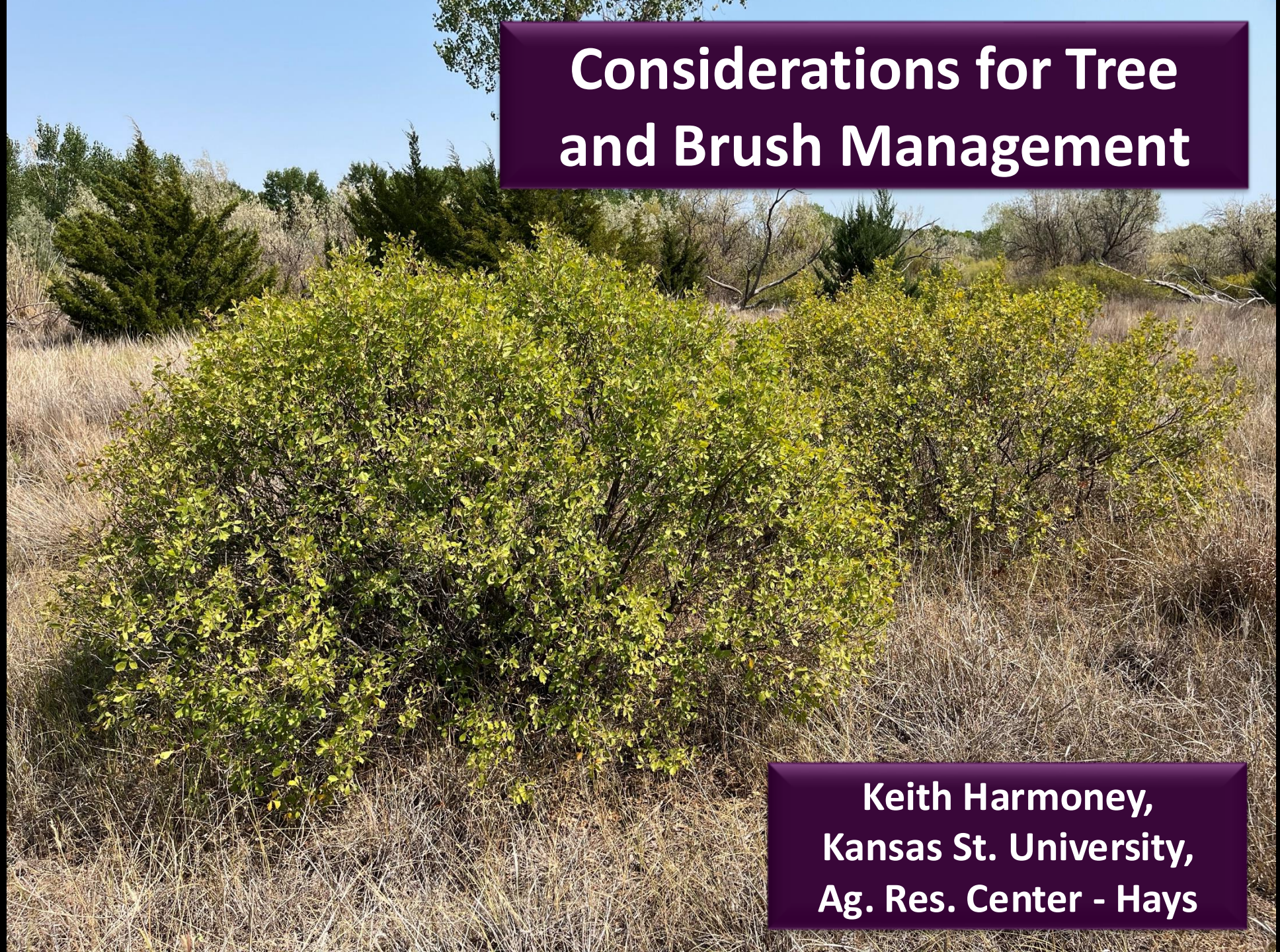


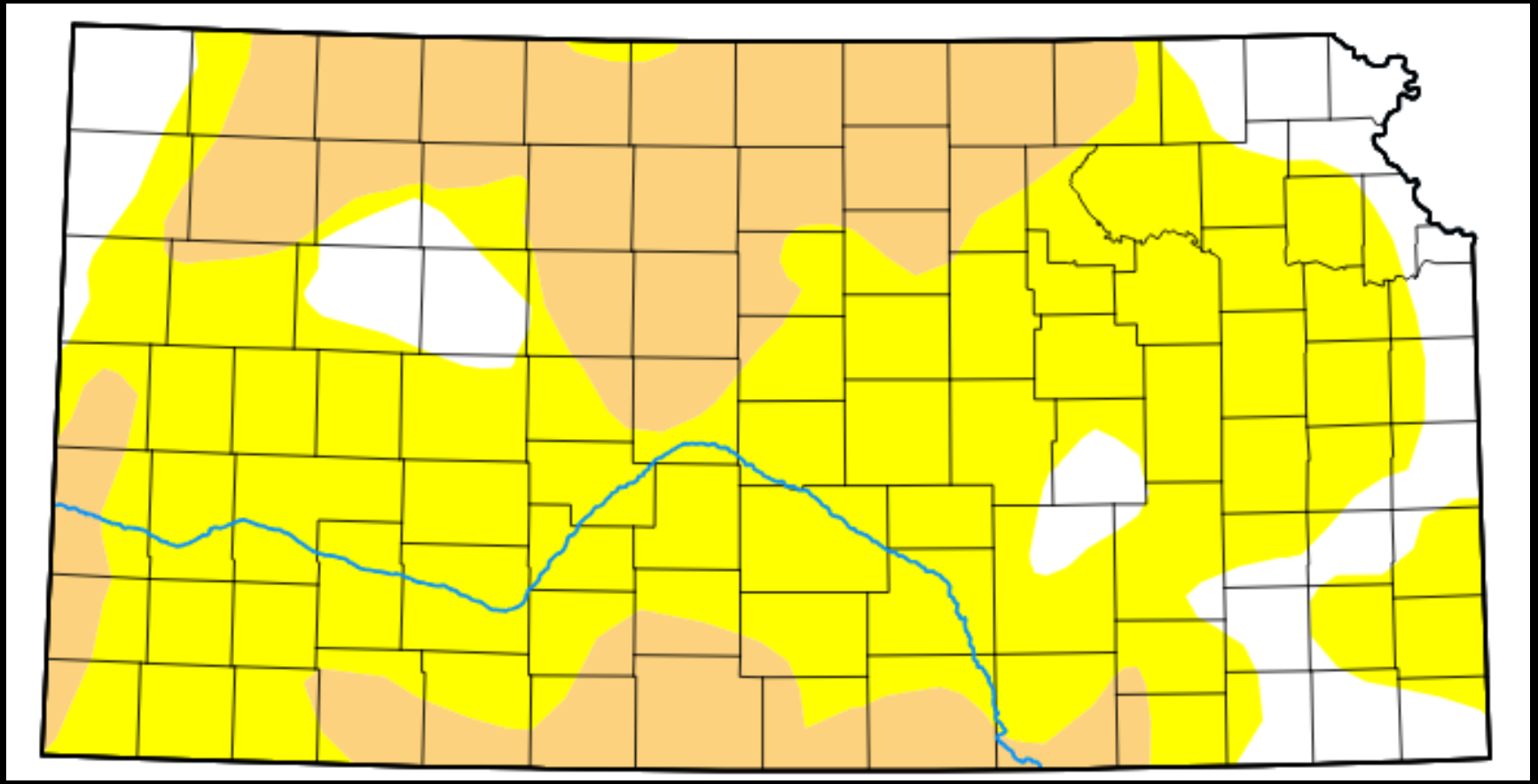
# Considerations for Tree and Brush Management

Keith Harmoney,
Kansas St. University,
Ag. Res. Center - Hays

K-STATE Research and Extension

Knowledge for Life

# Precipitation is the greatest factor that determines pasture forage yield each year



## US Drought Monitor

**Map released: Thurs. March 13, 2025**

Data valid: March 11, 2025 at 8 a.m. EDT

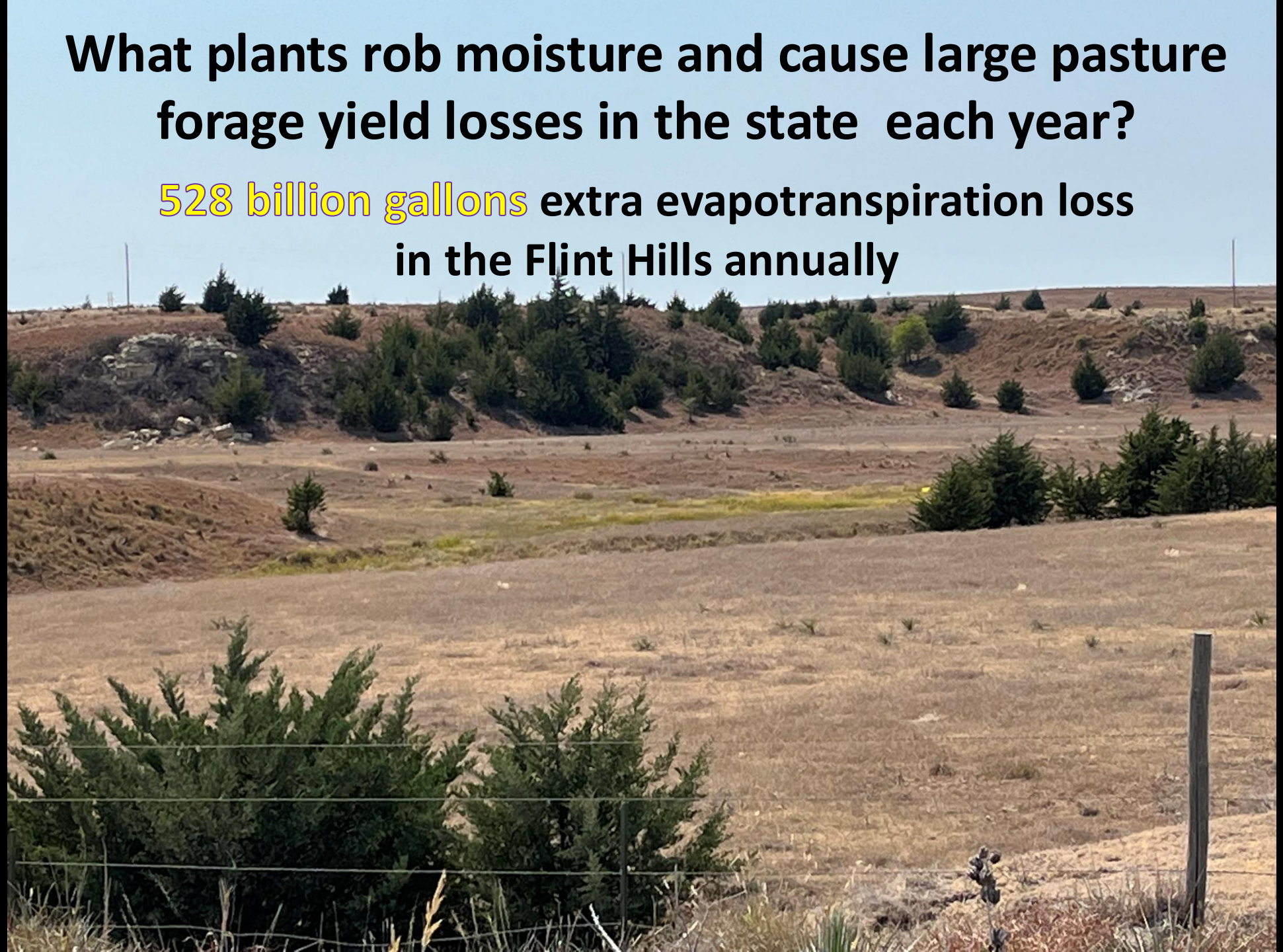
**Intensity**

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data


April, May, and June precipitation combined supply the soil moisture for the majority of yield production…
…need to capture it.

