

# Improving Roadside Restoration Through Site Specific and Adaptive Management



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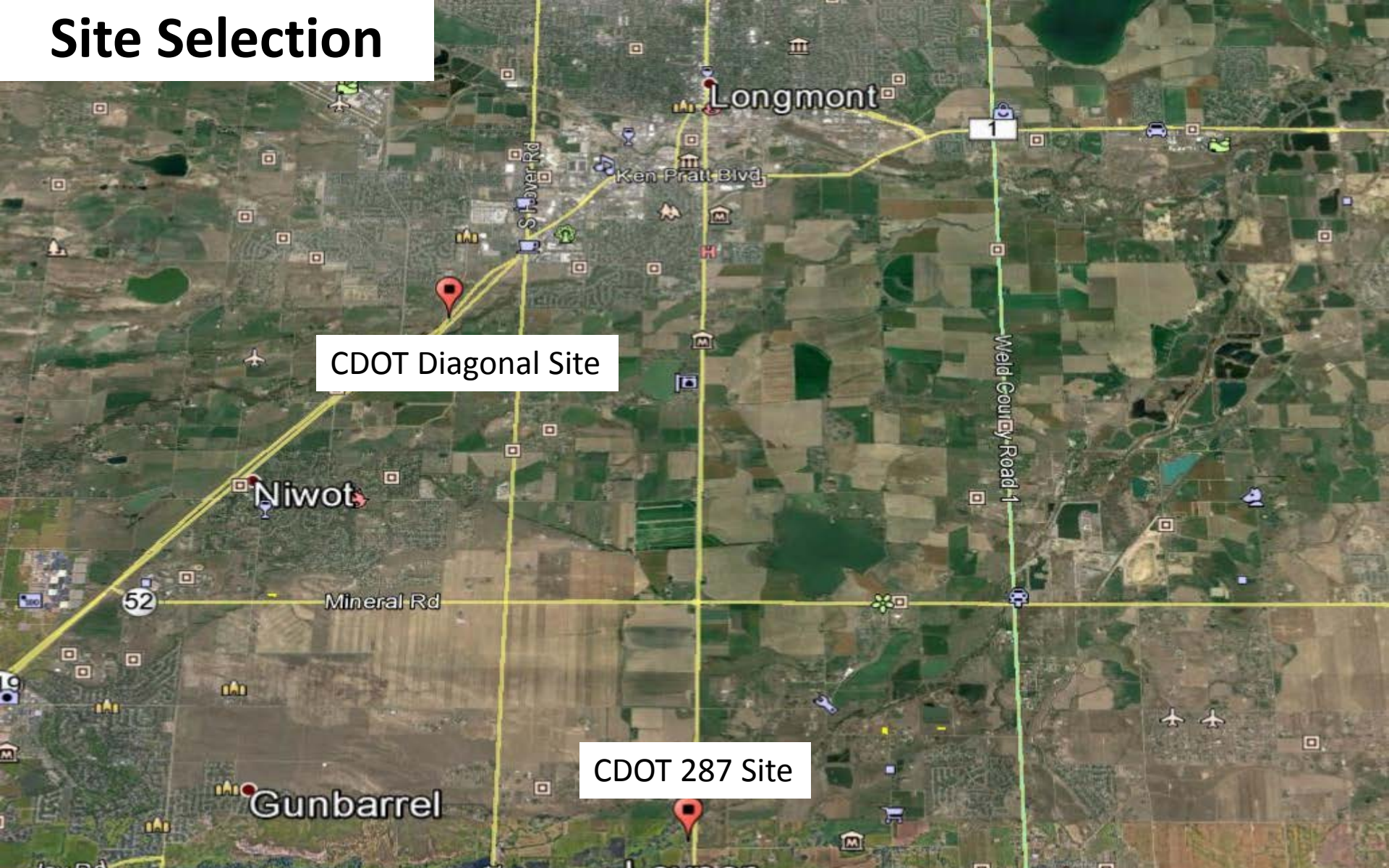


