

Combining All Mgmt Options Into Integrated Weed Mgmt Effort

K. George Beck
Professor of Weed Science
Dept Biog Ag Sciences & Pest Mgmt
Colorado State University

Successional Weed Management



Weed Management Strategies

- **Prevention:**
 - Active steps to avoid occurrence
- **Eradication:**
 - Elimination from an area
- **Control:**
 - Decrease population below critical threshold

Integrated Pest Management

- Use combination of control methods
 - Reduce population of pest organisms below biological & economic threshold
 - Minimize pesticide use
 - Not necessarily eliminate use
 - Optimize crop yield and return to producer
- Integrated Weed Management
 - IPM applied to invasive weeds

References

- Sheley, R.L., T.J. Svejcar, & B.D. Maxwell. 1996. A theoretical framework for developing successional weed management strategies on rangeland. *Weed Technology* 10:766-773
- Sheley, R.L., S. Kedzie-Webb, & B.D. Maxwell. Integrated weed management on rangeland. *in* R.L. Sheley & J.K. Petroff, eds. *Biology & Management of Noxious Rangeland Weeds* p 57-68

Ecologically Based Weed Management

- Develop strategies based upon current understanding of succession
 - Recognizes plant communities dynamic
 - Use technology to enhance natural processes & mechanisms that regulate vegetation change
 - Direct **weed infested communities** on trajectory to more desirable community

Causes of Succession

- Site availability
- Differential species availability
- Differential species performance
- **Successional weed management exploits these causes**

Successional Weed Management Components

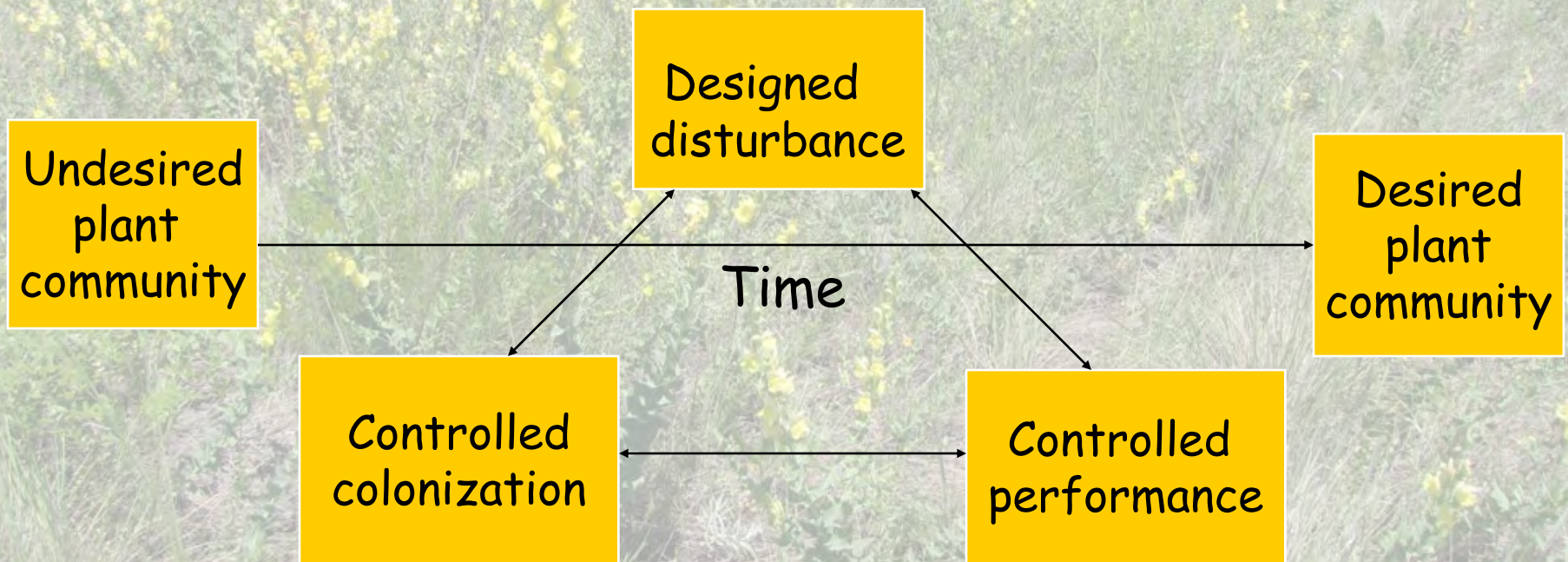
- Mgmt component:

