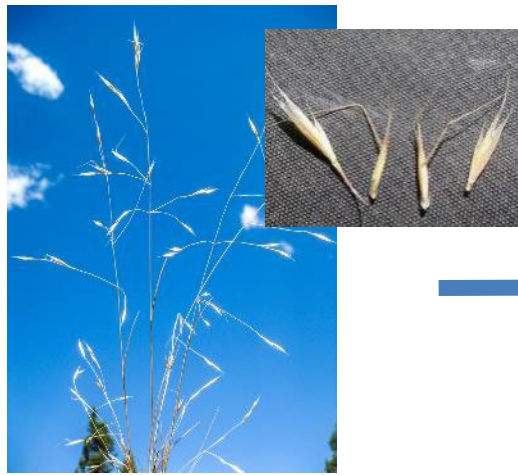
- Take care of perennial bunchgrasses and rhizomatous grasses
  - Multiple studies show annual grasses increase as perennial grasses decrease



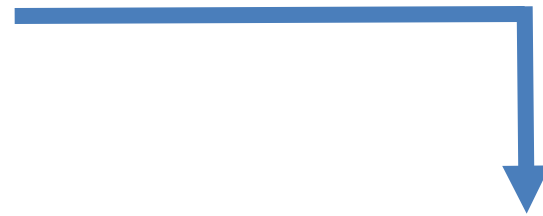
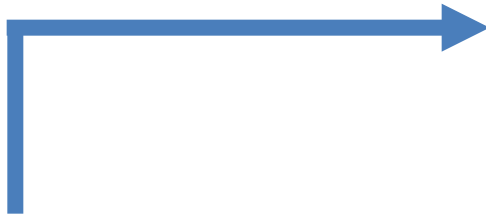
# Prevention

- Take care of perennial bunchgrasses and rhizomatous grasses
  - Multiple studies show annual grasses increase as perennial grasses decrease
- Grazing management, limit disturbance
- Stay clean
- Control annual grass patches while small

# Winter Annual



Keys to management:  
Stop seed production and  
deplete the seed bank.



# Chemical Control

## Currently Most Promising Option



Not treated (left, brown) and aerially treated (right, green)

Photo: Jaycie Arndt, IMAGINE, Univ. of WY

# Chemical Control—Range and Pasture

<i>Herbicide Active Ingredient</i> (e.g. Trade Name)	Application Timing
<i>Indaziflam</i> (Rejuvra)	Summer, <u>pre-germination</u>
<i>Imazapic</i> (Plateau, Panoramic SL)	Fall, pre- to post- emergent
<i>Rimsulfuron</i> (Matrix, Laramie)	Fall to early spring while desired perennial grasses are dormant
<i>Propoxycarbazone</i> (Canter R&P, Lambient)	Fall, post-emergent
<i>Sulfosulfuron</i> (Outrider)	Fall, post-emergent
<i>Glyphosate</i>	Spring, post-emergent

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<b><i>Glyphosate</i></b>	Spring, post-emergent

# Application timing guidelines



- Indaziflam provides pre-emergent control of seedlings by inhibiting normal root growth
- Imazapic and others are post-emergent herbicides
- Advantages and disadvantages to different herbicides

# Indaziflam

- Pre-emergent, non-selective
- Must be applied before seeds start *germinating*
  - Kills root as emerges from seed
- Limited impact to perennials
  - Roots below herbicide layer in soil
- 5 – 7 oz/A
- \$9-10/ounce, \$45-\$70/acre
- Multiple years of control



## Herbicide

Suspension Concentrate  
Preemergence Herbicide for the restoration and protection of Rangeland, Conservation Reserve Program (CRP) lands, Natural Areas e.g., Parks and Open Space, Wildlife Management Areas, Recreational Areas, Fire Rehabilitation Areas, Prairies and Fire Breaks and including any of these sites that are grazed or cut for grass hay.

ACTIVE INGREDIENT:  
Indaziflam (CAS No: 730979-19-8) ..... 19.05%  
OTHER INGREDIENTS: ..... 80.95%  
TOTAL: ..... 100.00%

EPA Reg. No. 101563-208 EPA Est. No.  
Contains 1.67 pounds of indaziflam per gallon

### KEEP OUT OF REACH OF CHILDREN CAUTION

For **MEDICAL** and **TRANSPORTATION** Emergencies **ONLY**  
Call 24 Hours a Day 1-800-424-9300  
For **PRODUCT USE** Information Call 1-800-331-2867

See Back Panel for First Aid Instructions and Booklet for Complete  
Precautionary Statements and Directions for Use