**Colorado State University**

# What is Adaptive Management?

- Documenting the weed and desirable plant community
- Determining the most selective management strategy
- Making the proper application, timing and rate
- Evaluate herbicide performance
- Consider follow-up treatments, could be second herbicide application, mowing, grazing, bio-control release
- Monitor, monitor, monitor
- Pre and post application photo points

# Site Selection



CDOT Diagonal Site

CDOT 287 Site

# Site Selection



CDOT 287 Site

# CDOT Study Site 1 (Diagonal)

Downy Brome, Field Bindweed, Marestalk, Prickly Lettuce, Perennial Grass



# Herbicide Selection

- Weeds requiring special consideration
  - Bindweed (controlled by only few herbicides)
  - Downy brome (residual herbicides with grass activity)
  - Russian knapweed, biennial and perennial thistles
  - KOCHIA
- Set-up treatments or using non-selective herbicide in a selective manner
- Encouraging perennial plant communities by using herbicides that impact annual weeds.

# The Basics?

- **Protect your investment**
  - You can do everything right and still fail.
  - Seedling grasses cannot compete with annual weeds.
  - You should try to provide at least one year without weed competition.
  - Kochia and Russian thistle will **EAT YOUR LUNCH.**
  - Most restoration projects fail due to weed competition.

# Kochia (*Kochia scoparia*)

- Introduced from Europe as an ornamental
- Increasing resistance problems (Heap, 2014)
- Single plant from 25,000 to 50,000 seeds
- Tolerance to temperature, drought, pH, and salt
- Problem in Crop and Non-crop areas







Photosystem II  
"Atrazine"

"ALS Inhibitor"  
Escort, Telar

PGR "Vista, Dicamba"

# Why is kochia such a problematic weed?

**Germinates at Moisture  
Levels Below Herbicide  
Activation**

# The Basics?

- If you walk away too soon you will fail.
- You need a long term, monitoring and maintenance program.
- An intervention 3 or 4 years down the road could save an entire restoration project.

# Secondary Invaders



**Perennial  
pepperweed**



**Russian  
knapweed**



**Downy brome  
(cheatgrass)**



**Whitetop**



**Canada thistle**



**Kochia**

# Russian Knapweed and Perennial Pepperweed invasion After fire



# Two Application Timings

- May 2015 (Spring/Summer)
- October 2015 (Fall/Winter)

Trt	Timing		Linear Mile Chemical Costs Only
1	S	Perspective + Plateau + Accord XRTII + Vista + 2,4-D	\$145
2	F	Perspective + Plateau + Accord XRTII	\$97
3	S	Tordon + Plateau + Accord XRTII + Vista + 2,4-D	\$116
4	F	Tordon + Plateau + Accord XRTII	\$68
5	S	Tordon + Milestone + Escort + Accord XRTII	\$55
• In year 2 (spring 2016), 2/3 of each treatment was sprayed with Vista XRT to protect seedlings during the establishment year.			\$30

Photo June 2015

# Two Application Timings

- May 2015 (Spring/Summer)
- October 2015 (Fall/Winter)



# Revegetation After Herbicide Applications (Dec. 2015)

Green Needlegrass, Western Wheatgrass, Slender Wheatgrass, Sand Dropseed, Prairie Wildflower Mix