- Designed disturbance
- Controlled colonization
- Controlled species performance

- Succession cause:

- Site availability
- Differential species availability
- Differential species performance

Ecological Opportunities for Weed Management



Successional Weed Mgmt: Treatment Examples

<u>Designed Disturbance</u>	<u>Controlled Colonization</u>	<u>Controlled spp Performance</u>
Bdlf herbicide	Biocontrol	Biocontrol
Cultivation	Mowing	Mowing
Non-selective herbicide	Seeding	Early spr grazing
Flooding & draining	Fertilization	Fertilization
Grazing	Grazing	Sheep grazing
Burning	Selective herbicide	Selective herbicide
	Burning	Reduce soil fert.
	Prevent wd intros	Irrigation

Some Examples

- CSU Weed Science research:
 - Canada thistle mowing plus herbicide studies
 - Weed Technology 14:351-356; 2000
 - Russian knapweed control with herbicides, minimum tillage, no tillage and seeding
 - Leafy spurge management with flea beetles and sheep grazing
- MSU models
 - Chap 5 Biology & Mgmt Noxious Rangeland Weeds

Canada Thistle

Kersey

CT 237 shoots/m²
47% cover
Grass 0% cover
Rush 8% cover

Year 1

Year 2

Mow 3 times
+
Curtail 2 qt/A

Mow 3 times
+
Curtail 2 qt/A

Kersey

CT 6 shoots/m²
8% cover
Grass 31% cover
Rush 54% cover

Brighton

CT 39 shoots/m²
42% cover
Grass 6% cover

Brighton

CT 80 shoots/m²
43% cover
Grass 36% cover

Designed disturbance
+
Controlled colonization
+
Controlled spp performance

Weed Management Herbicide Component

- Pasture & rangeland weed management
“born” in cattle production
 - Grasses favored
- Many think if a herbicide is used to decrease weed abundance
 - Select for grass species
 - Eliminate forbs & shrubs

Russian Knapweed Control & Native Forb & Shrub Establishment

- Experiment established May, 2009
 - Strip-strip plot - four replications; $P=0.05$
 - 4 herbicide treatments
 - Aminocyclopyrachlor at 0.5, 1.0 & 2.0 oz ai/A
 - Untreated control
 - 16 native seeded species
 - 10 forbs
 - 4 shrubs
 - 2 cool season perennial grasses
 - Herbicides applied May 14, 2009
 - Native species seeded April 2010