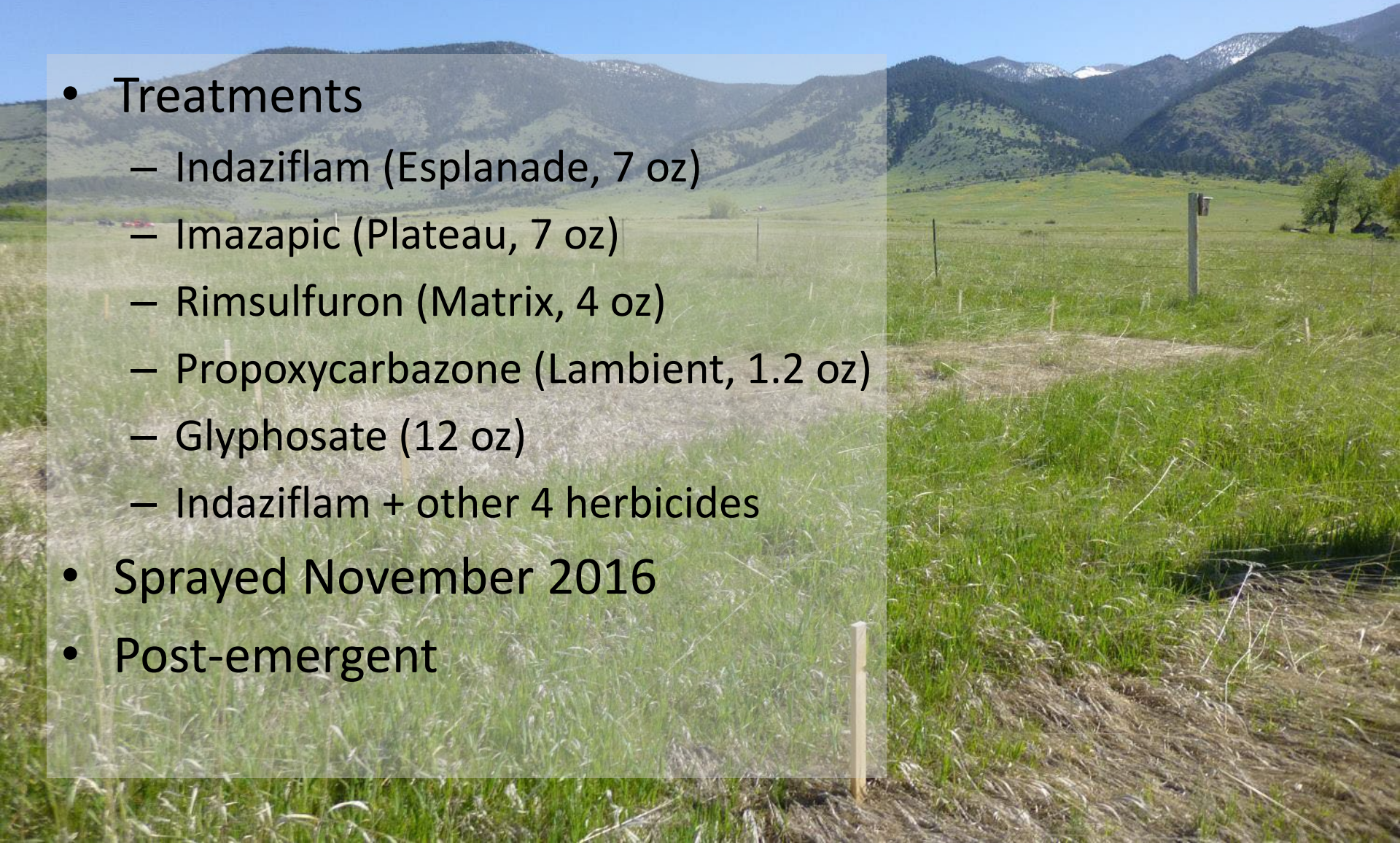
**86724774**  
86735512C 221216AV1  
Nonrefillable Container  
Net Contents  
**2.5 Gallons**

PRODUCED FOR  
Environmental Science U.S., LLC  
5000 CentreGreen Way, Suite 400  
Cary, NC 27513