Photo August 2016







**No Re-treatment**

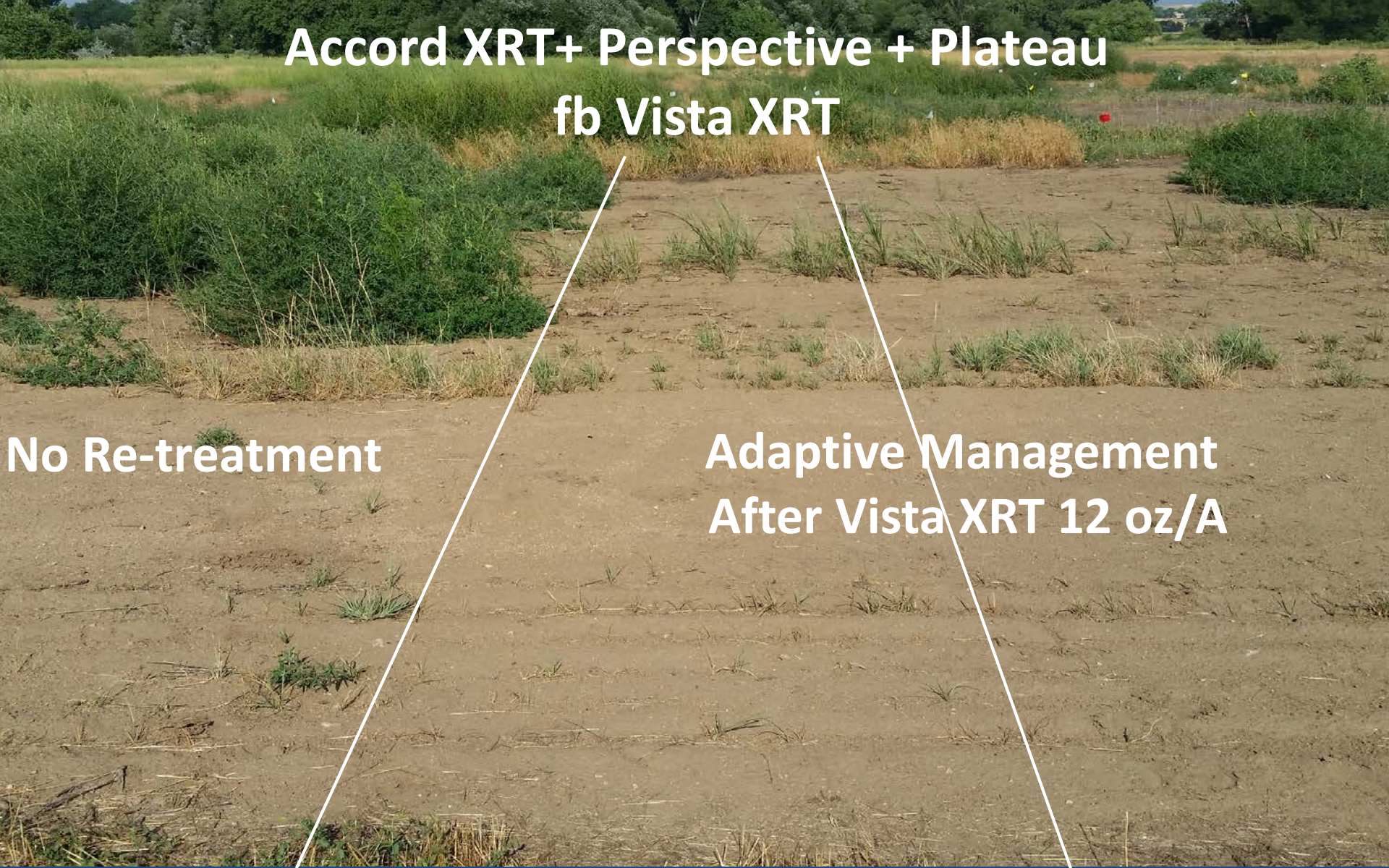
**Adaptive Management  
Before Vista XRT 12 oz/A**