Blanket Flower
Gaillardia pulchella

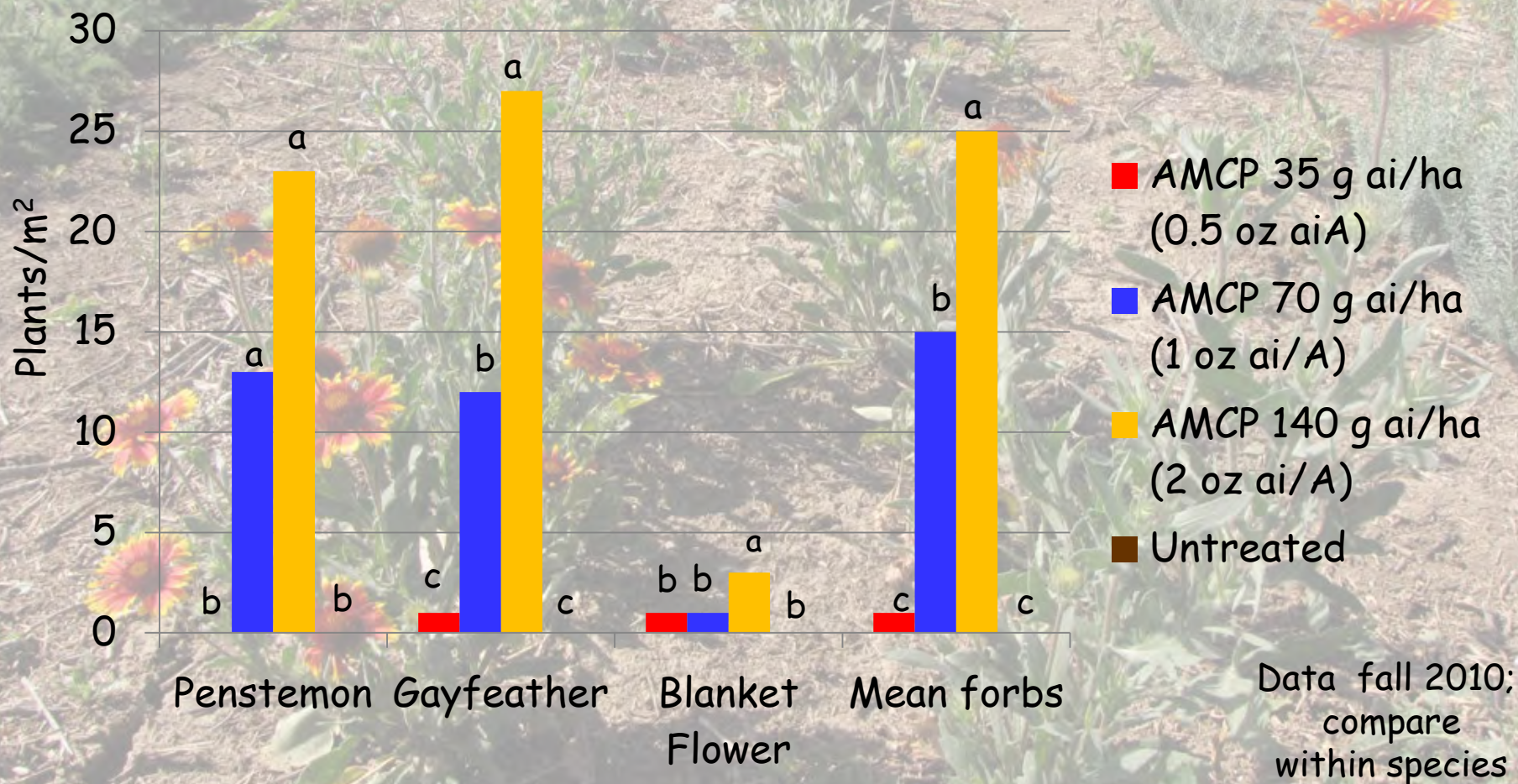


Gayfeather
Liatris punctata



