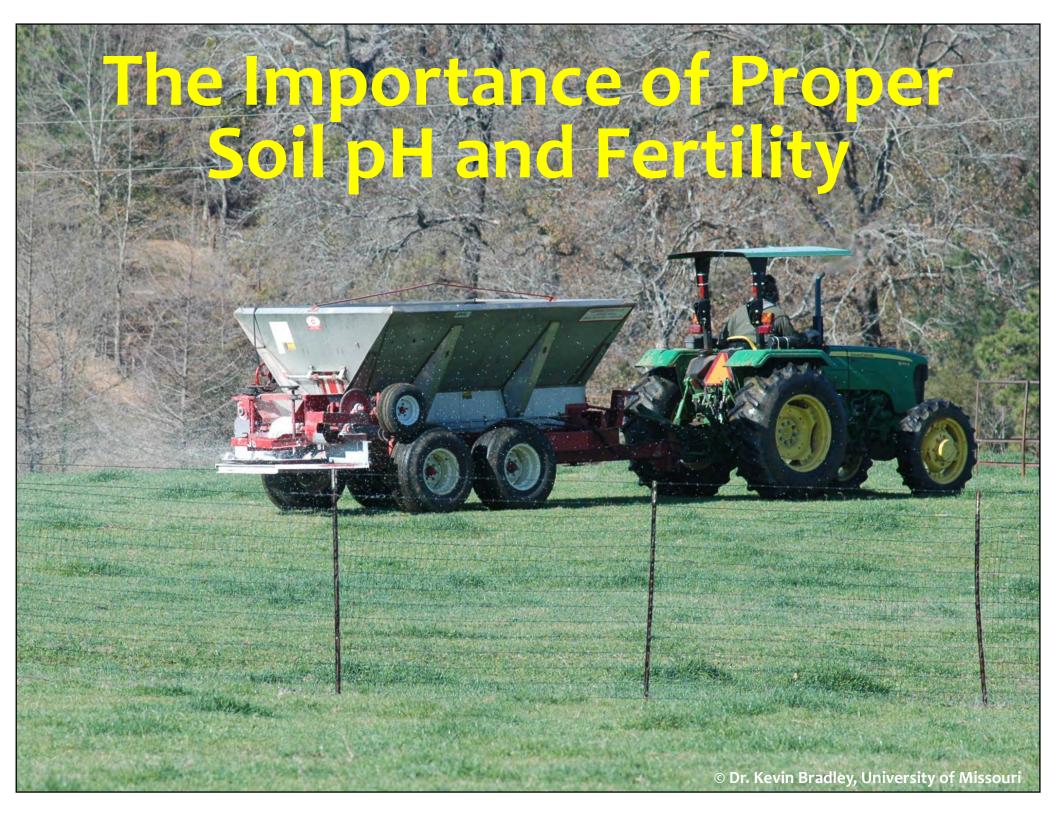


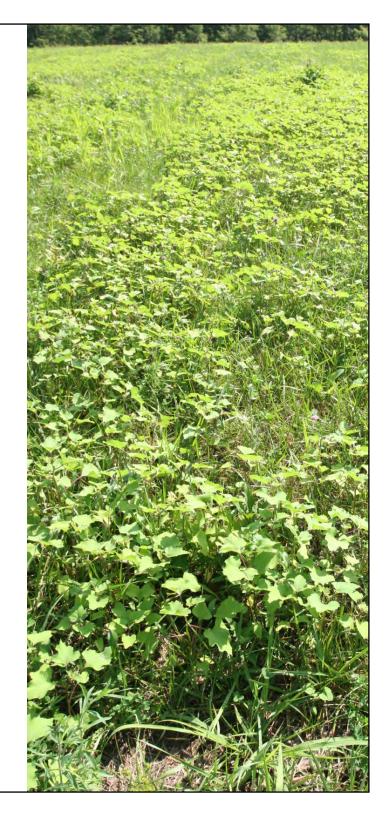
Publication

- a guide for identifying weeds and selecting and comparing herbicides
- color photos of 75 weeds in various stages of development
- tables provide details on weed response to herbicides, herbicides currently labeled for control of various weeds, and crop replant restrictions
- Order at: www. extension. missouri.edu/p/ipm1031



Missouri Pasture Survey

- 1. What are the most common weeds in Missouri pastures?
- 2. What is the seasonal distribution of weeds in Missouri pastures?
- 3. Are overall weed infestation levels associated with specific nutrient and/or soil pH levels in pastures?
- 4. Can we identify any <u>specific</u> weed-nutrient and/or weed-pH relationships?