**Accord XRT+ Perspective + Plateau  
fb Vista XRT**

**No Re-treatment**

**Adaptive Management  
After Vista XRT 12 oz/A**



**Accord XRT+ Perspective + Plateau**

**fb Vista XRT**

**No Re-treatment**

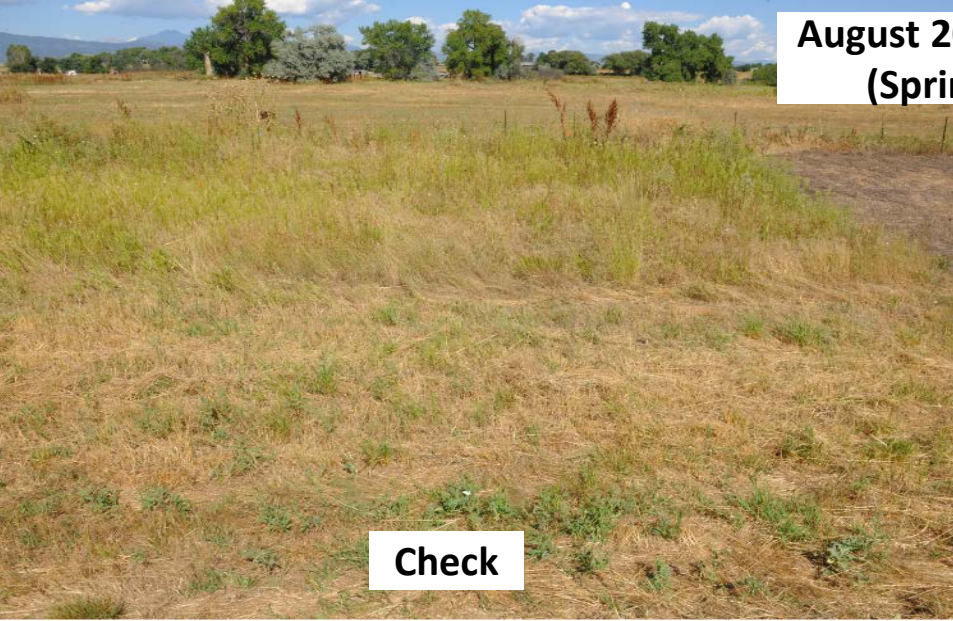
**Adaptive Management**

**Fall 2016**



**Piper™  
(flumioxazin + pyroxasulfone)**

**August 2015 Photos  
(Spring Trts)**



**Check**



**Tordon 1qt + Milestone 7oz  
+ Escort 1oz + Accord 2qt**

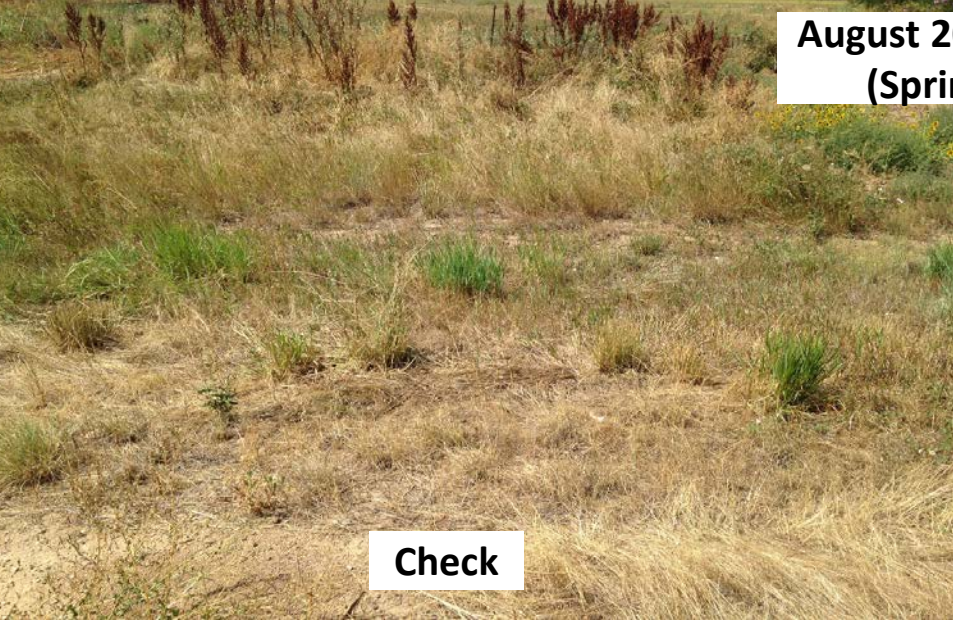


**Tordon 1qt+ Plateau 7oz + Accord 2qt  
+ Vista 12oz + 2,4-D 1qt**



**Perspective 5oz + Plateau 7oz + Accord 2qt  
+ Vista 12oz + 2,4-D 1qt**

**August 2016 Photos  
(Spring Trts)**