Penstemon spp.

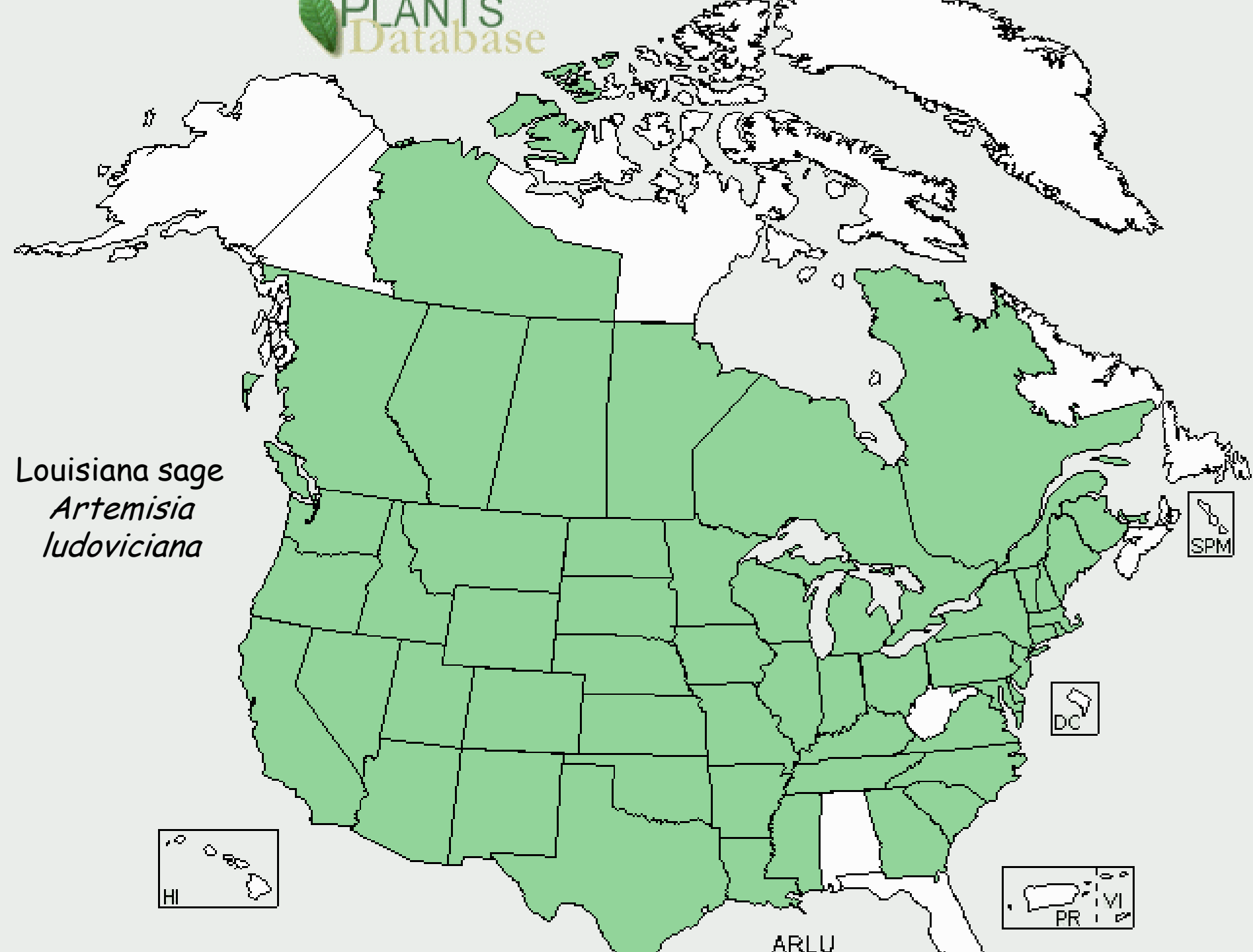
Russian Knapweed Control & Native Forb Establishment