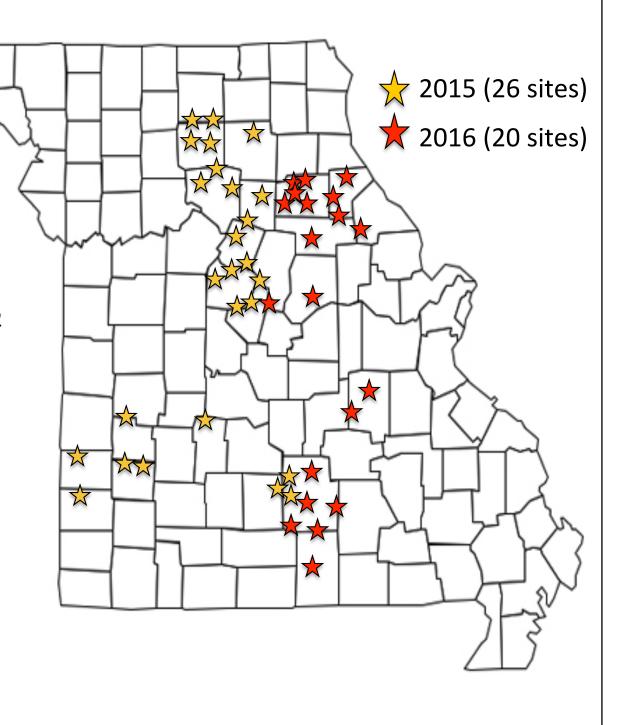


Methods

 Survey conducted in Missouri pastures at 14-day intervals throughout each season (April-Oct)

1, representative 20-m²
 sampling area was
 surveyed per 10 acres
 of each pasture

The center of each 20-m² sampling area was georeferenced in order to survey the same location throughout the season



The Importance of Proper Soil pH and Fertility

- 37 of 46 (80%) of pastures surveyed were classified as having LOW or VERY LOW soil P levels
- 17 Of 46 (37%) of pastures surveyed were classified as having LOW or VERY LOW soil K levels
- Average soil pH in the pastures surveyed was 5.8

The Importance of Proper Soil pH and Fertility

Based on a survey of 46 Missouri pastures in 2015-16:

- a 1-unit increase in soil pH corresponded to ~ 4,100 fewer weeds per acre
- each 0.1 ppm unit increase in P and K corresponded to 162 and 12 fewer weeds per acre, respectively.

Influence of Select Soil and Forage Properties on Weed Density in Missouri Pastures

Parameters	Change in Total Weed Density per acre for each unit Increase in Selected Parameter
Soil pH	- 4,168
Forage Groundcover	- 283
Manganese	243
Sulfur	162
Phosphorus	- 162
Zinc	- 162
Potassium	- 12
Magnesium	- 8
Calcium	- 4

^{*}O.M. and forage groundcover represented as %, soil pH in 1.0-unit increments, and Ca, K, Mg, Mn, P, S, and Zn as 1-ppm.

Influence of Select Soil and Forage Properties on Weed Density in Missouri Pastures

Change in Density per Acre for each 1-unit Increase in Selected Parameter

Parameter*	Common Ragweed	Horsenettle	Ironweed Species	Vervain Species	Annual Fleabane	Lanceleaf Ragweed	Yellow Foxtail
Phosphorus	-59	71	-36		-55	-176	
Potassium		4	-8	8	-6	-28	
Magnesium		-4			2	12	4
Calcium		-0.6	0.4		0.4		2
рН	-2454				834	-1993	-864
Sulfur	150						-326
Zinc	-257		-93		-83		
Manganese	91	30	-63	28	-49		-65
Forage Grndcover			-26	-20		-158	-26

^{*}O.M. and forage groundcover represented as %, soil pH in 1.0-unit increments, and Ca, K, Mg, Mn, P, S, and Zn as ppm.



Spray or Mow? How much does it cost per acre?







What are the factors you should consider before you spray a herbicide on a grass pasture or hay field?

Spring applications of metsulfuroncontaining herbicides (Cimarron products, Chaparral, etc.) can have good and bad consequences.



What are the factors you should consider before you spray a herbicide on a grass pasture or hay field?

 Spring applications of most metsulfuron-containing herbicides can reduce tall fescue seed heads.

14 to 61% tall fescue seed head reduction when applied to 6-inch vegetative tall fescue (early to mid April); 53 to 88% reduction when applied to 12-inch boot stage tall fescue (early May).



What are the factors you should consider before you spray a herbicide on a grass pasture or hay field?