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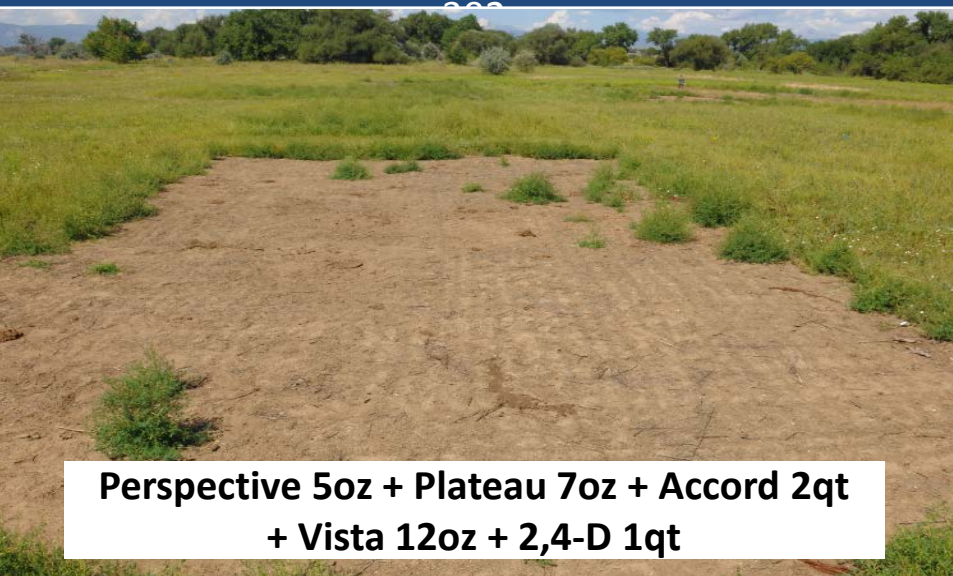
**August 2015 Photos  
(Spring Trts)**



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**Tordon 1qt+ Plateau 7oz + Accord 2qt  
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**July 2016 Photos  
(Spring Trts)**



**Check**



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# Hydro-seeding and Hydro-mulching



# Advantages vs Cost

- More desirable environment
- Protect seeds
- Weed suppression
- Significant Increase in seeding rates
- Increased cost over drill or broadcast seeding
- Great for steep/rough sites

Feral Rye Invasion (Devil's Backbone Open Space)



Downy Brome Invasion (Wellington, CO)



