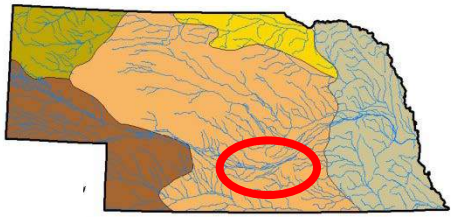
Managing Prairies for Biological Diversity and Ecological Resilience

Chris Helzer, The Nature Conservancy - Nebraska

Platte River Prairies - Nebraska



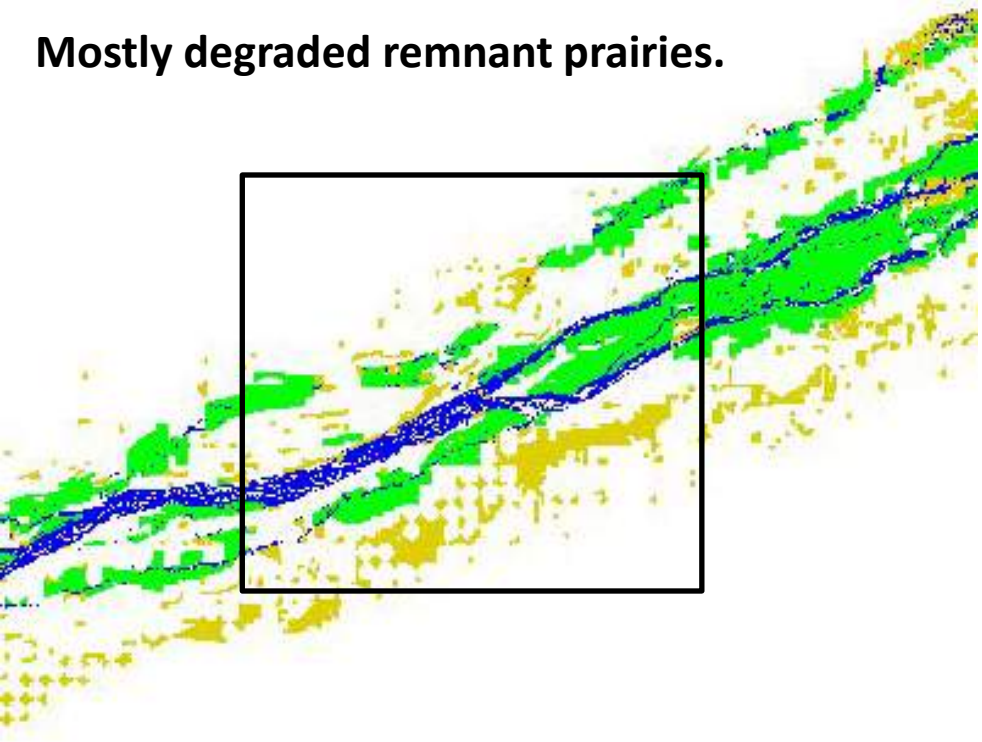
25-28” annual rainfall

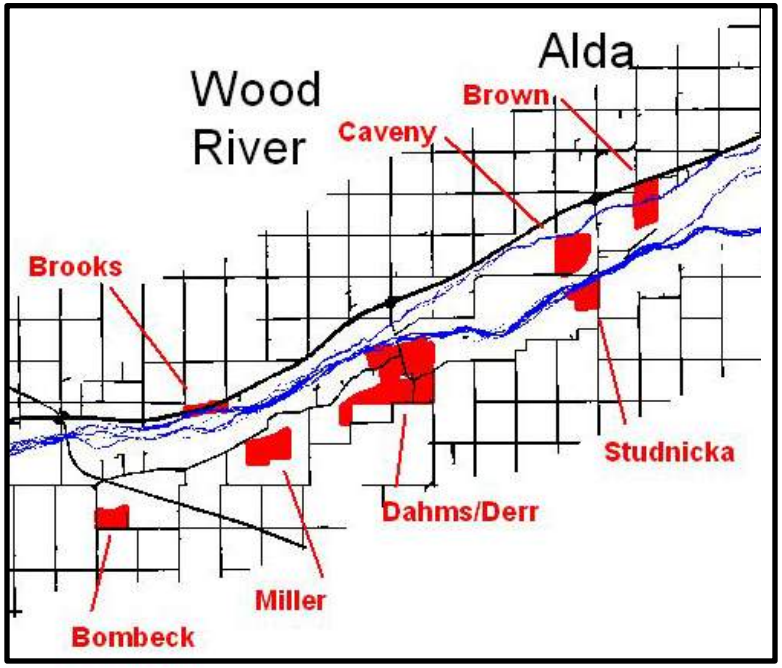
Lowland tallgrass and upland mixed-grass prairie

Sedge meadow, mesic prairie, and sand prairie communities.