RK control: 0.5 oz ai=31%; 1 oz ai=38%; 2 oz ai=87%; untrt=0%



Louisiana sage

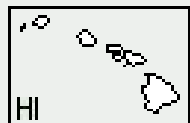




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Fourwing saltbush; *Atriplex canescens*

Fourwing
saltbush
*Atriplex
canescens*



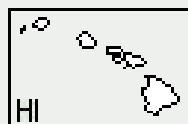
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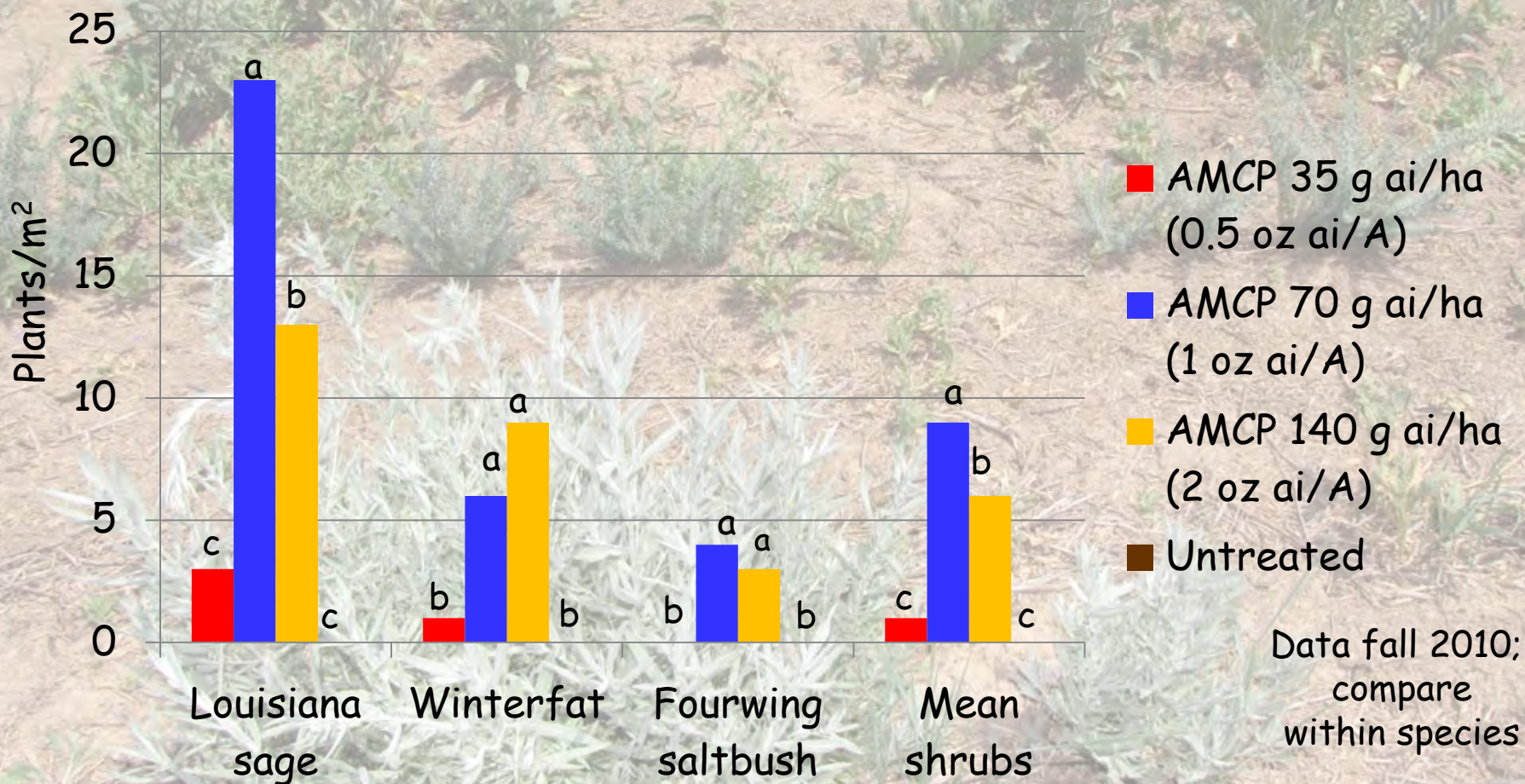
Winterfat; *Krascheninnikovia lanata*