# Winter Annual Grass Management



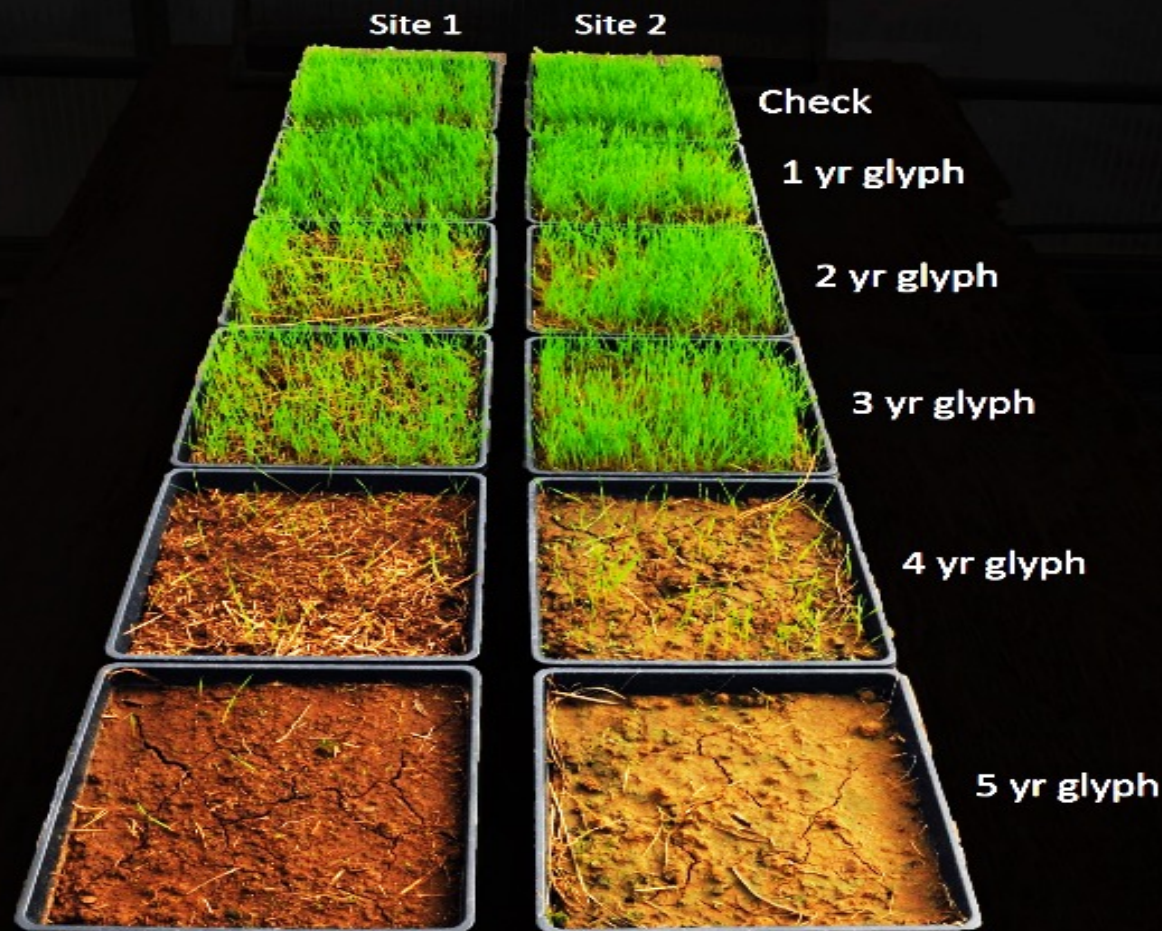
# **Downy Brome and other Winter Annual Grasses**

- 1. There are no or very few native winter annual grasses.**
- 2. There are significant amount of bare ground.**
- 3. Invasive grasses have no competition.**
- 4. What biological characteristics we can use for management?**
- 5. What can we do to help native plant communities resistant re-invasion?**

# Simple Experiment to Determine Seed Longevity

1. Two site with dense DB
2. Every spring control all flushes of DB with Roundup.
3. Eliminate seed production for 1,2,3,4,5,6 years
4. Monitor DB in soil seed bank
5. Determine impacts on native plant community

## Sequential Glyphosate Treatments to Deplete Downy Brome Soil Seed Reserve



What are management strategies to eradicate downy brome?