2. Spring applications of most metsulfuron-containing herbicides will likely cause tall fescue yield reductions!

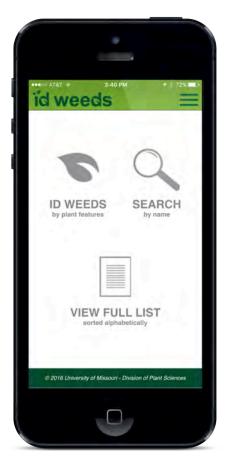
careful application timing (boot stage or later) can minimize this

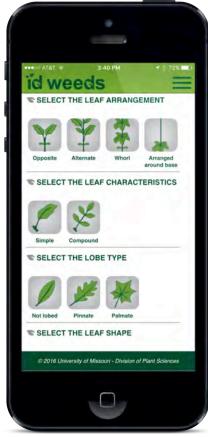


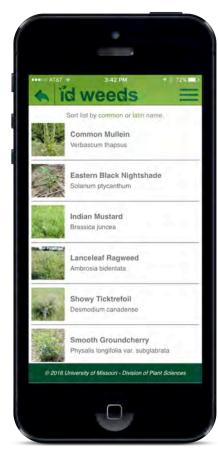
Principles of Pasture and Hayland Weed Control with Herbicides

1. Weed Identification

We Have an App for that!









Most Common Weeds in Missouri Pastures

(results based on 46 Missouri pastures surveyed in the 2015 and 2016 growing seasons)

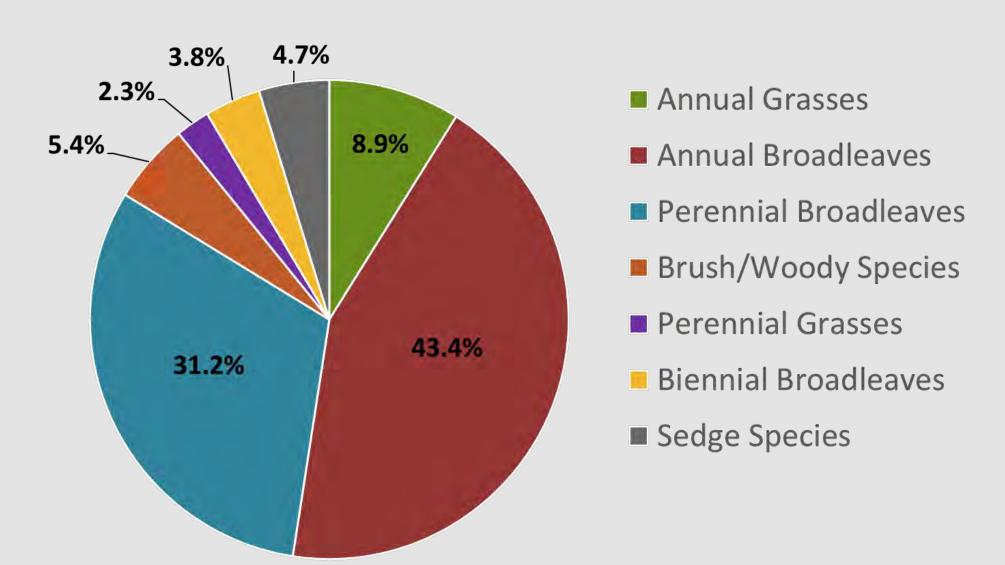
Weed	Scientific Name	Frequency of Occurrence	Avg. Density per Acre	Grazing Preference
Horsenettle	Solanum carolinense	100%	2,873	Avoided
Common Ragweed	Ambrosia artemisiifolia	96%	5,059	Grazed
Nutsedge spp.	Cyperus spp.	93%	1,862	Avoided
Annual Fleabane	Erigeron annuus	93%	1,740	Avoided
Vervain spp.	Verbena spp.	80%	1,174	Avoided
Yellow Foxtail	Setaria pumila	80%	3,440	Grazed
Broadleaf Plantain	Plantago major	80%	931	Grazed
Virginia Copperleaf	Acalypha virginica	80%	971	Avoided
Dandelion	Taraxacum officinale	78%	1,619	Grazed
Tall Ironweed	Vernonia gigantea	72%	1,781	Avoided