# What plants rob moisture and cause large pasture forage yield losses in the state each year?

**528 billion gallons extra evapotranspiration loss in the Flint Hills annually**



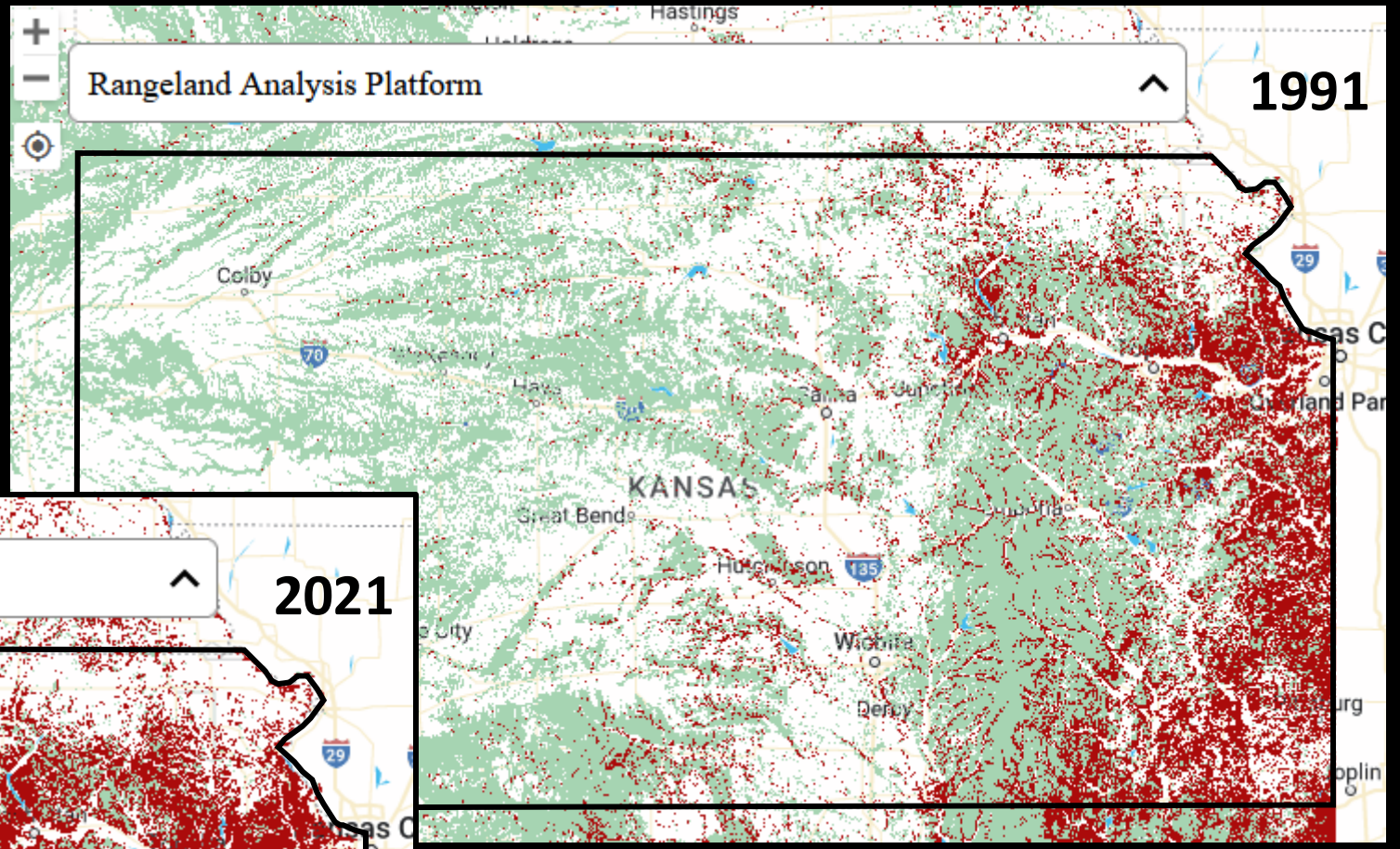

**Historically, did we have trees and brush on the Kansas plains?**

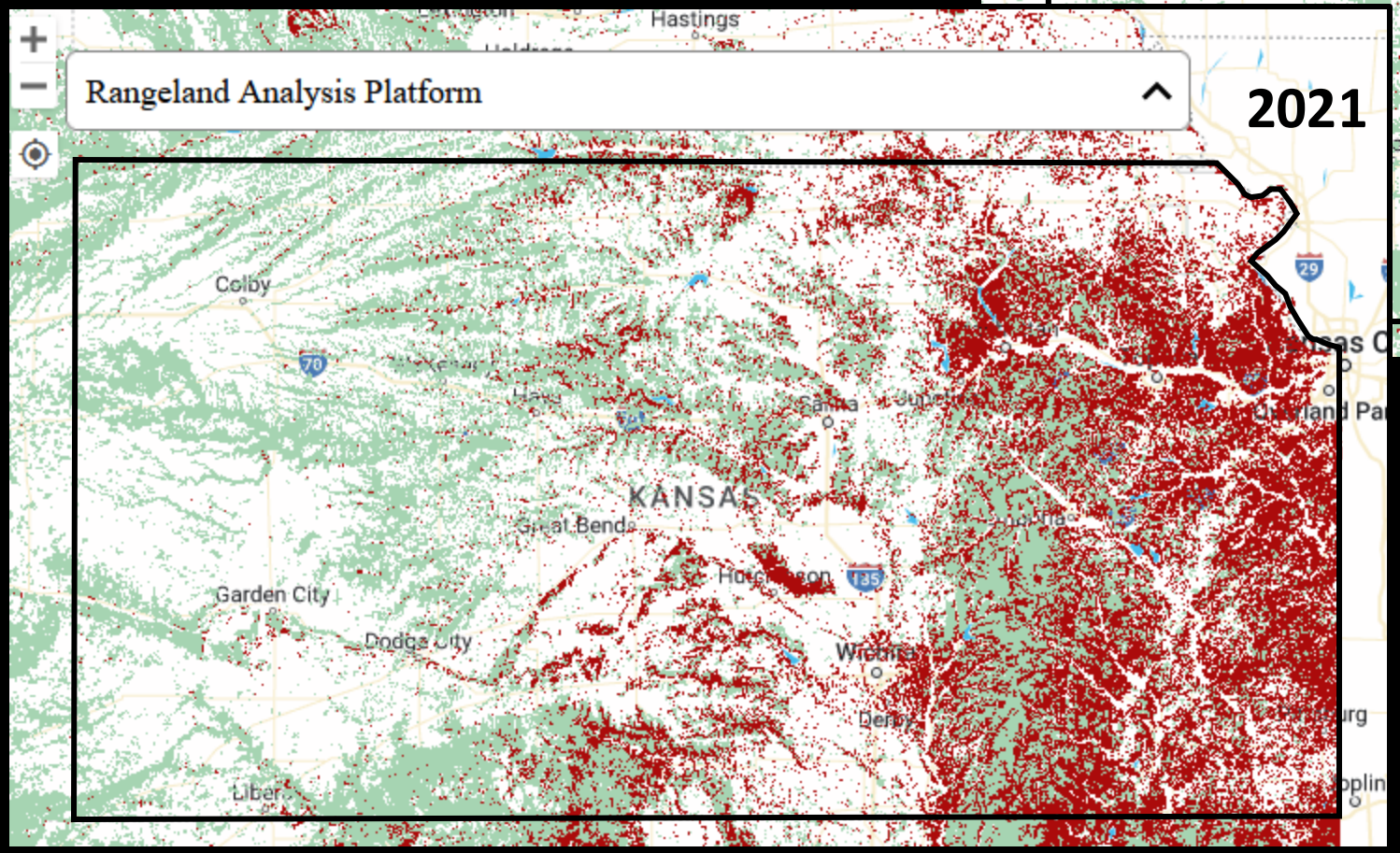
Trees, brush, and other invaders have increased mainly because of a lack of regular burning and browsers in pastures…

…and we've introduced seed sources into new areas.