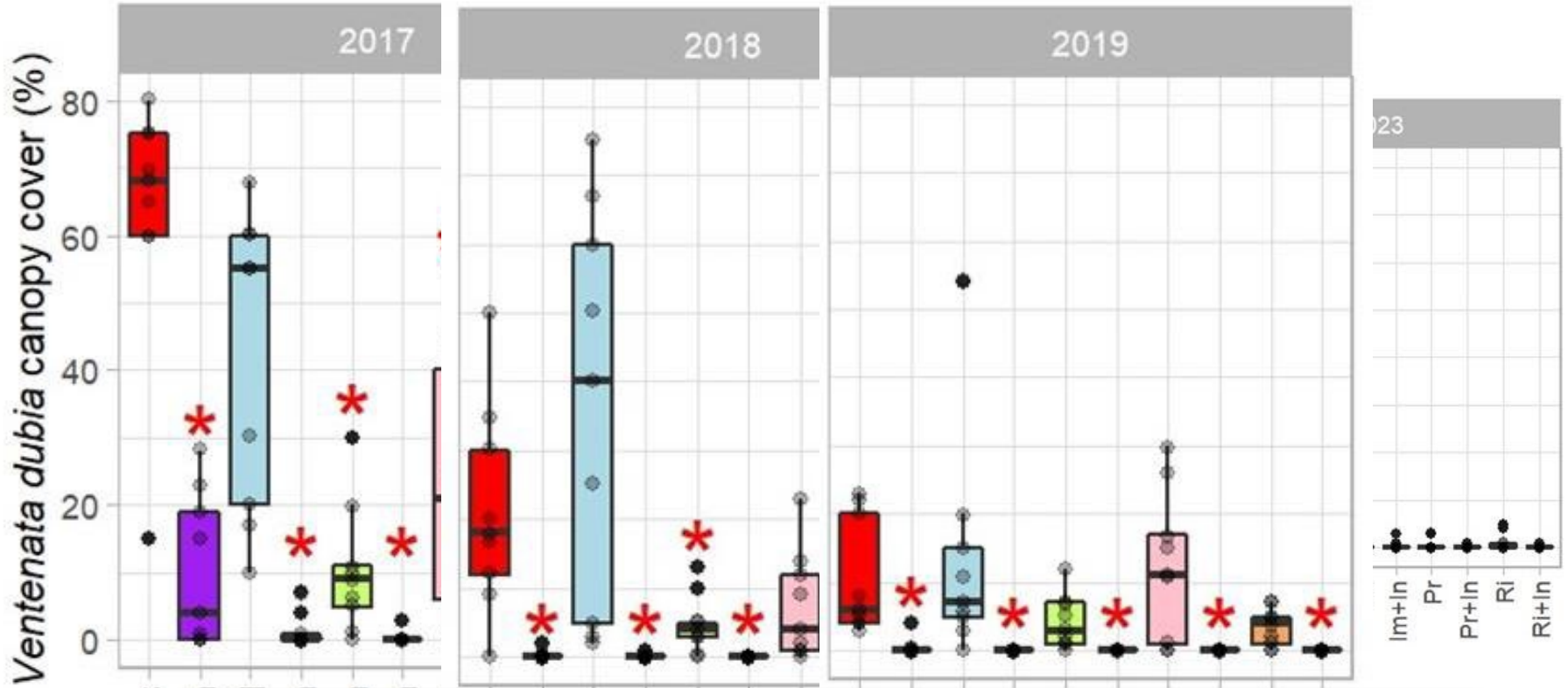


# Herbicide Trial—Ventenata

- Treatments
  - Indaziflam (Esplanade, 7 oz)
  - Imazapic (Plateau, 7 oz)
  - Rimsulfuron (Matrix, 4 oz)
  - Propoxycarbazone (Lambient, 1.2 oz)
  - Glyphosate (12 oz)
  - Indaziflam + other 4 herbicides
- Sprayed November 2016
- Post-emergent



# Ventenata Cover—2017-2019, 2023



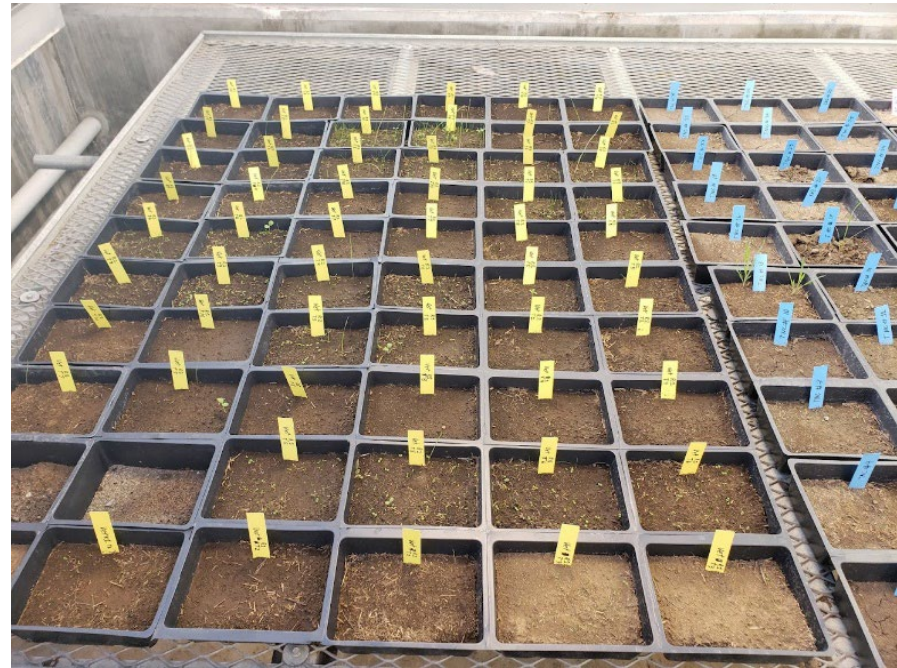
\* Difference  
 A single application of indaziflam controlled ventenata for 6 years.