Principles of Pasture and Hayland Weed Control with Herbicides

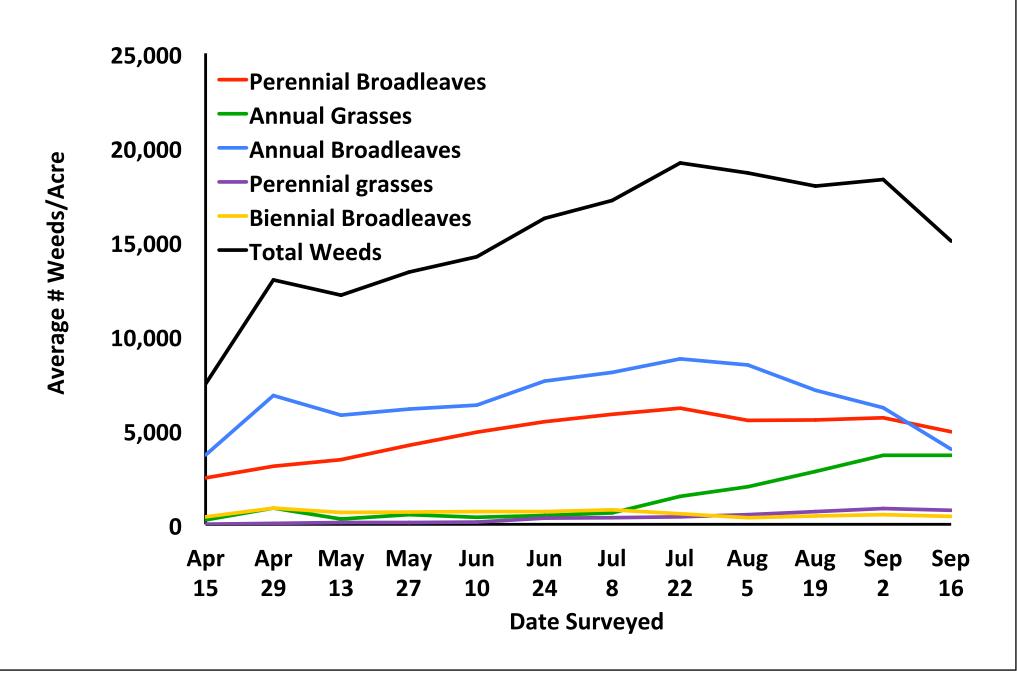
- 1. Weed Identification
- 2. Growth Habit Identification
- 3. Timing of Application



Predominant Weed Types in Missouri Pastures



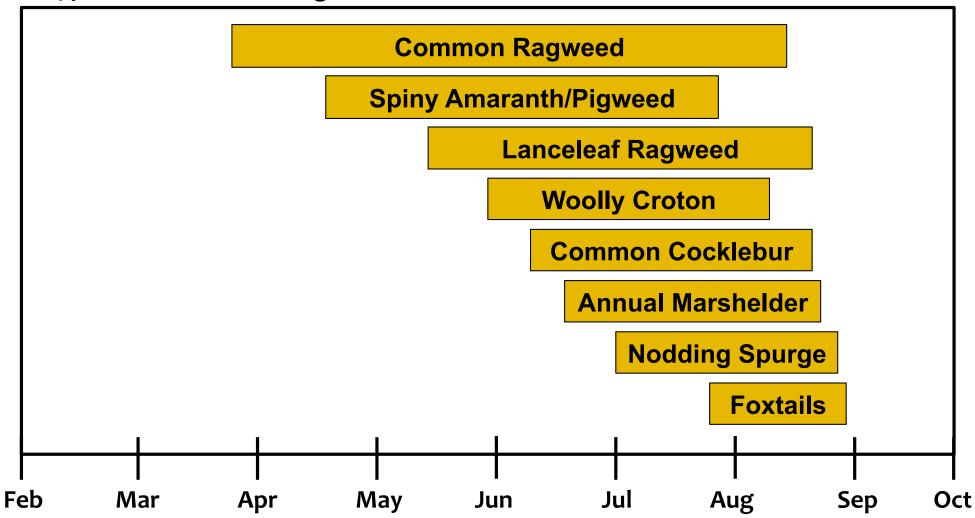
Seasonal Distribution of Weed Species in Missouri Pastures (results based on an average of 46 pastures surveyed in 2015-2016)



Proper Herbicide Application Timing is Critical

What weed species are you targeting? When is the best time for control?

Typical Timeline of Emergence of Some Common Summer Annual Pasture Weeds



*Can vary based on grazing pressure, cutting frequency, tall fescue height, temperature, etc.

Principles of Pasture and Hayland Weed Control with Herbicides

- 1. Weed Identification
- 2. Growth Habit Identification
- 3. Timing of Application
- 4. Herbicide and Rate Selection



Some Common Pasture Herbicides

```
Plotter/Purestand/others (metsulfuron)
     2, 4-D/Weedar / etc. (2,4-D)
        Banvel/Clarity (dicamba)
        Milestone (aminopyralid)
           Remedy (triclopyr) Crossbow (2,4-D+Remedy)
           Stinger (clopyralid) Graslan L (Tordon + 2,4-D)
           Tordon (picloram) Surmount (Tordon+Starane)
                             Weedmaster (2,4-D+Banvel)
                            Chaparral (Milestone+Cimarron)
                          PastureGard HL (Remedy+Starane)
                        Cimarron Max (Cimarron+Banvel+2,4-D)
                       Forefront/GrazonNext(Milestone+2,4-D)
                       Grazon P+D/Gunslinger (Tordon+2,4-D)
```