# Tree and Brush Cover:

1991: 2.9% tree cover
3.6% brush cover
= 6.5% total




2023: 9.3% tree cover
3.6% brush cover
= 12.9% total

# Franklin County, Kansas

## Rangeland Production Lost to Tree Encroachment

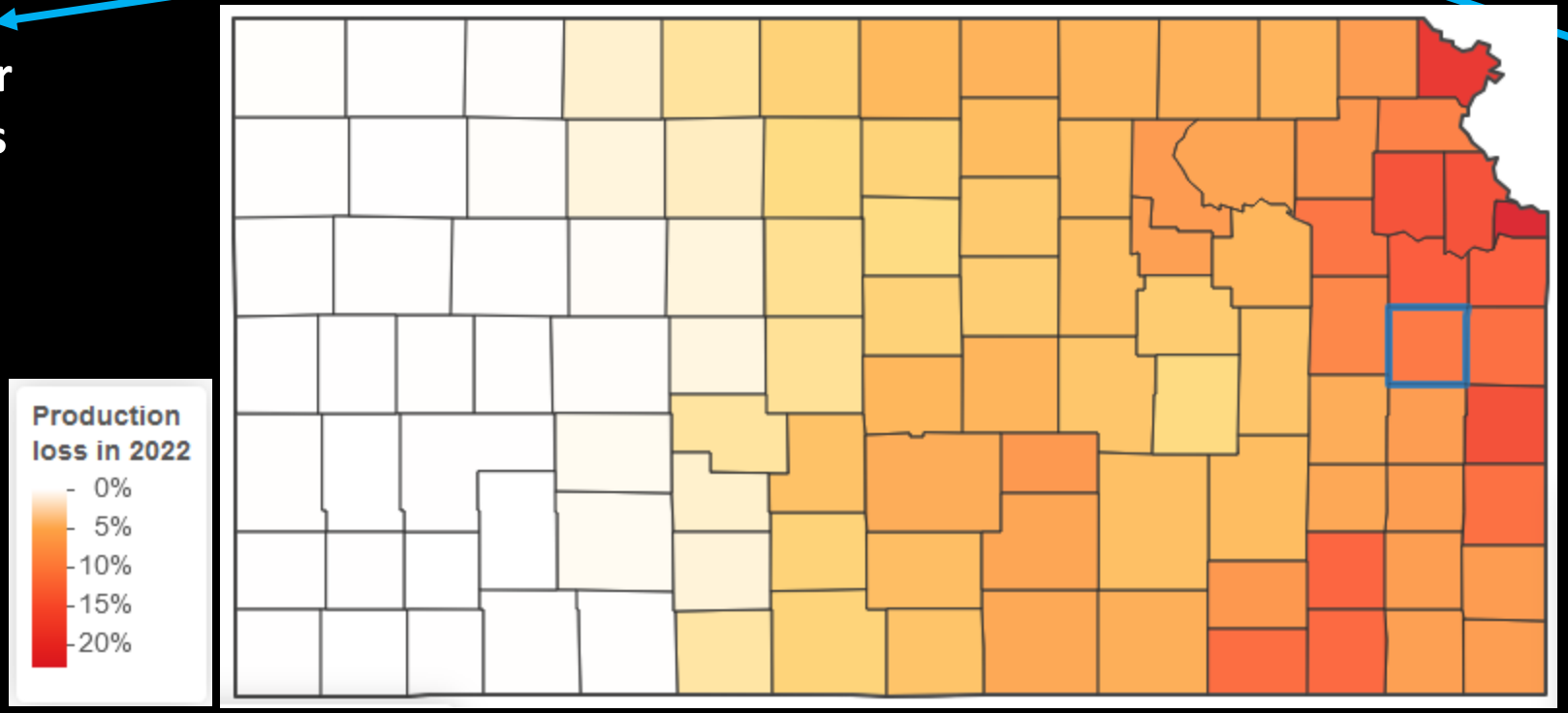
| Production lost to tree encroachment in 2022 | Cumulative production lost to tree encroachment (1990-2022) |
|---|---|
| 23,481 tons | 475,605 tons |

Over 269,000 cow/calf pair grazing days

Over 1,494 cow/calf pair for 6 months

Over 5.45 million cow/calf pair grazing days

Over 30,270 cow/calf pair for 6 months




**That's over $45.4 million in lost calf revenue at today's market!**

https://www.wlfw.org/yieldgap/Kansas/index.html

# Rangeland Production and Tree Cover Summary

| | |
|---|---|
| Rangeland production in 2022 | 192,952 tons |
| Rangeland production losses in 2022 | 23,481 tons (10.85%) |
| Cumulative rangeland production losses since 1990 | 475,605 tons |
| Tree cover in 2022 | 33,514 acres |
| Tree cover change since 1990 | +21,534 acres |
| Tree cover percent in 2022 | 19.8% |

# Kansas

## Rangeland Production Lost to Tree Encroachment

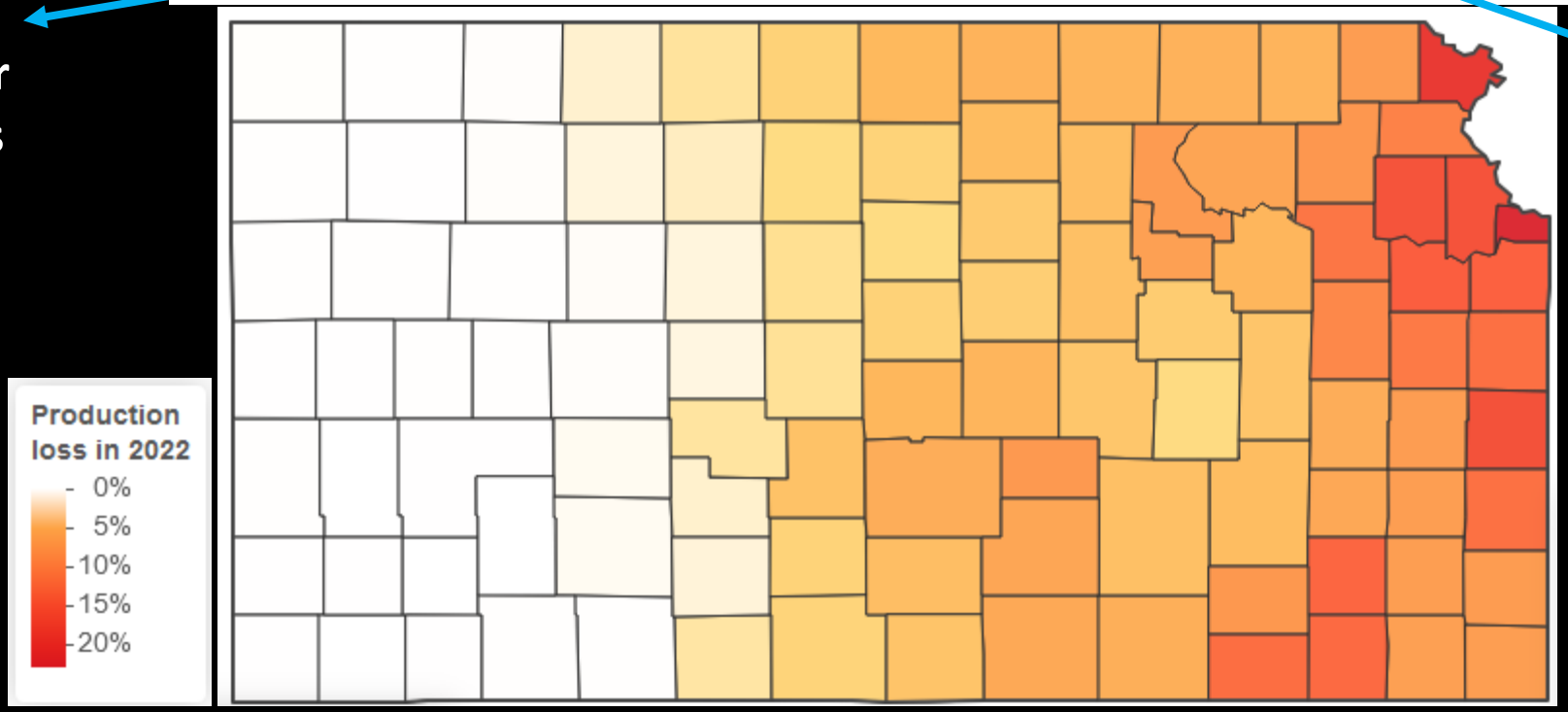
| Production lost to tree encroachment in 2022 | Cumulative production lost to tree encroachment (1990-2022) |
|---|---|
| 968,908 tons | 20,997,982 tons |

Nearly 11.1 million cow/calf pair grazing days

Over 61,518 cow/calf pair for 6 months

Almost 240 million cow/calf pair grazing days

Over 1.33 million cow/calf pair for 6 months




**That's $2.0 billion in lost calf revenue at the value of fall 2024 market!**

https://www.wlfw.org/yieldgap/Kansas/index.html

# Effects of Trees and Brush in Pasture:

-Suppresses grass through shading
-Intercepts rainfall and uses abundant water
-Habitat for pests that spread illness
-Increased risk of dangerous wildfire
-Reduces habitat quality for grassland wildlife
-Some may be toxic to livestock
-Produce seeds that spread more widely from animals eating fruits and pods
-Livestock, human, and equipment risk (i.e. thorns)

# Common Problem Trees and Brush of Kansas-

**Trees:**

- Eastern red cedar
- Honey locust
- Hedge or Osage Orange
- Callery pear
- Russian olive
- Salt cedar
- Siberian elm
- Mulberry
- Black locust

**Brush:**

- Roughleaf dogwood
- Smooth sumac
- Multiflora rose
- Blackberry
- Poison ivy
- Skunkbrush (aromatic sumac)
- Buckbrush
- Bush honeysuckle