# Seed Bank Study

## Are there any seeds left?

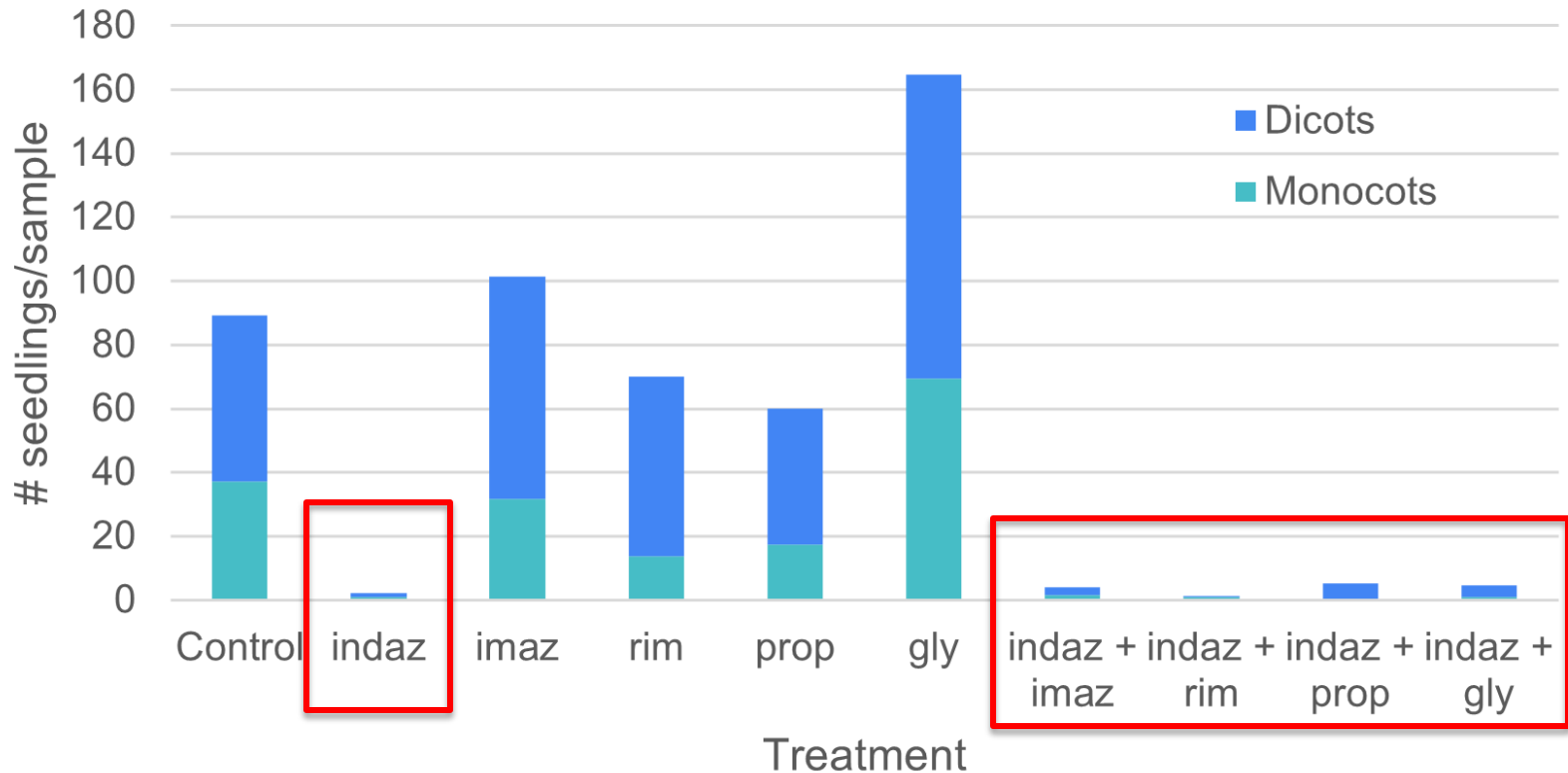


Collected seed bank samples August 2021



Grew in greenhouse fall/winter 2021

# Emerged Seedlings

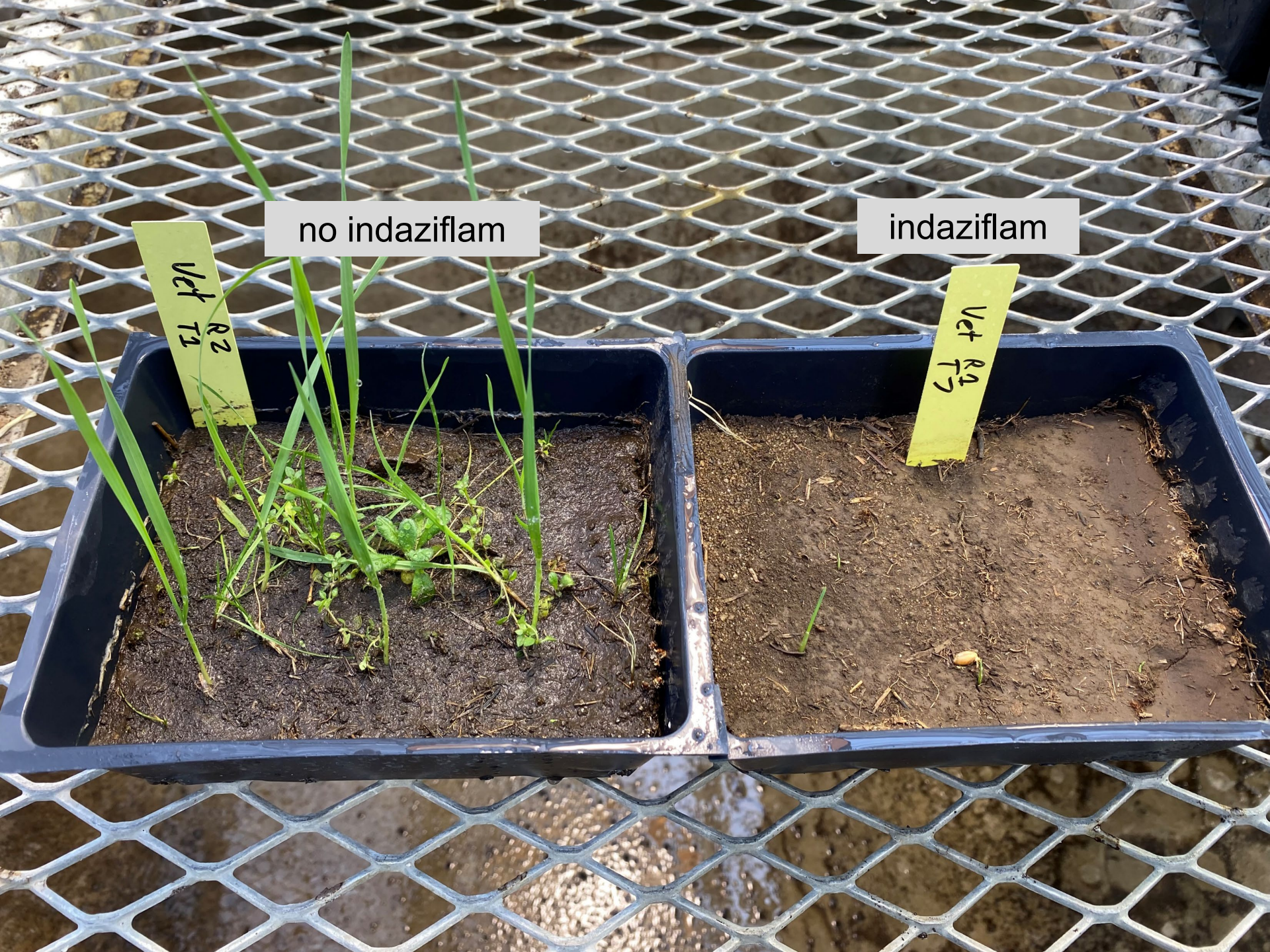


no indaziflam

Vet  
R2  
T2

indaziflam

Vet  
R2  
T2





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  - Roots below herbicide layer in soil
- 5 – 7 oz/A
- \$9-10/ounce, \$45-\$70/acre
- Multiple years of control
- **Delay seeding for at least 24 months and seed test strips first**

Too expensive  
or need to  
revegetate?

2.5 Gallons

envu

# Imazapic

- Post-emergent
- 6-12 oz/A
- \$1/ounce, \$6-\$12/acre
- 1 to 2 years control
- 6 oz/A at 1-2 leaf stage

SPECIMEN

Imazapic Group 2 Herbicide

## Plateau®

### Herbicide

For weed control, native grass establishment and turf growth suppression on pastures, rangeland and noncrop areas and conifer plantation site preparation


**Active Ingredient:**  
Ammonium salt of imazapic (+)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid\* ..... 23.6%

**Other Ingredients:** ..... 76.4%

**Total:** ..... 100.0%

\*Equivalent to 22.2% (+)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid (1 gallon contains 2.0 pounds of active ingredient as the free acid)

EPA Reg. No. 241-365 EPA Est. No.

 **IMAZAPIC GROUP 2 HERBICIDE**

## PANORAMIC® 2SL

### HERBICIDE

For use on Conservation Reserve Program (CRP) land, paved surfaces, pasture and rangeland.

<b>ACTIVE INGREDIENT:</b>	<b>% BY WT.</b>
Ammonium salt of imazapic (+/-)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid* ..... 23.3%	
<b>OTHER INGREDIENTS:</b> .....	76.7%
<b>TOTAL:</b> .....	100.0%

\*Equivalent to 21.9%(+/-)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid (1 gallon contains 2.0 pounds of active ingredient as the free acid)