- Sequential glyphosate treatments for 5+ years

OR

- Soil residual herbicide (indaziflam application at years 1 and 3)



# **Prescriptive Winter Annual Grass Management Approach**

- 1. Residual Winter Annual Grass Control (3+Years)**
- 2. Eliminate Litter Accumulation**
- 3. Manage Soil Seed Bank (5 Year Investment)**
- 4. Re-establishment of Remnant Plant Community**

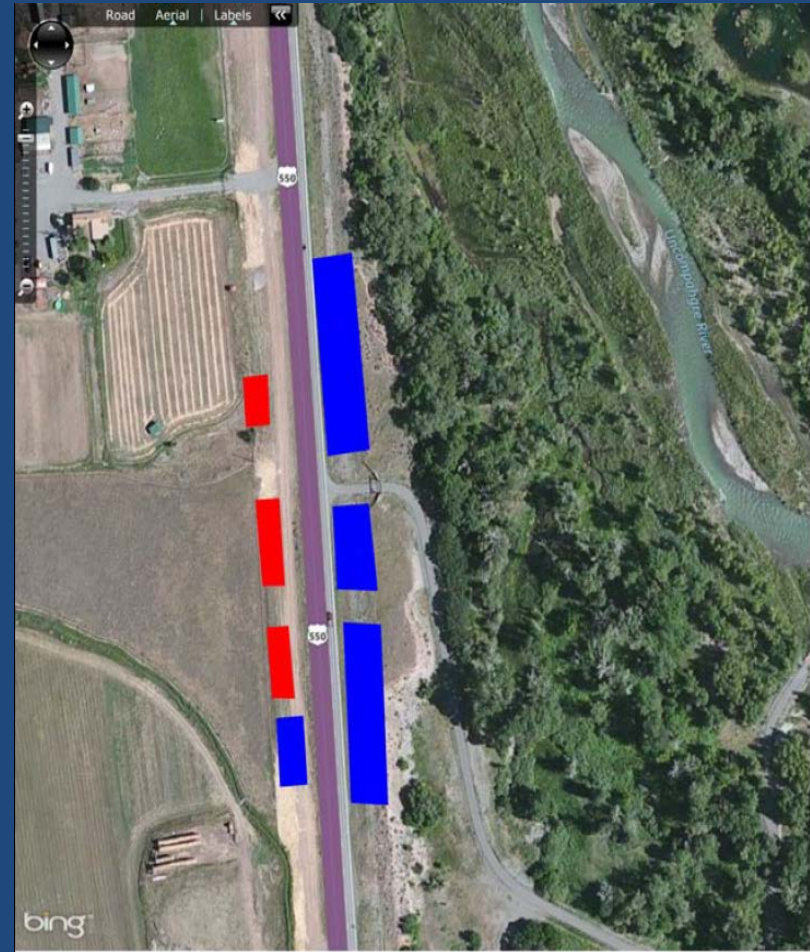
# Eplanade (indaziflam)

- **Weed Control-** Broad Spectrum Control of over 75 species
- **Mode of Action-** Cellulose-Biosynthesis Inhibitor (CBI)
- **Labeled Use Rates**
  - 51 to 102 g ai ha<sup>-1</sup>
  - 3.5 to 7 oz/A
- **\*No Current Grazing Label\***
  - Labeled for use on non-grazed sites
  - Open space, natural areas



# Ouray County CDOT Site

- Near Colona, CO on Hwy 550
- Prior restoration attempt had failed
- Replicate of the Longmont sites
- Weeds: jointed goat grass, downy brome, kochia



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<ul style="list-style-type: none"><li>• In year 2 (spring 2016), 2/3 of each treatment was sprayed with Vista XRT to protect seedlings during the establishment year.</li></ul>			\$30

# Additional Ouray County Treatments

- **Fall 2016 treatment of Raptor and Esplanade**
  - **Protection against jointed goatgrass and downy brome**
- **Future spring treatment of Vista to protect against kochia**



# Unique Challenges of the Ouray County Site

- **Cobbly/Rocky soils**
  - Drilling not practical
  - Broadcast seeding
- **Shorter growing season**
- **Landowner involvement**



A landscape photograph showing a paved road in the middle ground, flanked by green grass and wildflowers in the foreground. In the background, there are trees and a clear blue sky. The word "Questions" is overlaid in white text in the center of the image.

Questions