Eastern Red Cedar

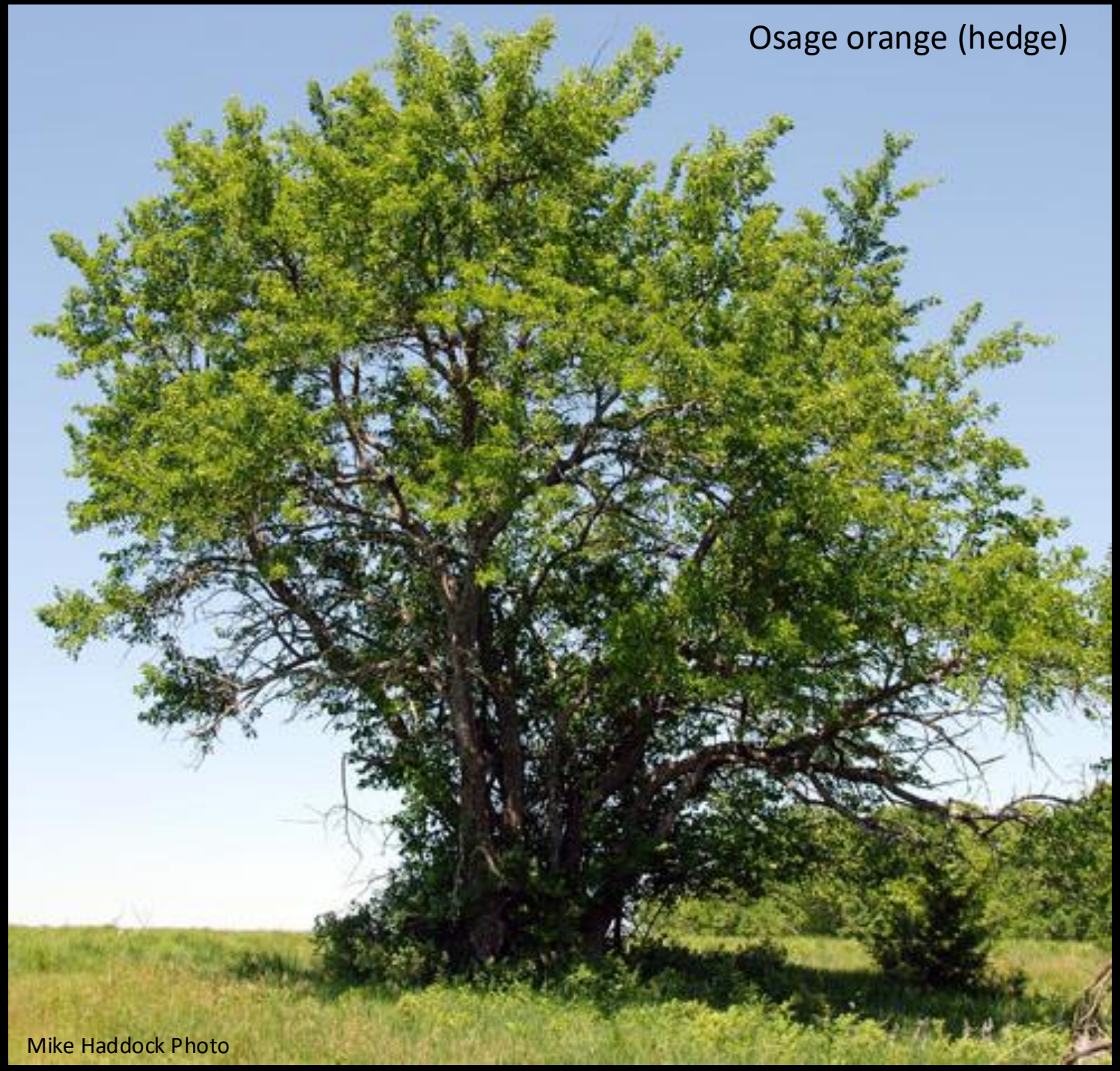
Honey Locust


Honey Locust

Osage orange (hedge)

NC State Photo

Osage orange (hedge)



Mike Haddock Photo


Osage orange (hedge)
PLANTS Database photo

Mulberry

Mulberry


Mulberry


Mulberry

Rough-leaf dogwood

Mike Haddock photos

Buckbrush

Aromatic Sumac (skunkbrush)


Aromatic Sumac (skunkbrush)

# Smooth Sumac

Smooth Sumac

# Blackberry

Mike Haddock photos

Multiflora rose

Mike Haddock photos


Poison Ivy


Poison Ivy

Bush honeysuckle

Photo by Sarah Lancaster

Photo by Walt Fick

## Methods of Tree and Brush Control:

1. Prescribed burning
2. Cutting (trees), Repeated Mowing (brush)
   (and herbicide treating stump/stems if necessary)
2. Foliar treatment (herbicide)
4. Basal bark/stem treatment (herbicide)
5. Frill/girdle/hack and squirt (herbicide)
6. Soil treatment (herbicide)
7. Browsing/biological control

# Cost Per Acre of Treatment

High

$/acre

Low

Fire

Loppers/
Sapling
Foliar

Chain
Saw/
Treat

Aerial
Plane/
Clearing

Low → High

Density

# Prescribed burning


Cut stump


Cut stump
432

**Without effective herbicide treatment, deciduous trees resprout**


Basal bark application


Girdle


Soil applied

## Common foliar treatment herbicides:

1. Triclopyr (Remedy, Garlon, Crossbow)- hedge, elm, mulberry, blackberry, rose, sumac
2. Aminopyralid (Milestone, Chaparral, Duracor)- honey locust
3. Picloram (Tordon 22K, Grazon P+D, Surmount)- honey locust, rose, sumac, many others
4. Metsulfuron methyl (Escort, Cimarron, Chaparral)- blackberry, others
5. Dicamba (Clarity, Rangestar, Rifle, Rave)- buckbrush, and use as an added herbicide
6. Fluroxypyr (Vista, Surmount, PastureGard)- dogwood, blackberry, hedge, rose, sumac
7. 2,4-D- sumac, buckbrush, and use as an added herbicide

## Common cut stump/frill/girdle stem treatment herbicides:

1. Triclopyr (Remedy, Crossbow, PastureGard, Pathfinder RTU)- hedge, elm, cottonwood, mulberry
2. Aminopyralid (Milestone)- honey locust
3. Picloram (Tordon 22K, with supplemental label)- honey locust, many others
4. Dicamba (Clarity, Banvel)- added as an extra herbicide
5. 2,4-D- added as and extra herbicide
6. Imazapyr (Arsenal, Ecomazapyr)- salt cedar, others
7. Glyphosate (non-crop areas)-

## Common basal bark treatment herbicides:

1. Triclopyr (Remedy, Crossbow, or PastureGard + diesel fuel)- hedge, elm, cottonwood, mulberry
2. Aminopyralid (Milestone + oil carrier)- honey locust
3. Picloram (Tordon 22K + oil carrier, with supplemental label)- honey locust, many others

(aminopyralid and picloram are water based herbicides, do a jar test to make sure that the herbicide stays mixed)

**The right combination of method, timing, and herbicide (if needed) can greatly reduce tree and brush encroachment, and produce more grass.**

Milestone $370 / gallon
Tordon 22K $79 / gallon
Remedy $78 / gallon

## In one gallon of spray for cut stump/frill or girdle treatment:

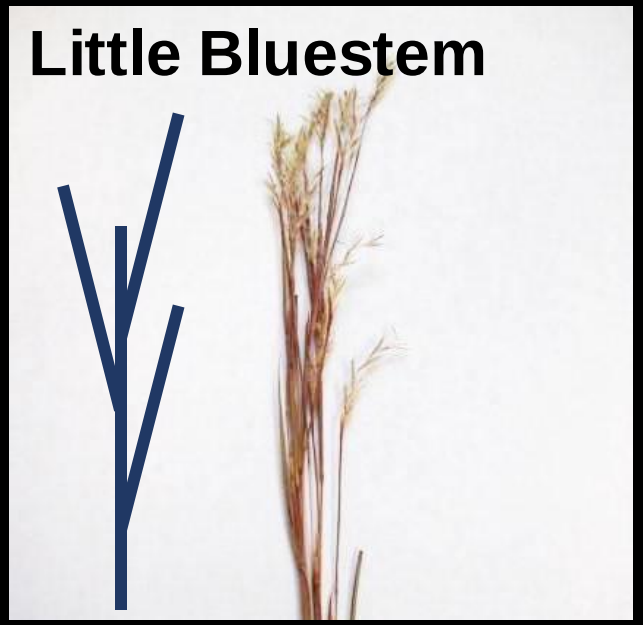
Milestone 10% + 90% water = $37.00 (honey locust)
Tordon 22K 10% + 90% water = $7.90 (honey locust, hedge, elm)
Remedy Ultra 25% + 75% diesel = $21.95 (hedge, elm, others)

## In one gallon of spray for basal bark treatment:

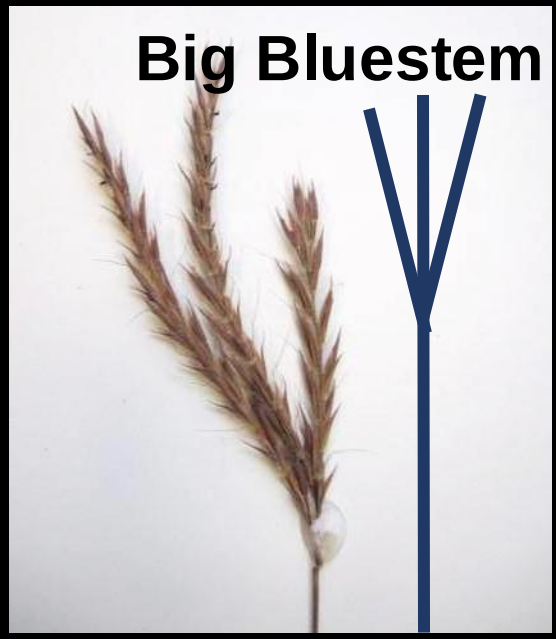
Milestone 5% + 95% oil carrier = $56.50 (honey locust)
Tordon 22K 5% + 95% oil carrier = $43.95 (honey locust, hedge, elm)
Remedy Ultra 25% + 75% diesel = $21.95 (hedge, elm, others)


Total cost/acre will depend on the size and density of trees or brush species.
As with other things, prevention is the best medicine, and the cheapest.

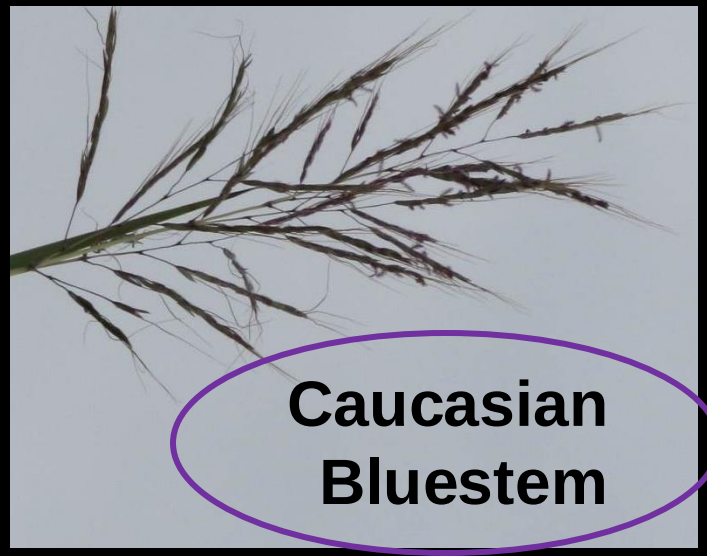
# Do you know grass invaders, like old world bluestems?