Winterfat
*Krascheninnikovia
lanata*



KRASC

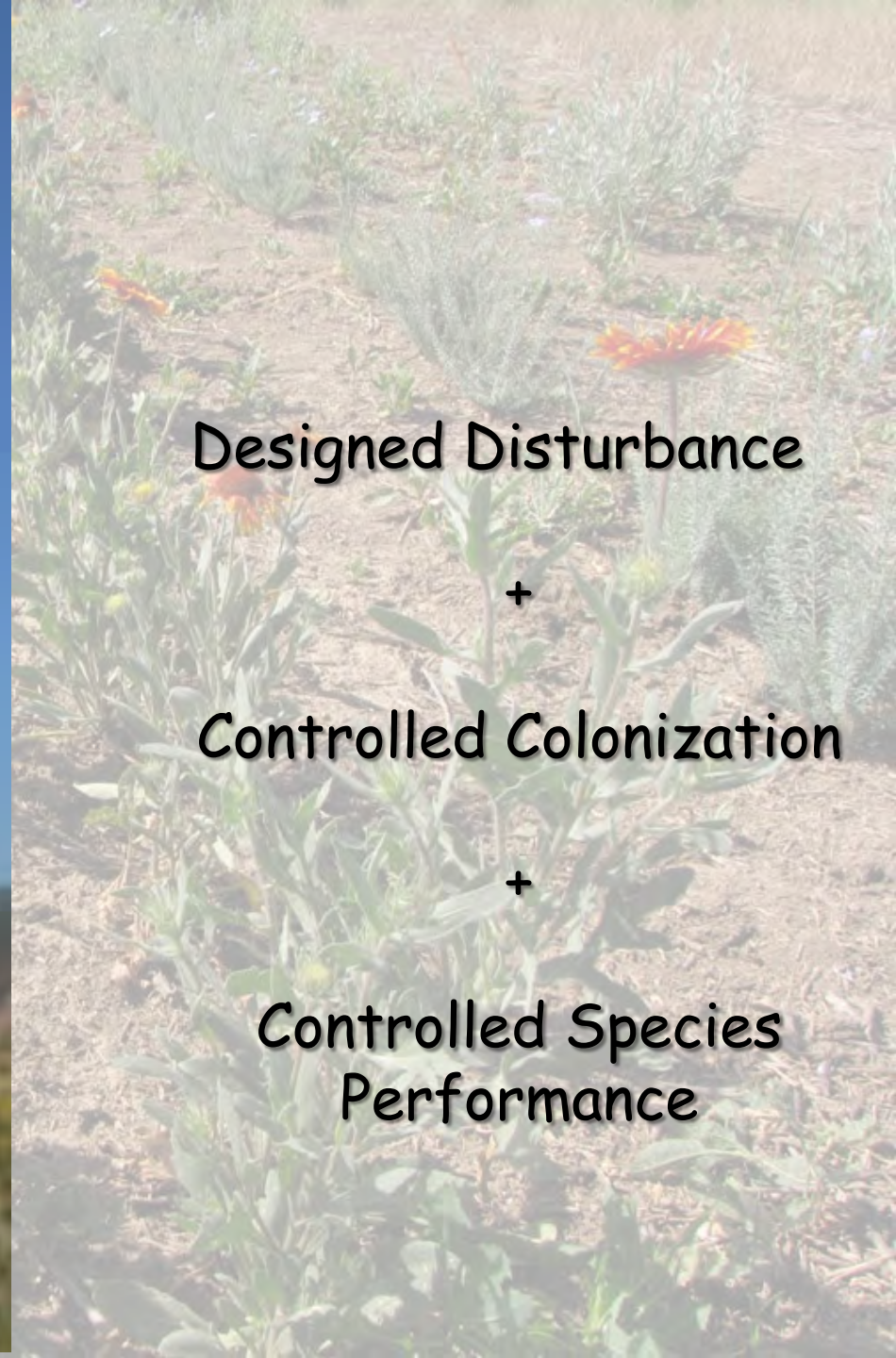
Russian Knapweed Control & Native Shrub Establishment