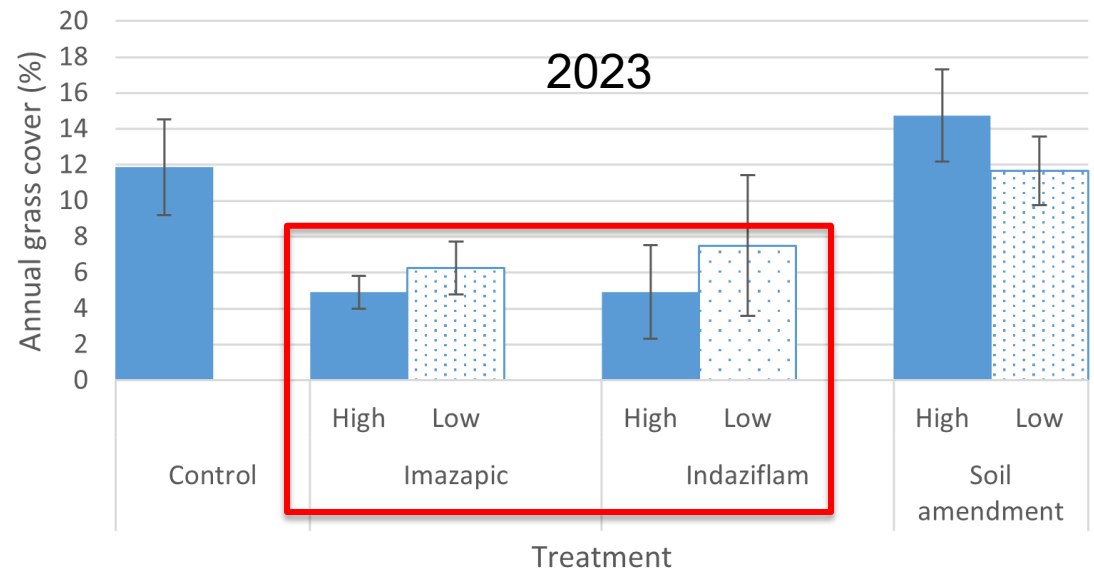
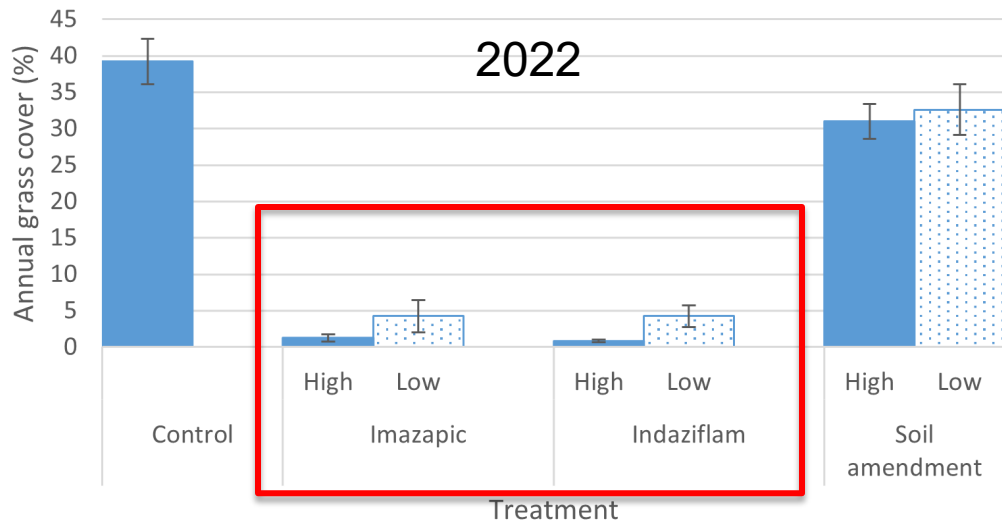
EPA Reg. No. 66222-141-81927 EPA Est. No. 81927-AL-001

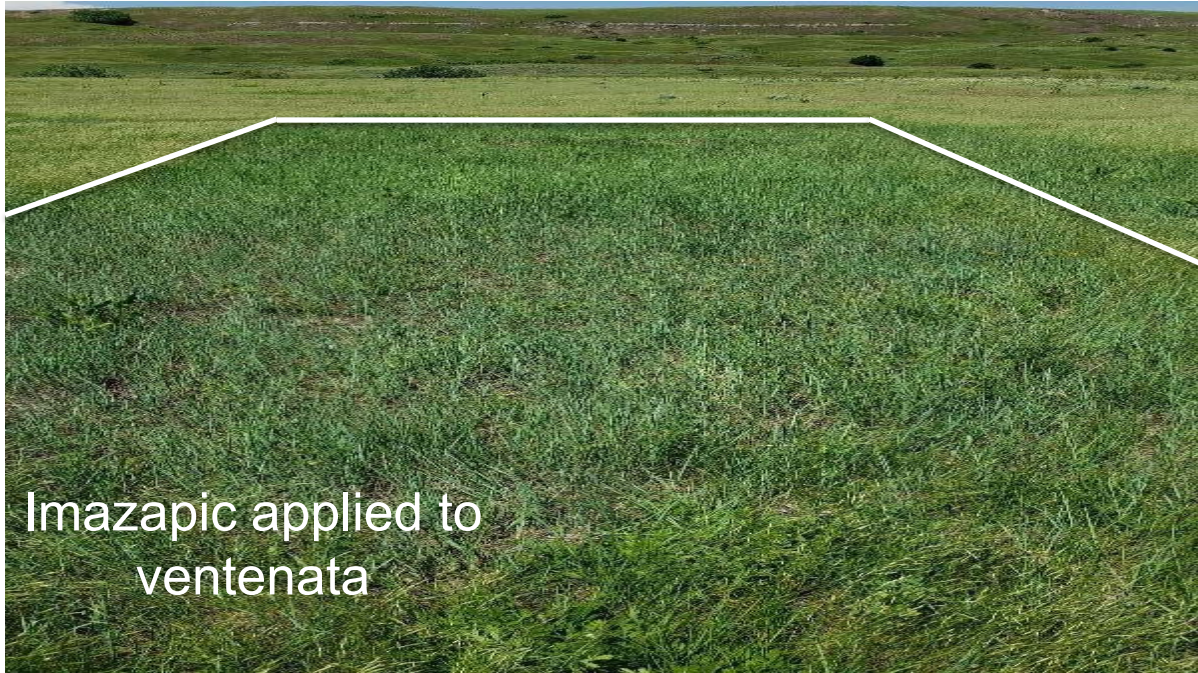
FIRST AID
<b>IF IN EYES:</b> Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
<b>IF INHALED:</b> Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.
<b>IF ON SKIN OR CLOTHING:</b> Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice.
<b>IF SWALLOWED:</b> Call a poison control center or doctor immediately for