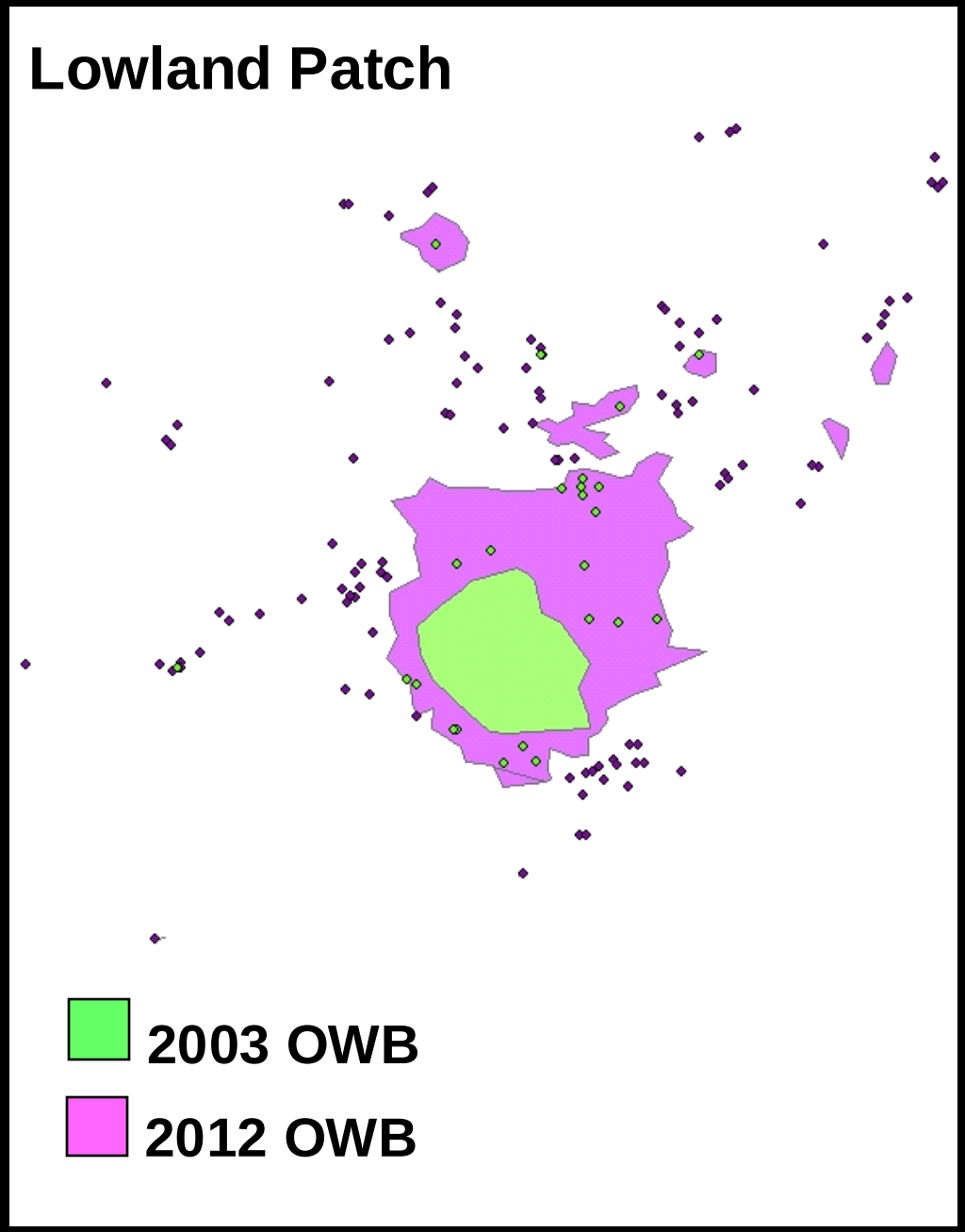


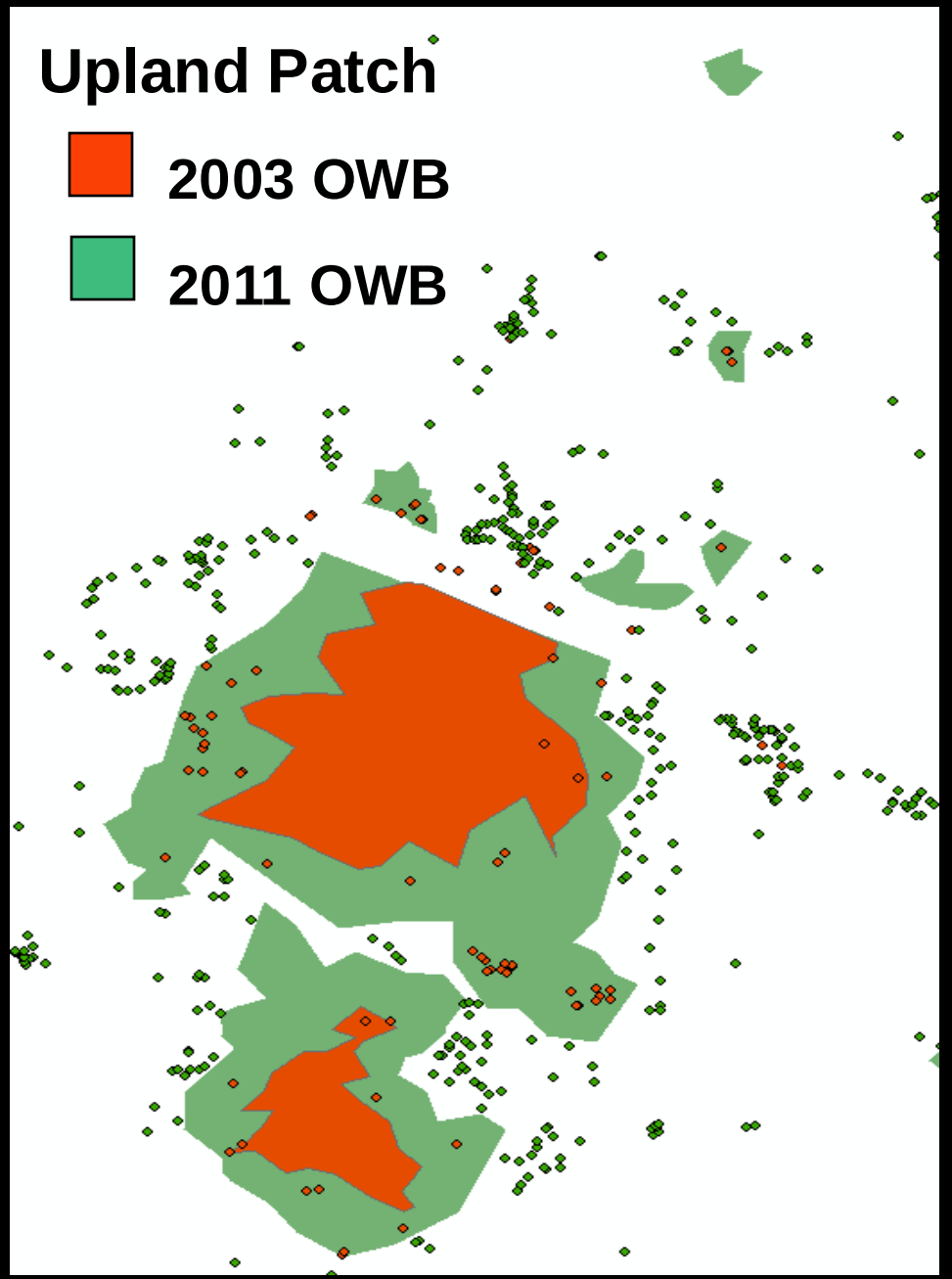







Large patches and fields of OWB have lower
plant, insect, and wildlife diversity;
alters soil biology through allelopathy.




**13-15% patch annual compounded spread rate!**

## Control options are limited:

**MECHANICAL – remove root system with shovel (disc or hand shovel)**

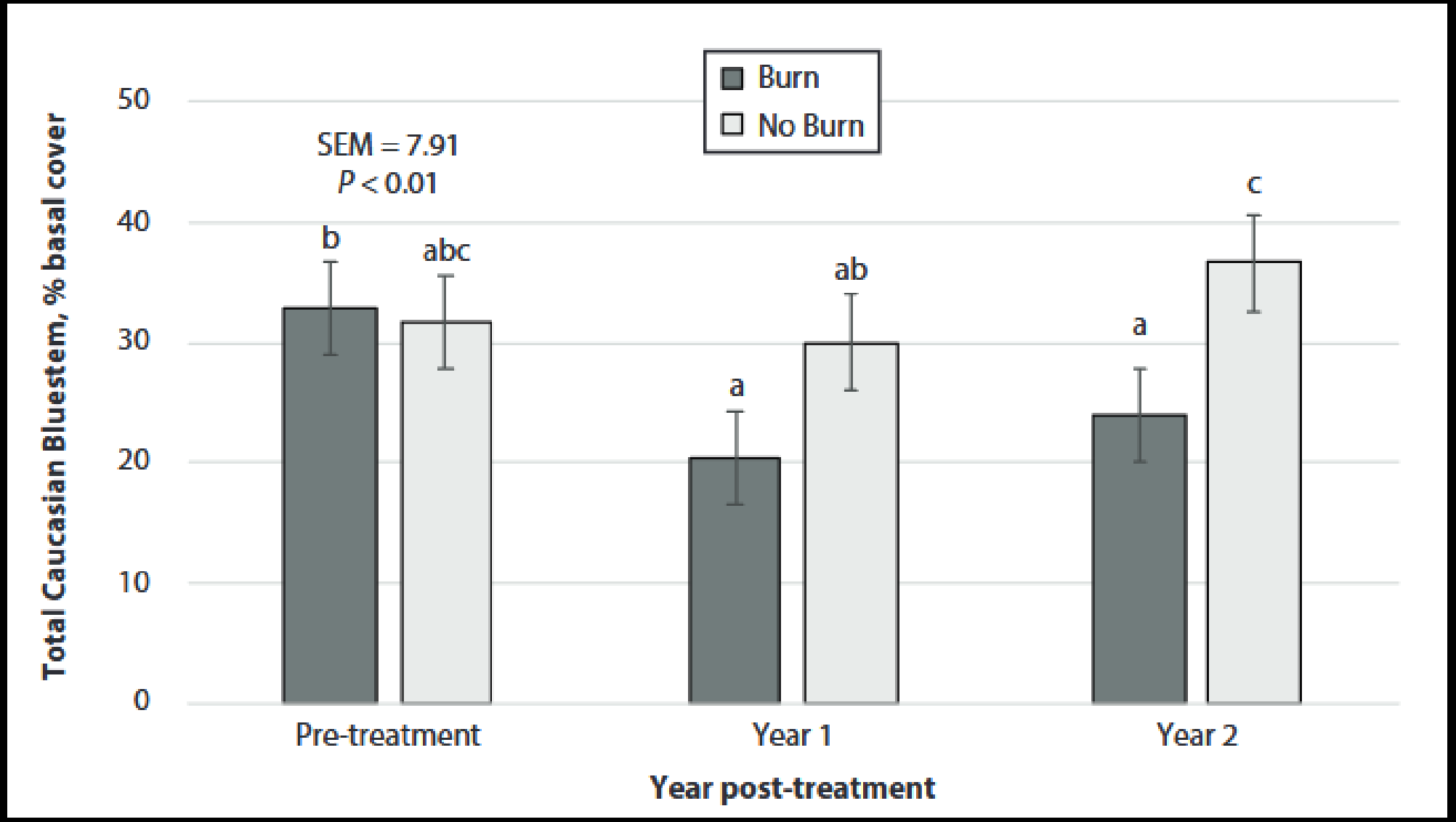
**FIRE – late growing season or late summer burn**