Some of the Most Common Poisonous Weeds in Missouri

- Black Cherry
- Black Locust
- Black Nightshade
- Jimsonweed
- Johnsongrass
- Milkweed Species
- Perilla Mint

- Poison Hemlock
- Pokeweed
- Snow-on-the-Mountain
- White Snakeroot
- Nodding Spurge
- Woolly Croton







Perilla Mint

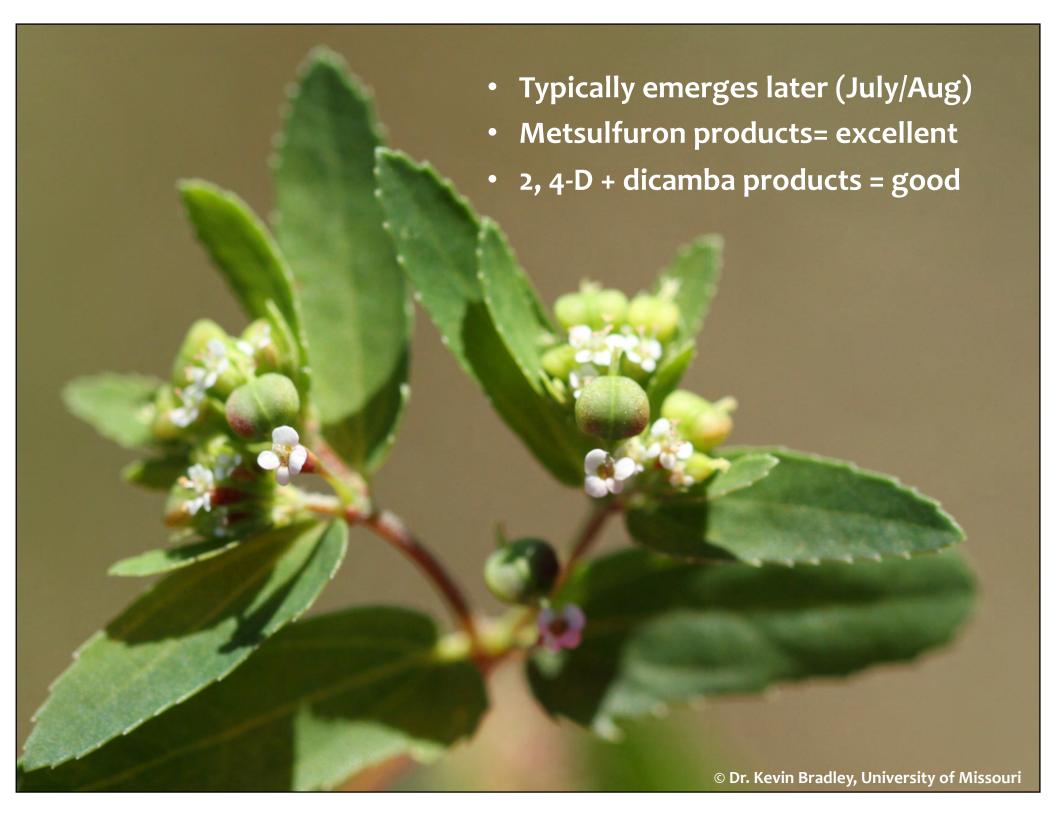
Poisonous weed that primarily occurs in shady environments around pastures and hay fields.

Control: Timing is the key! Most pasture herbicides will provide excellent control if applied to small plants that are young and actively growing.

science







Poison Hemlock

- Fresh poison hemlock tissue has been reported to be lethal at amounts ranging from 2 to 6 grams of plant material per pound of body weight in cattle, sheep, and pigs (Keeler and Balls 1978; Panter et al. 1988)
- Rosette applications of Grazon P+D, GrazonNext, or mixes of either with Remedy are very effective as a broadcast spray
- Many options for spot treatment



Woolly Croton

- Plant covered with short, dense hair
- Toxic only in large quantities; usually avoided by grazing animals
- Common pasture herbicide premixes will provide good control



Snow-on-the-Mountain (Euphorbia marginata)

Most pasture herbicide premixes will provide good control when applied in the vegetative stage







Wild Indigo:

Spot treatment of picloramcontaining products Grazon P+D, Tordon, etc) will provide good control of these species











Horsenettle Control Recommendations

Herbicides: Grazon P+D, Grazon Next, Weedmaster (or any 2,4-D + dicamba combination), Cimarron Max, and Chaparral all provide similar control 1 year after treatment. Choose based on price, legume replant interval, etc.