# Another Study, Southeastern Montana

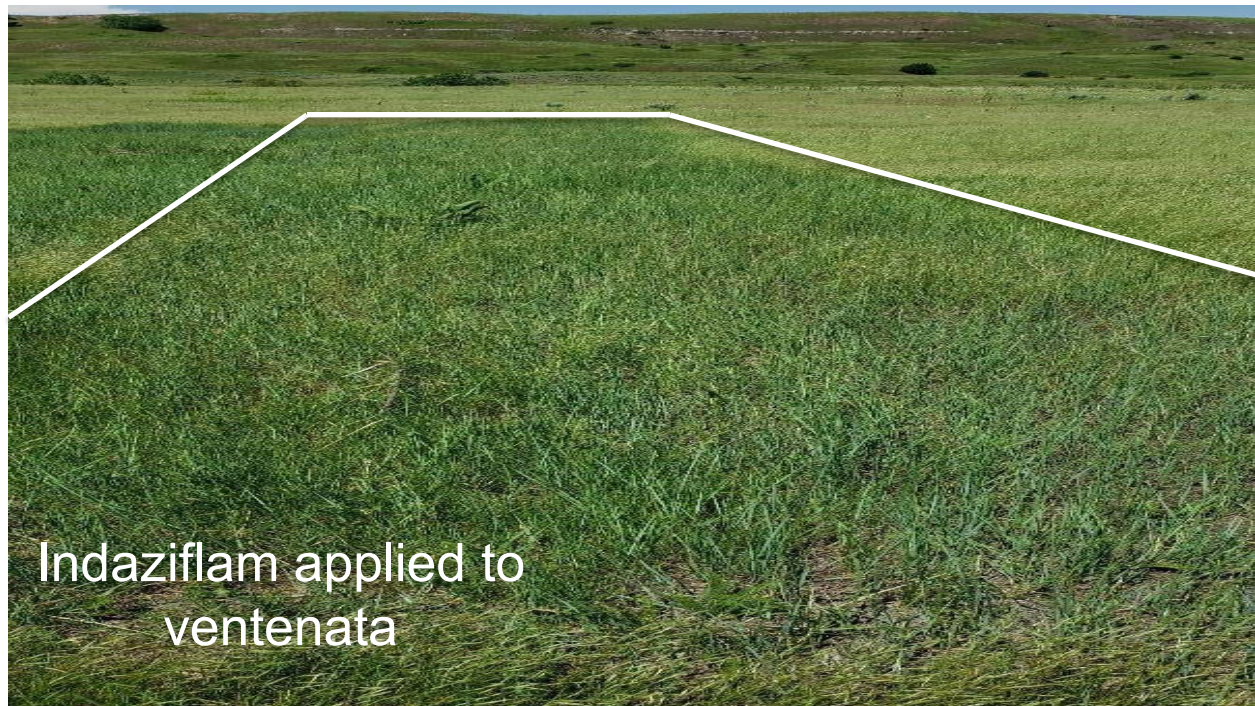
- 4 sites
- 2 herbicides, 2 water carrier rates
  - Indaziflam (Rejuvra<sup>®</sup> at 5 oz/A)
  - Imazapic (Plateau<sup>®</sup> at 6 oz/A)
  - 5 gal/A, 15 gal/A
- 1 soil amendment, 2 application rates
  - NutraFix<sup>™</sup>
  - 167 lb/A, 275 lb/A
- Treated late summer, early fall 2021
- Sampled 2022 and 2023