**HERBICIDE – two chemistries, glyphosate and imazapyr**

# FIRE:

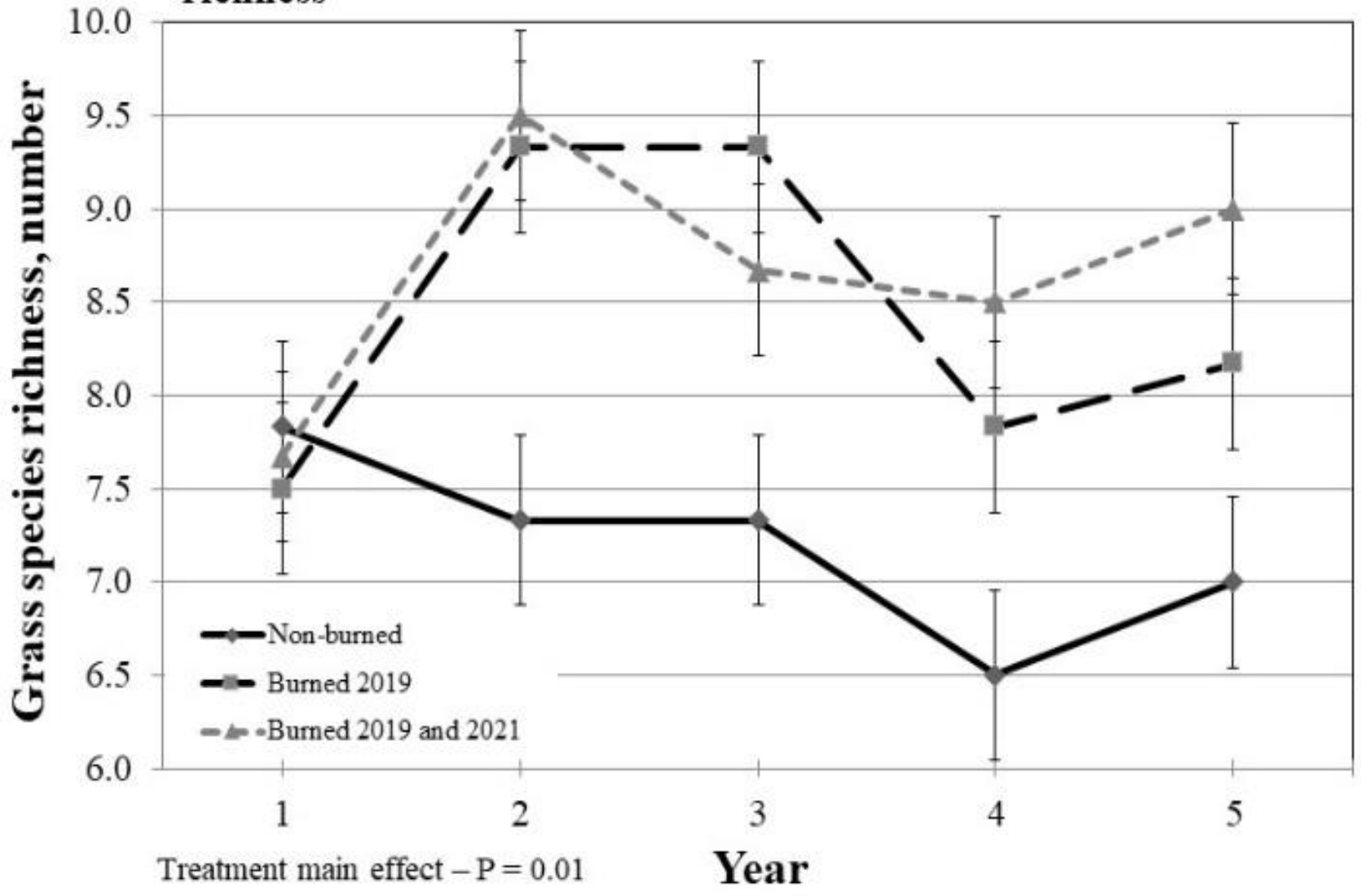
| | |
|---|---|
| Timing | 1) some control after stem elongation and mid growing season<br>2) before herbicide application |
| Fuel load | 1) greater fuel load potentially results in greater control |
| Method | 1) back fire or slow flank fire increases injury instead of head fire |

# Basal Cover Composition of Caucasian OWB after August Prescribed Fire




Ramirez 2022

**Figure 5. Effects of late summer prescribed fire on grass species richness**




Giefer 2025

# HERBICIDES:

Application 1) foliar spray most effective
2) wiper applications with glyphosate achieve modest control

Chemistry 1) glyphosate (2-4 lb/acre season total, non-selective)
2) imazapyr (0.25-0.75 lb/acre total, more selective)
*use higher rates during dry conditions

Timing 1) imazapyr and glyphosate can both be applied from 5-leaf stage to stem elongation
2) single application, or split application at 5 leaf stage and 8 weeks later
3) glyphosate could be applied as long as the plants still have green leaves

# Recommendations for mixed native and OWB stands:

1. Do a growing season prescribed burn in August for 1 or 2 growing seasons
2. Treat with 0.50 lb/ac imazapyr after 5 leaf stage and before boot stage the next year after 1 or 2 growing season burns
3. Repeat growing season prescribed burn when pasture growth is adequate
4. Treat with imazapyr following a mow, graze, or burn event (spot treat if capable)

Isolated Plants – Dig them up by the root, spot spray with glyphosate at 4-6 pts/25 gallons water or imazapyr at 2 pts/25 gallons water

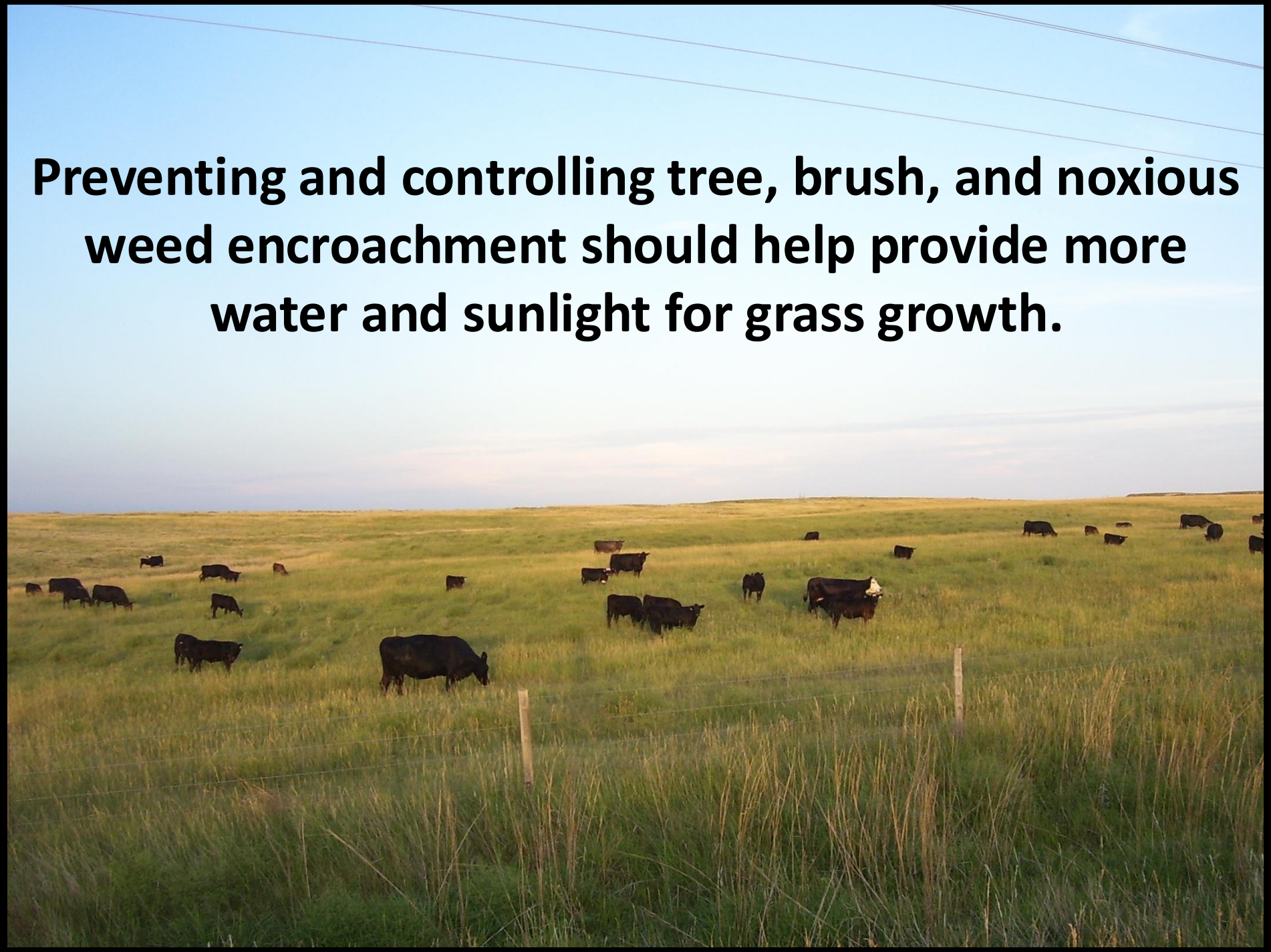
# Pasture Species Cover When OWB Is Treated with Imazapyr for Three Years – 2017 to 2019, Ellsworth County