RK control: 0.5 oz ai=31%; 1 oz ai=38%; 2 oz ai=87%; untrt=0%

RK Control & Native Forb & Shrub Establishment Summary

- Species richness:
 - untreated controls:
 - Forbs 8%; shrubs 0%, grasses 50%
- Aminocyclopyrachlor 2.0 oz ai/A
 - Best Russian knapweed control
 - Forbs 93%; shrubs 88%; grasses 100%



Designed Disturbance

+

Controlled Colonization

+

Controlled Species
Performance



Black dot spurge
flea beetle

Black spurge flea beetle





Leafy Spurge Grazing Research

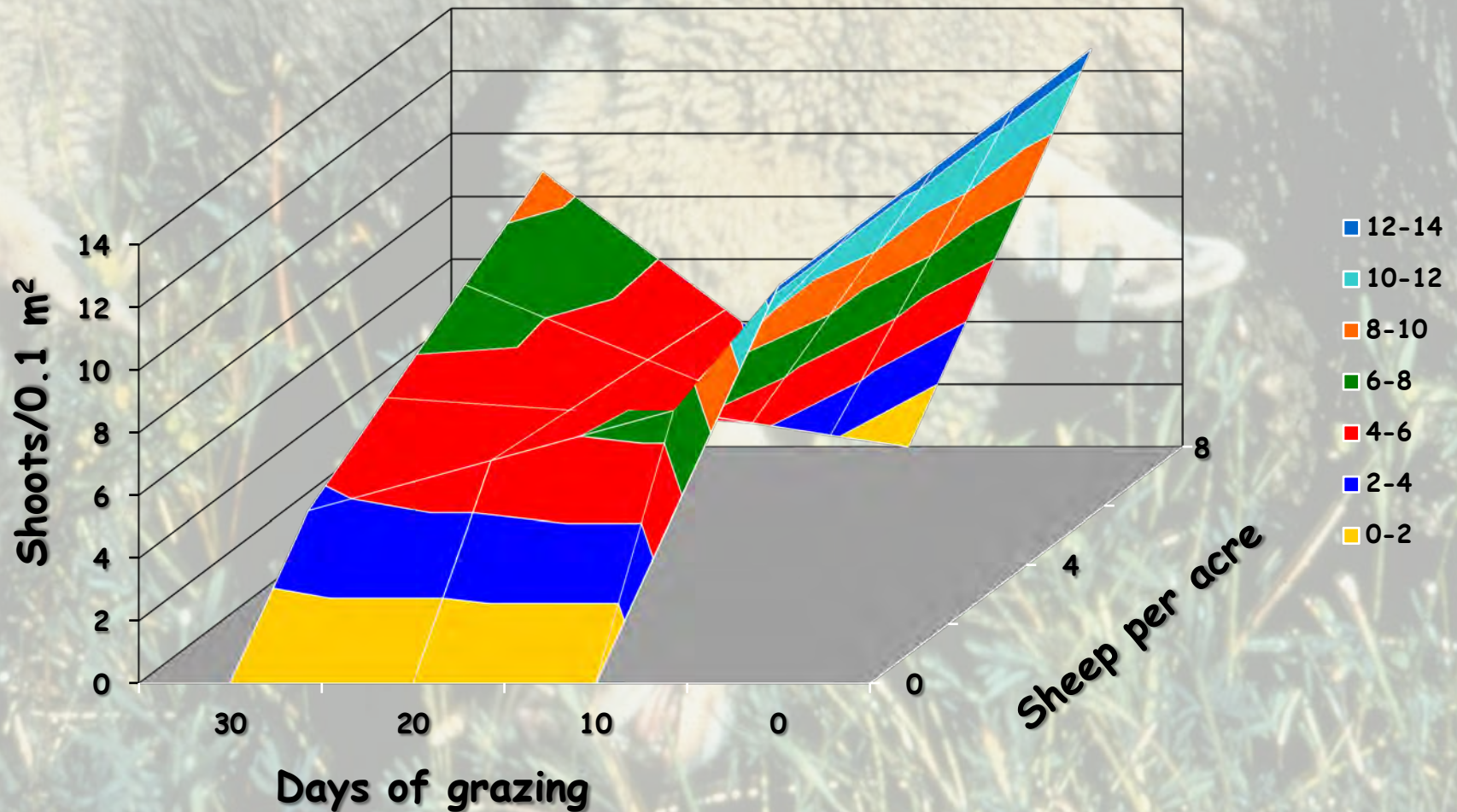
- Varied sheep stocking intensity:
 - Four sheep stocking rates
 - 2, 4, 6, or 8 sheep per acre
 - Three grazing durations
 - 10, 20, or 30 days
- With or without flea beetles
 - Flea beetles released at one end of plot
 - 500
- Experimental controls
 - No sheep grazing
 - With and without flea beetles