Timing: pre-bloom to bloom stage (can occur several times during the year).







Bull Thistle









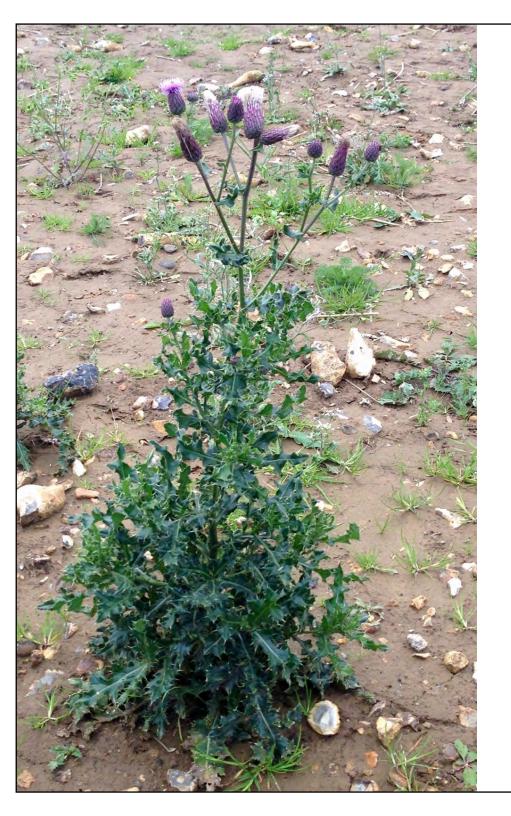


Musk and Bull Thistle Recommendations

The key is the timing. We can get good control with Grazon P+D, GrazonNext, Milestone, 2,4-D + Banvel, Weedmaster, Cimarron Max, Chaparral, etc. with rosette stage applications.

Bolted plants are more difficult to control.





Canada Thistle

(Cirsium canadensis)

- Often incorrectly identified and/or confused with musk thistle in Missouri.
- Rarely occurs in Missouri!
 Much more common in more northern states.
- The only true perennial thistle (with creeping roots or rhizomes).
- Pre-bloom applications the most effective: Grazon P+D, GrazonNext, Milestone, Tordon

Blackberry Species in Missouri

Upright, Cane-type (Blackberries)

- Rubus allegheniensis, Common Blackberry
- Rubus argutus, Smooth Blackberry
- Rubus occidentalis, Black Raspberry
- Rubus pensilvanicus, Penn. Blackberry
- Rubus armeniacus, Himalaya Blackberry

Prostrate, Creeping-type (Dewberries)

- Rubus flagellaris, Dewberry
- Rubus trivialis, Southern Dewberry

Upright Blackberry Recommendations

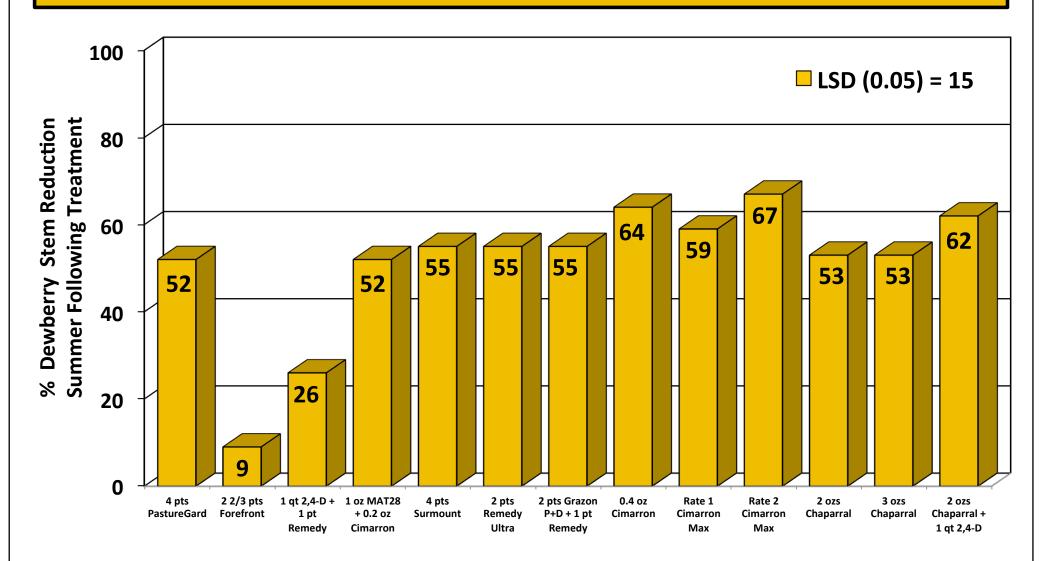
- Do not mow the season of treatment; mowing stems the year before treatment is OK
- Early fall is the better application timing; ~ 2-3 weeks before 1st frost
- Metsulfuron alone seems to provide best control at 0.4-0.5 oz/A; similar but slightly lower control achieved with PastureGard or with mixes of Remedy (2,4-D + Remedy, Grazon P+D + Remedy)
- Spot-spraying will provide better results and is more economical







Northern Dewberry Control with Selected Herbicide Treatments (Salem, MO 2008-2011)



Treatments (Late-Sep/Early-Oct Application Timing)

Some weeds cattle are unlikely to eat because of bitter taste and/or poor palatability...