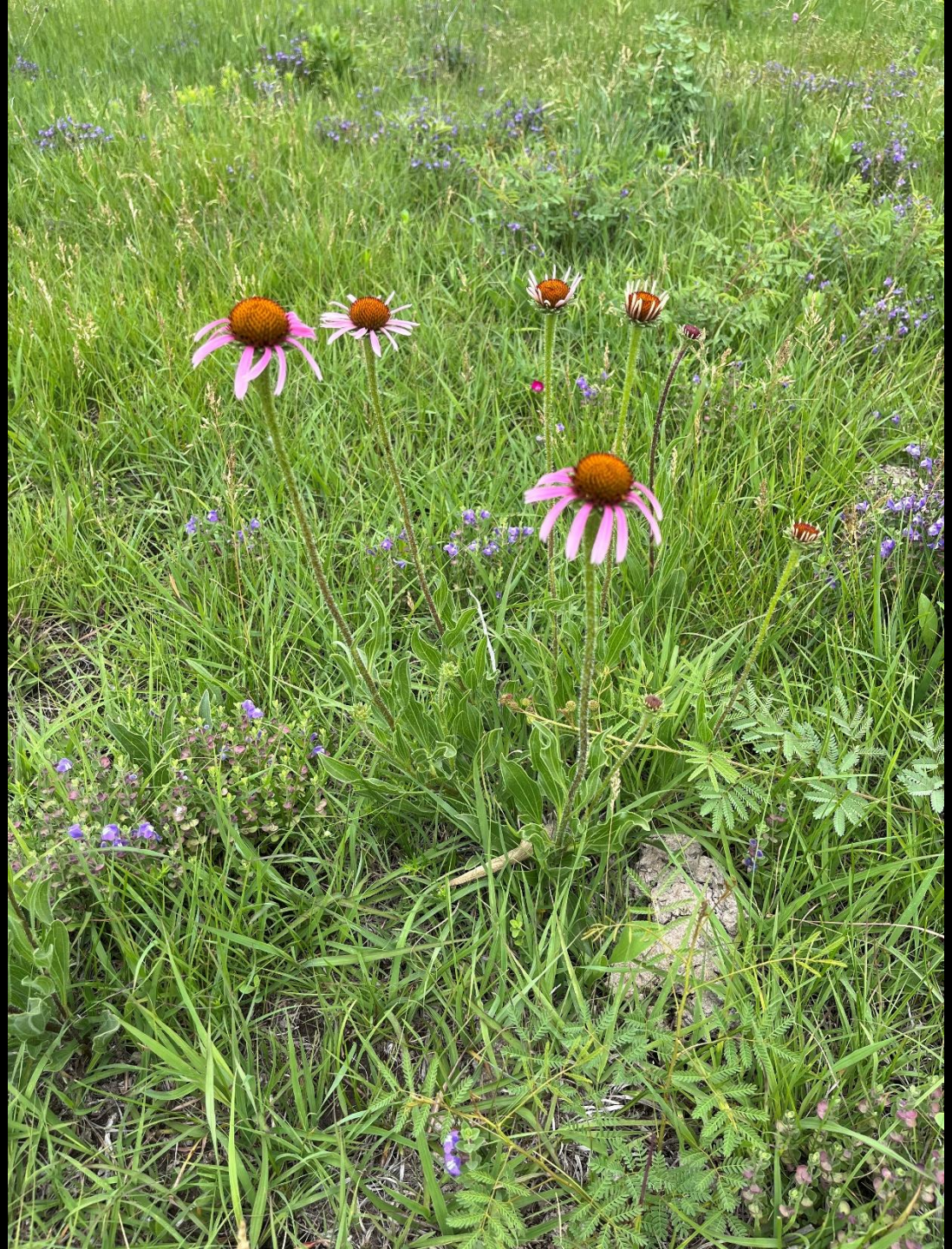
| | 2016 | 2019 | 2020 |
|---|---|---|---|
| Species | Daubenmire Cover % | | |
| OWB | 51.1 a | 0.2 b | 5.6 c |
| Indiangrass | 1.9 a | 5.0 a | 13.5 b |
| Big bluestem | 0.4 a | 4.9 a | 18.0 b |
| Little bluestem | 7.0 a | 16.1 a | 27.2 b |
| Sideoats grama | 0.1 a | 0.4 a | 5.7 b |
| Blue grama + Buffalograss | 14.1 a | 1.1 b | 3.5 b |
| Western ragweed | 0.1 a | 17.5 b | 8.9 b |
| Marestail | 0.0 a | 25.5 b | 5.1 c |

Native tall and mid grasses are tolerant of imazapyr at the 0.5 lb/acre rate

# Reseeding to Native Grasses After Treating OWB With Imazapyr for Three Years – 2017 to 2019, Ellsworth County

## Reducing OWB in Pasture is a Multi-Year Commitment!


Preventing and controlling tree, brush, and noxious weed encroachment should help provide more water and sunlight for grass growth.



**But remember, just because a pasture plant is not a grass, doesn’t mean that it’s a weed….**


In the end, the best weed deterrent is a healthy grassland
that competes heavily with invaders.


Keith Harmoney
kharmone@ksu.edu

**Western Kansas Stocking Decision Tool:**
Use along with median precipitation chart and probabilities for precipitation in April, May, and June. The greater the deficit in April, May, and June, the greater the probability that forage production will be less than expected.

With dry soil conditions entering the growing season, Hays research data shows that the percentage reduction in forage production is approximately equal to the percentage reduction from average precipitation in April + May + June combined. Pastures will likely have much more forage demand than forage available to maintain the typical desired 50% total use by livestock, wildlife, trampling, weathering, etc. if pastures receive less than 75% of average precipitation and were stocked at the typical rate.

# On-site Pasture Assessment

## Prior Year Grass Unstressed

### Current Dry Soil Conditions

**Spring Turnout:** Plants have adequate vigor to start spring growth, but may lack needed early precipitation for early growth, delay turnout or reduce stocking rate by up to 10%

- May+June precipitation more than 75% of average → **Late Spring Adjust:** No further reductions → Total Reduction 0-10%
- May+June precipitation less than 75% of average → **Late Spring Adjust:** Reduce stocking by 10-15%, or by percentage deficit from average Apr + May + Jun precip → Total Reduction 10-25%, or more

### Current Moist Soil Conditions

**Spring Turnout:** Plants have adequate vigor to start spring growth and adequate moisture to rapidly grow, progress with spring turnout as planned with no stocking reductions

- May+June precipitation more than 75% of average → **Late Spring Adjust:** No further reductions → Total Reduction 0%
- May+June precipitation less than 75% of average → **Late Spring Adjust:** Reduce stocking by 10-15%, or by percentage deficit from average Apr + May + Jun precip → Total Reduction 10-15%, or more

## Prior Year Grass Stressed

### Current Dry Soil Conditions

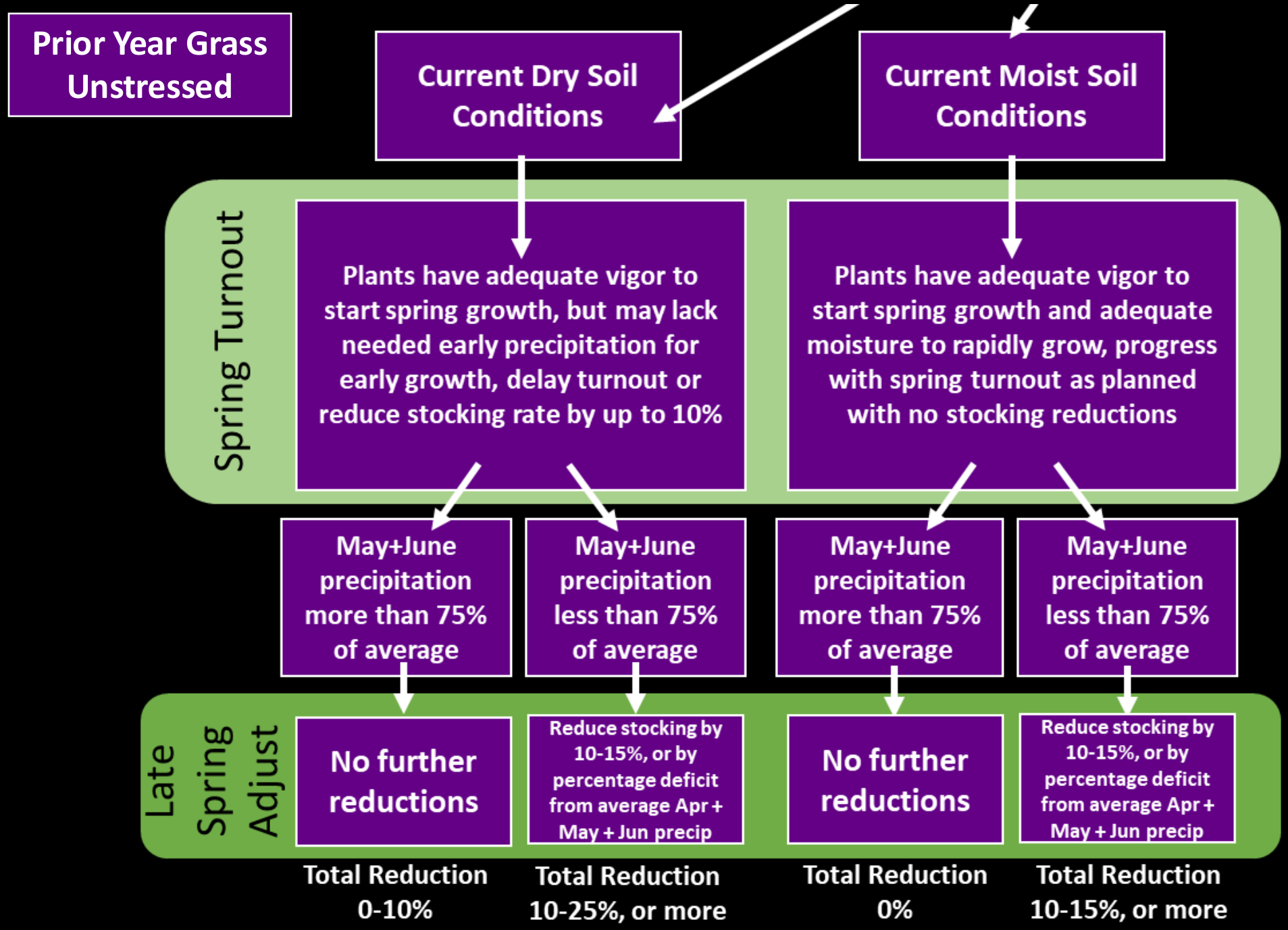
**Spring Turnout:** Plants lack vigor or standing residue from prior year stress, and lack spring moisture to rapidly grow, so delay spring turnout by 2-4 weeks (grass is 3-4") and/or reduce stocking rate by 15-25%