Leafy Spurge Grazing Research Summary

- 6 to 8 sheep/A graze 10 days for 5 yr
 - Decreased leafy density 83-94%
- 8 sheep/A graze 10 days for 5 yr plus flea beetles
 - Decreased leafy spurge density to zero!
 - 81% from sheep
 - 19% from flea beetles

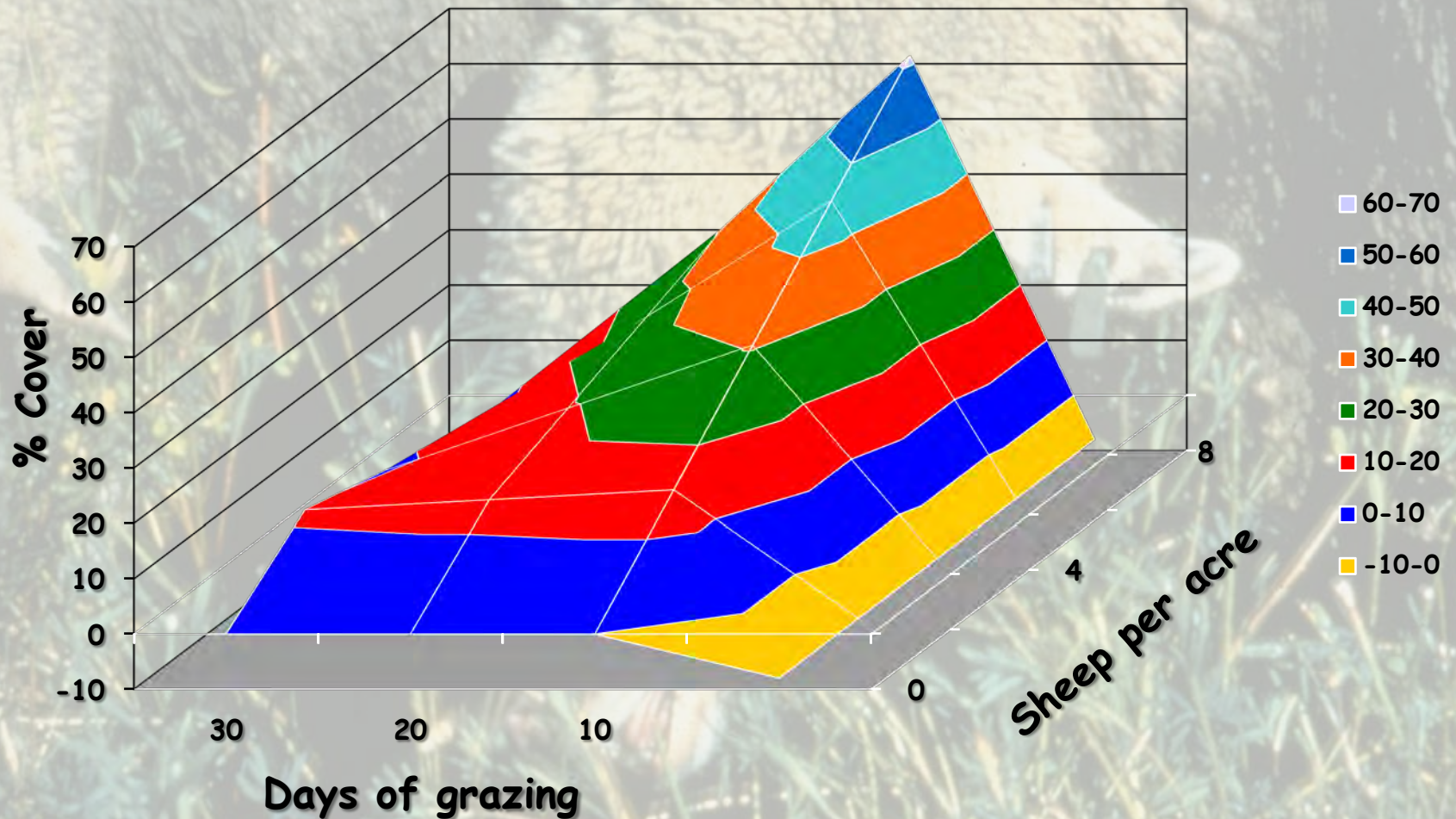
Leafy Spurge Density

Sheep Grazing + Flea Beetle Herbivory



Smooth Brome Cover

Sheep Grazing + Flea Beetle Herbivory



Leafy Spurge Mgmt Sheep + Flea Beetles

- What successional weed management components were used ?
 - Designed disturbance
 - Sheep grazing
 - Controlled colonization
 - Flea beetles and sheep
 - Controlled species performance
 - Suppressed LS and favored smooth brome



How Manage Weeds?

- Develop a comprehensive, successional weed management plan
- Implement the plan



Comprehensive Weed Management Program Includes

- Detailed map of weed infestations
- Develop successional weed mgmt strategy
 - recognize current status of plant community & what is desired state
- Evaluation of results
- Good, detailed record keeping

Objective of Weed Management

- Manage weeds so that *intended land use* can be achieved
- Intended land use & habitat will help determine
 - how aggressive to make weed mgmt program
 - weed control methods
 - what successional strategies to exploit

Comprehensive Weed Mgmt Programs Include

- Map weed infestation
 - type/size
 - weed species & desirable plants
 - habitat
 - water
- Productive or estimated land value





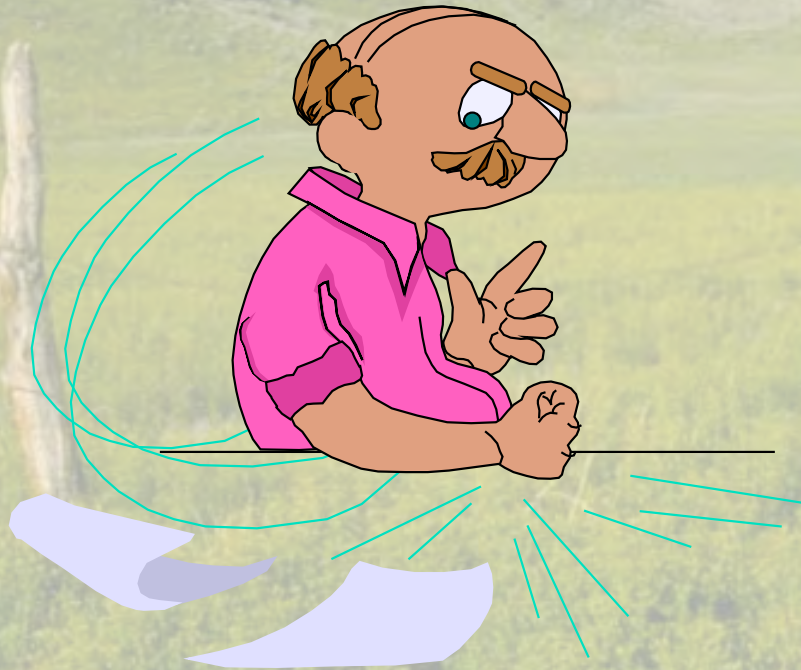
Comprehensive Weed Management Program

- Be systematic in attack!!
 - start on perimeter infestations
 - easier to control
 - costs less to control
 - regain use of that land - return on investment
 - prevents large infestations from small ones





Successful Weed Management



- *Persistence!!!*

Comprehensive Weed Management Summary:

- Map infestations
 - type/size
 - weed & desirable plants present
 - productive land value
 - habitat & water
- Develop successional mgmt strategy
- Systematic attack
- Evaluate results & keep records

Colorado State University Weed Science