Sericea Lespedeza (Lespedeza cuneata L.)

- Perennial legume native to eastern Asia
- Introduced into the U. S. in the late 1890's as a potential forage species and also planted for erosion control
- Declared a noxious weed in Kansas and Colorado, spreading and becoming more problematic in many other states

science

Sericea Lespedeza







- Prolific Seed Producer: at least 1,000 seed per stem; ~600 lbs seed/A (Guernsey 1970; Ohlenbusch et al. 2001)
- □ Allelopathic: Sericea lespedeza residues reduced the germination, emergence, and biomass of rye and tall fescue (Kalburtji and Mosjidis 1993)



Economic Impact?

- Average annual forage loss of \$29 million in Flint Hills region of Kansas (Scott 1995)
- Long-term economic impact studies have shown a reduction in the 30-yr net present value of grazing land in Kansas from \$294/acre for non-infested land to \$74/ acre for infested land



Grazing?

- Tannin content increases dramatically with maturity;
 6% in 4-inch plants, 21% in 36-inch plants (Stitt 1943)
- Cattle may graze it when young, but almost never when plants are >4-6 inches tall
- Dead stems from previous year persist into the summer, making it difficult for cattle to graze new growth (Koger et al. 2002)



Sericea Lespedeza Recommendations

- In MO research, application timing does not usually influence Sericea lespedeza control 1 yr after treatment. When it does, it is typically with metsulfuroncontaining products.
- 1.5 pts PastureGard HL per acre has been the most consistent treatment across many years of our research, regardless of application timing.
- Triclopyr alone (Remedy Ultra) can also provide good control but generally not as good as PastureGard.
- Metsulfuron-containing products can also provide good control but are typically best later in the season in the pre-bloom to post-bloom timeframe.





Ironweed Species

Very common perennial weed of pastures and hay fields in Missouri.

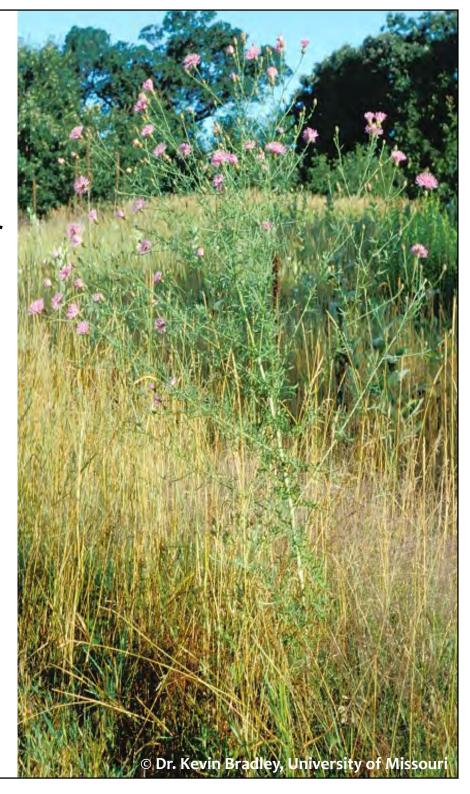
Chemical: Triclopyr (Remedy Ultra, PastureGard) is the key! Grazon P+D, Grazon Next, Cimarron Max will provide high levels of suppression, but addition of Remedy will improve control dramatically.

Mowing: 3 times per year for 2 years provided 80-90% control.