- May+June precipitation more than 75% of average → **Late Spring Adjust:** No further reductions → Total Reduction 15-25%
- May+June precipitation less than 75% of average → **Late Spring Adjust:** Reduce stocking by 15-20%, or by percentage deficit from average Apr + May + Jun precip → Total Reduction 30-45%, or more

### Current Moist Soil Conditions

**Spring Turnout:** Plants lack vigor or standing residue from prior year stress, but have spring moisture to grow, so use a short delay in spring turnout (up to 2 weeks) and/or reduce stocking rate by 10-15%

- May+June precipitation more than 75% of average → **Late Spring Adjust:** No further reductions → Total Reduction 10-15%
- May+June precipitation less than 75% of average → **Late Spring Adjust:** Reduce stocking by 15-20%, or by percentage deficit from average Apr + May + Jun precip → Total Reduction 25-35%, or more


Prior Year Grass Unstressed
Current Dry Soil Conditions
Current Moist Soil Conditions
Spring Turnout
Plants have adequate vigor to start spring growth, but may lack needed early precipitation for early growth, delay turnout or reduce stocking rate by up to 10%
Plants have adequate vigor to start spring growth and adequate moisture to rapidly grow, progress with spring turnout as planned with no stocking reductions
May+June precipitation more than 75% of average
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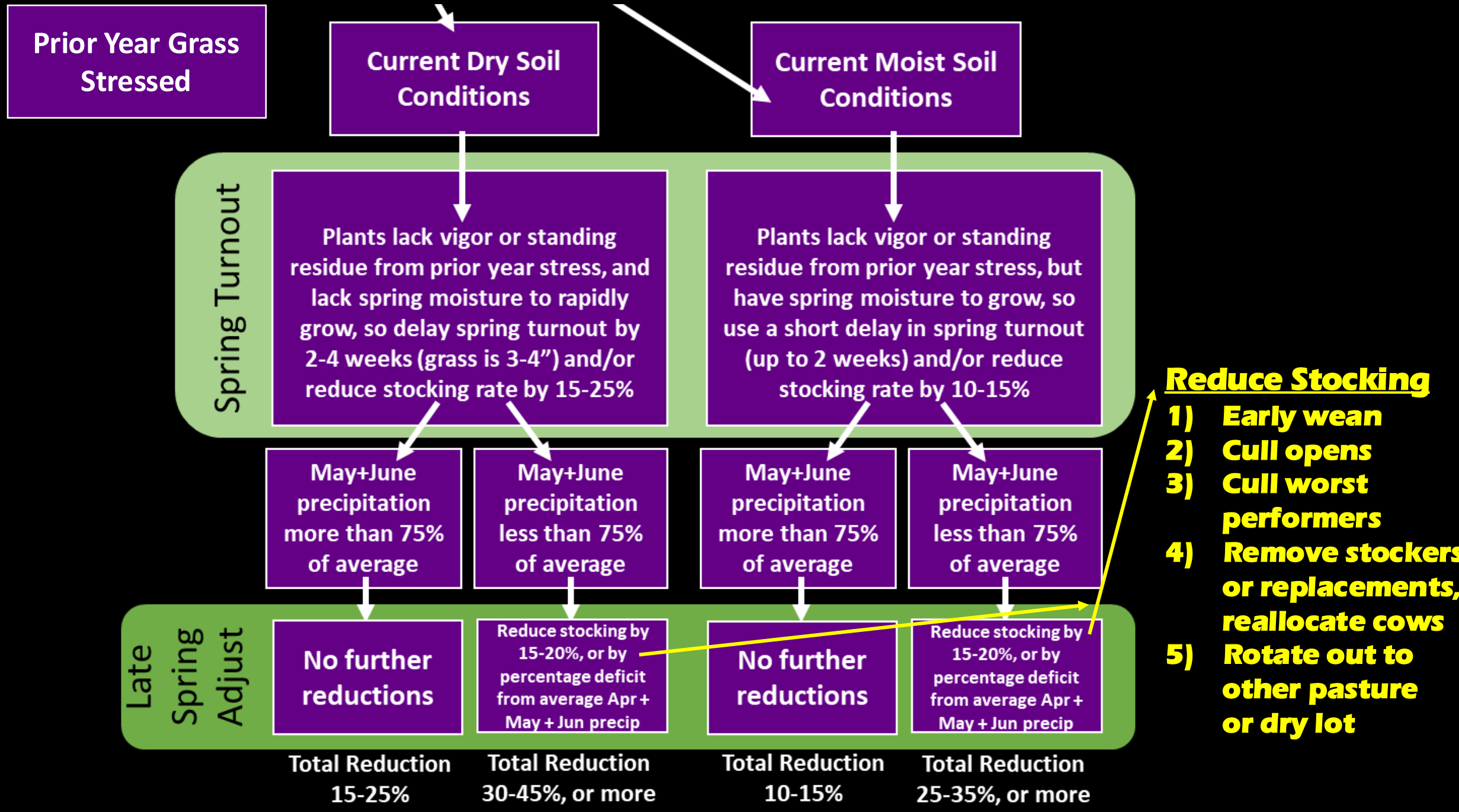
Total Reduction 10-25%, or more
Total Reduction 0%
Total Reduction 10-15%, or more


Prior Year Grass Stressed
Current Dry Soil Conditions
Current Moist Soil Conditions
Spring Turnout
Plants lack vigor or standing residue from prior year stress, and lack spring moisture to rapidly grow, so delay spring turnout by 2-4 weeks (grass is 3-4") and/or reduce stocking rate by 15-25%
Plants lack vigor or standing residue from prior year stress, but have spring moisture to grow, so use a short delay in spring turnout (up to 2 weeks) and/or reduce stocking rate by 10-15%
May+June precipitation more than 75% of average
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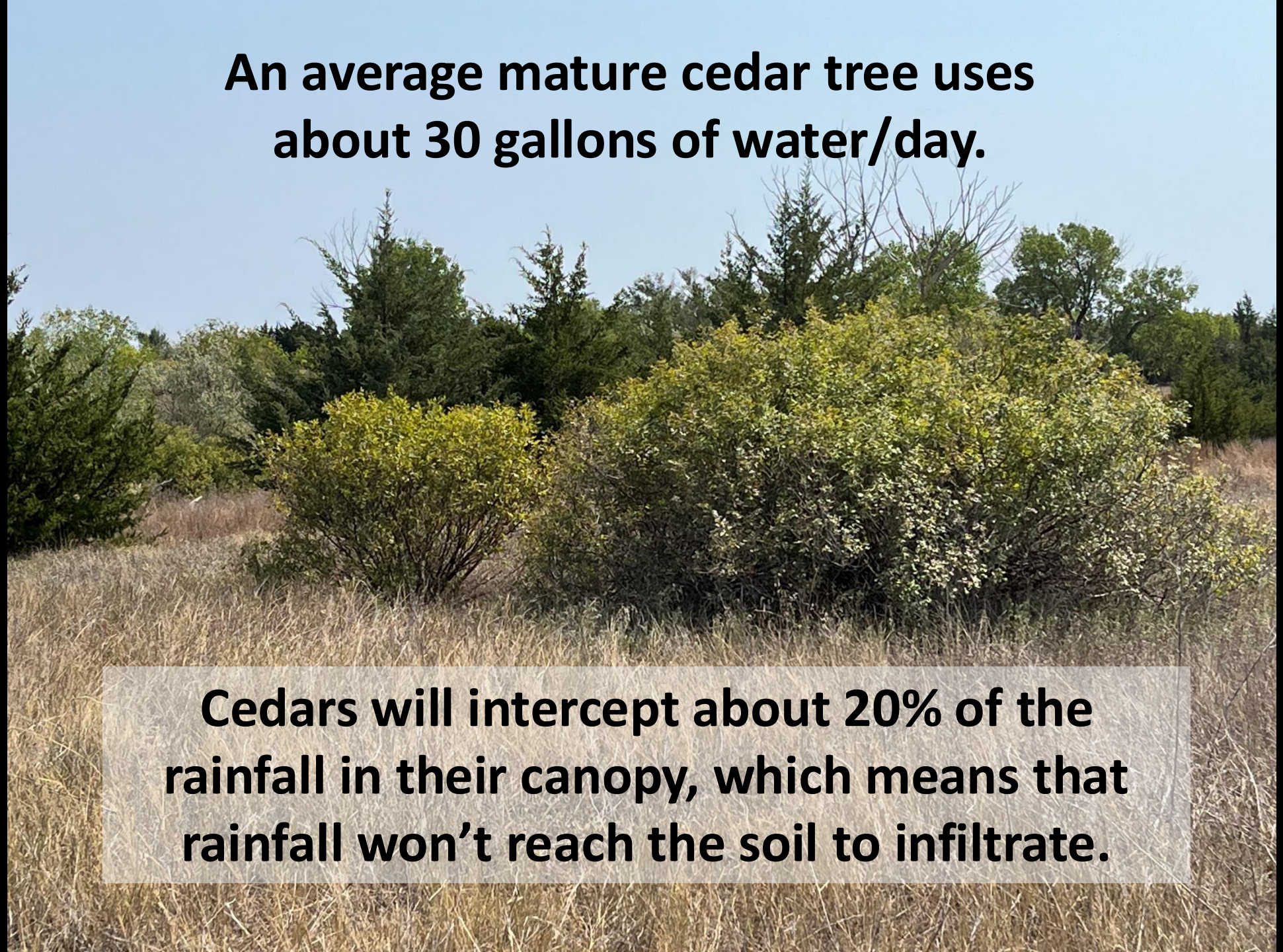
Late Spring Adjust
No further reductions
Reduce stocking by 15-20%, or by percentage deficit from average Apr + May + Jun precip
No further reductions
Reduce stocking by 15-20%, or by percentage deficit from average Apr + May + Jun precip
Total Reduction 15-25%
Total Reduction 30-45%, or more
Total Reduction 10-15%
Total Reduction 25-35%, or more
Reduce Stocking
1) Early wean
2) Cull opens
3) Cull worst performers
4) Remove stockers or replacements, reallocate cows
5) Rotate out to other pasture or dry lot


An average mature cedar tree uses about 30 gallons of water/day.
Cedars will intercept about 20% of the rainfall in their canopy, which means that rainfall won’t reach the soil to infiltrate.