# Site 1: Medium to high ventenata cover





Imazapic applied to  
ventenata



Indaziflam applied to  
ventenata

Southeastern  
Montana

# Targeting Cheatgrass with Glyphosate

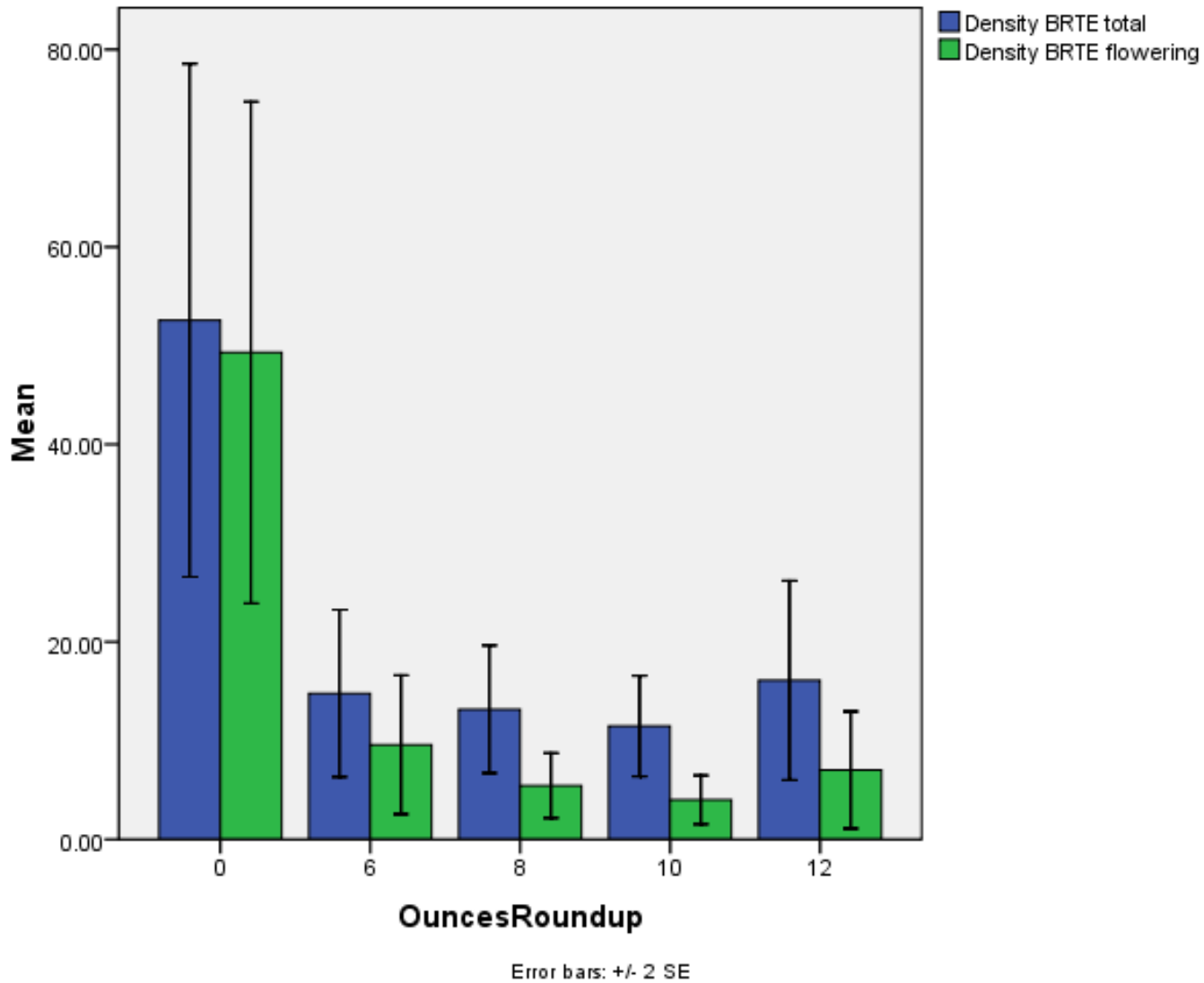
Photo taken in mid-June

Sprayed on May 11, 2009

Non-sprayed control

- 3 sites (southwestern Montana)
- Sprayed at 6, 8, 10, or 12 oz. Roundup/A
- Sampled June 16-18, 2009

# Targeting Cheatgrass with Glyphosate



Spra

- 3 sites (
- Sprayed
- Sampled June 10, 15, 2000

# Outline

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    - Imazapic
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    - Other
  - **Other. . .**



# Targeted Grazing



# Targeted Grazing

A close-up photograph of a white sheep's head and shoulders. The sheep is looking slightly to the right. It has a red ear tag in its right ear. The sheep is behind a wire fence, and the background is a field of tall, dry grass under bright sunlight.

- Good option for cheatgrass and Japanese brome
  - Spring—2 to 3 grazings, 2-3 years in a row
  - Fall/winter—reduce litter, reduce fine fuels
- Not promising for medusahead and ventenata, likely due to silica

# Prescribed Fire

- Not typically effective
- Timing is difficult
  - Seeds on plants killed by fire
  - Seeds on soil surface survive
- Litter reduction
  - Improve contact between herbicide and plants
  - Integrated with revegetation
- Positive feedback between cheatgrass and fire in Great Basin of U.S.



# Take Home Messages

- Don't dismiss annual grasses
- Learn to identify
- Stay clean
- Manage patches while small
  - Herbicides
    - Glyphosate
    - Indaziflam
    - Rimsulfuron
    - Imazapic
- Take care of perennial grasses





**Thank you! Questions?**  
**Jane Mangold—(406) 994-5513**  
**[jane.mangold@montana.edu](mailto:jane.mangold@montana.edu)**  
**[msuinvasiveplants.org](http://msuinvasiveplants.org)**