Spotted Knapweed

- biennial or short-lived perennial from a taproot
- soil disturbance favors higher plant densities
- plants are allelopathic
- produce an average of 1000 seed per plant; > 50% of seed remain viable after burial in the soil for 5 years (Davis et al. 1993)
- Control: at least 5 fl oz Milestone/A, 1.5 pt GrazonNext, or 1 pt Tordon 22k/A, whichever costs less

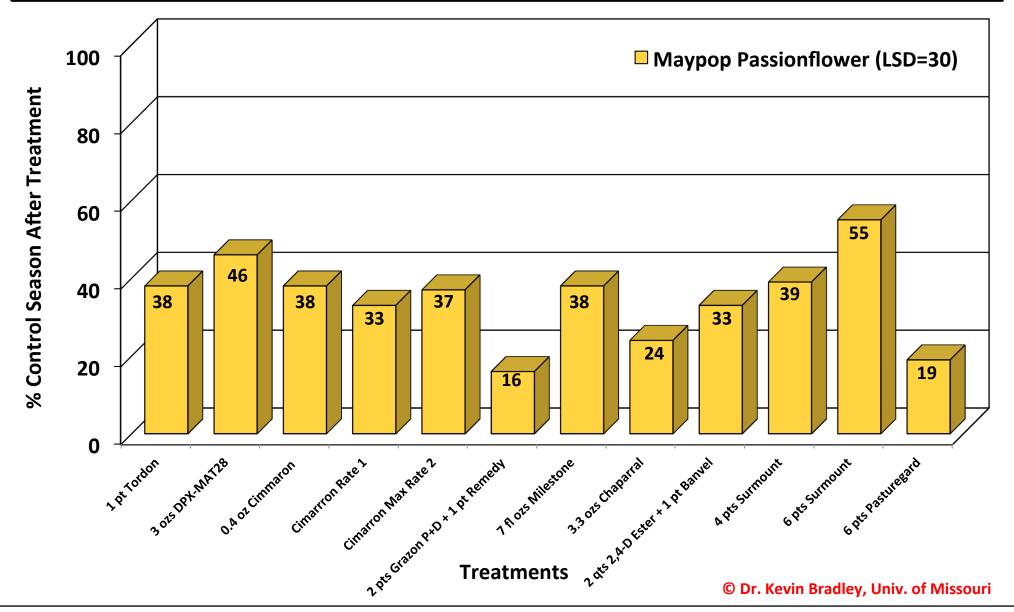


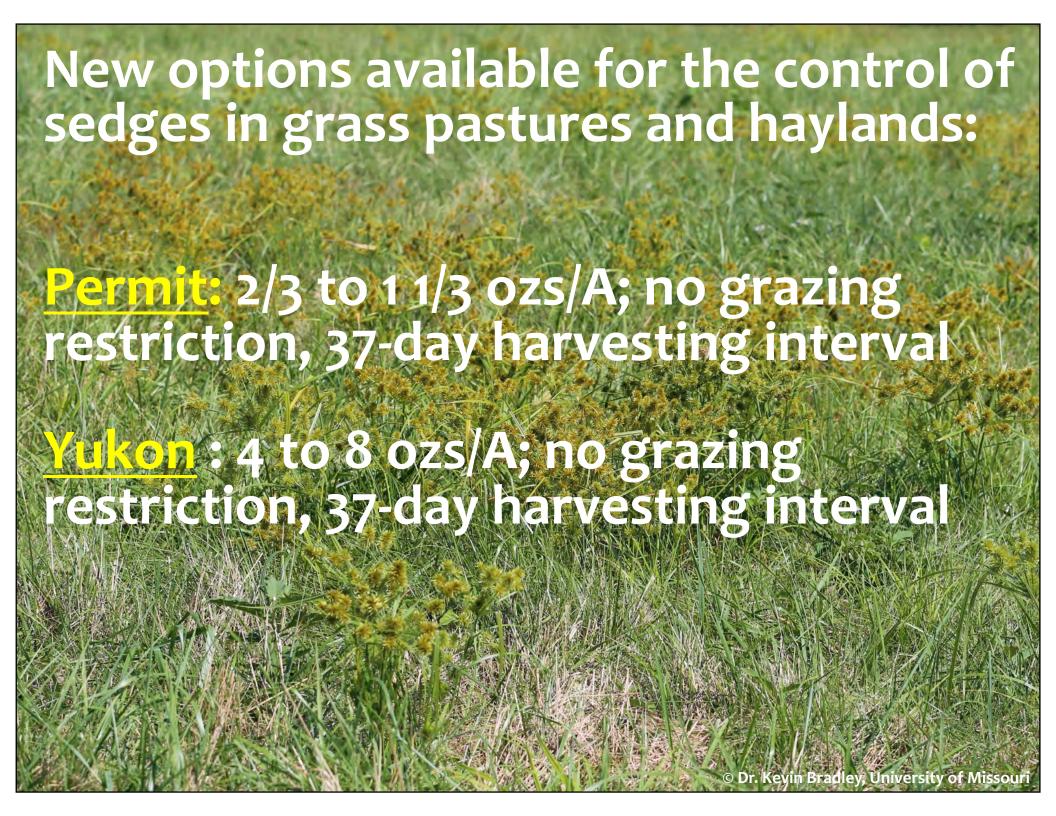


Maypop Passionflower Passiflora incarnata









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