Sandy loam soils, sometimes subirrigated.

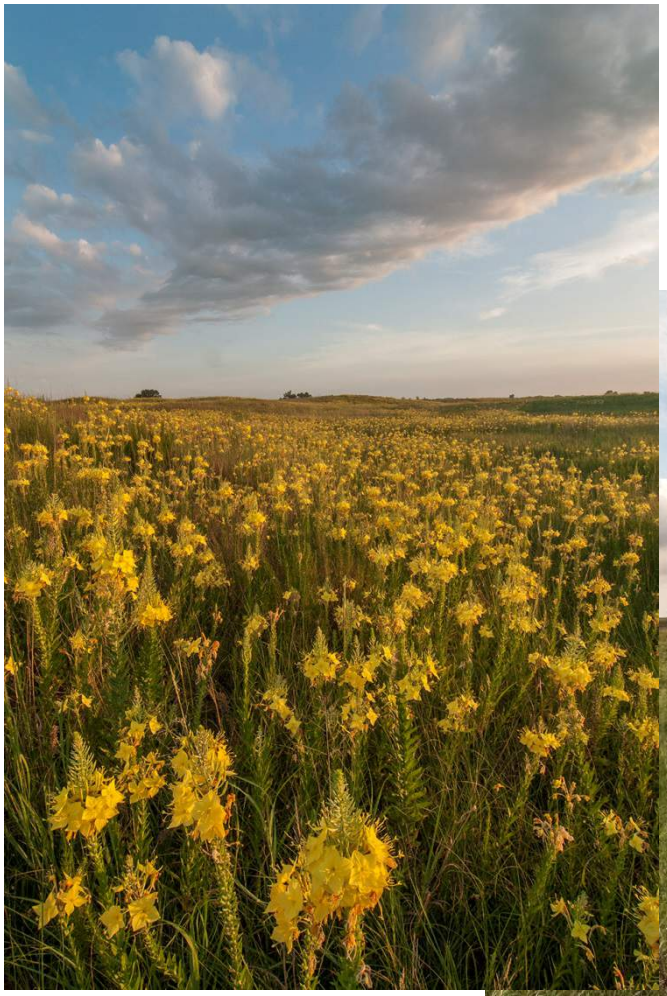
Mostly degraded remnant prairies.





Mesic/Wet Mesic Prairie

Upland Sandhill Prairie

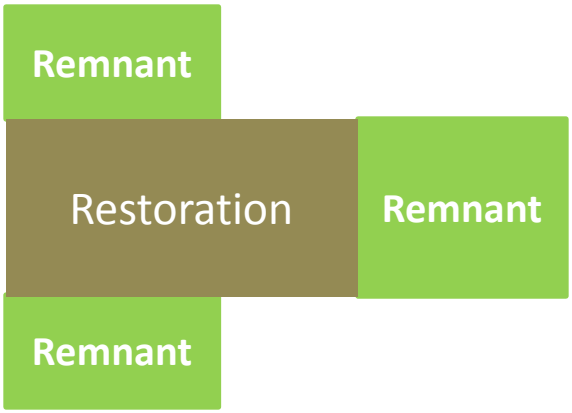


Wet Meadow

Eastern Nebraska Program Goals

Restoration Goal:

Enlarge and connect prairies along the Central Platte River



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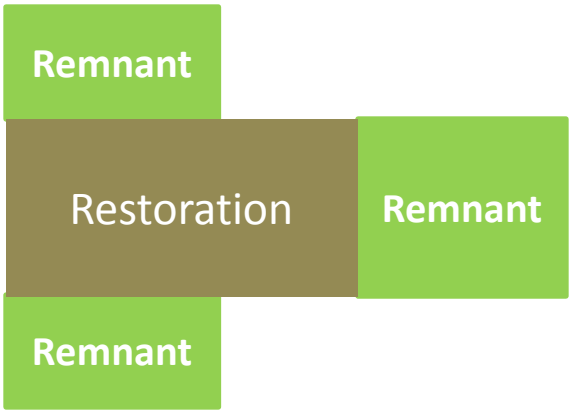
Enlarge and connect prairies along the Central Platte River

- Increase species diversity and population viability
- Increase grassland function and resilience



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Use TNC sites as experiment/demonstration sites

- Test, develop, and export rest/mgt strategies.
- Research on biological diversity/resilience.

Prairie/Wetland Restoration

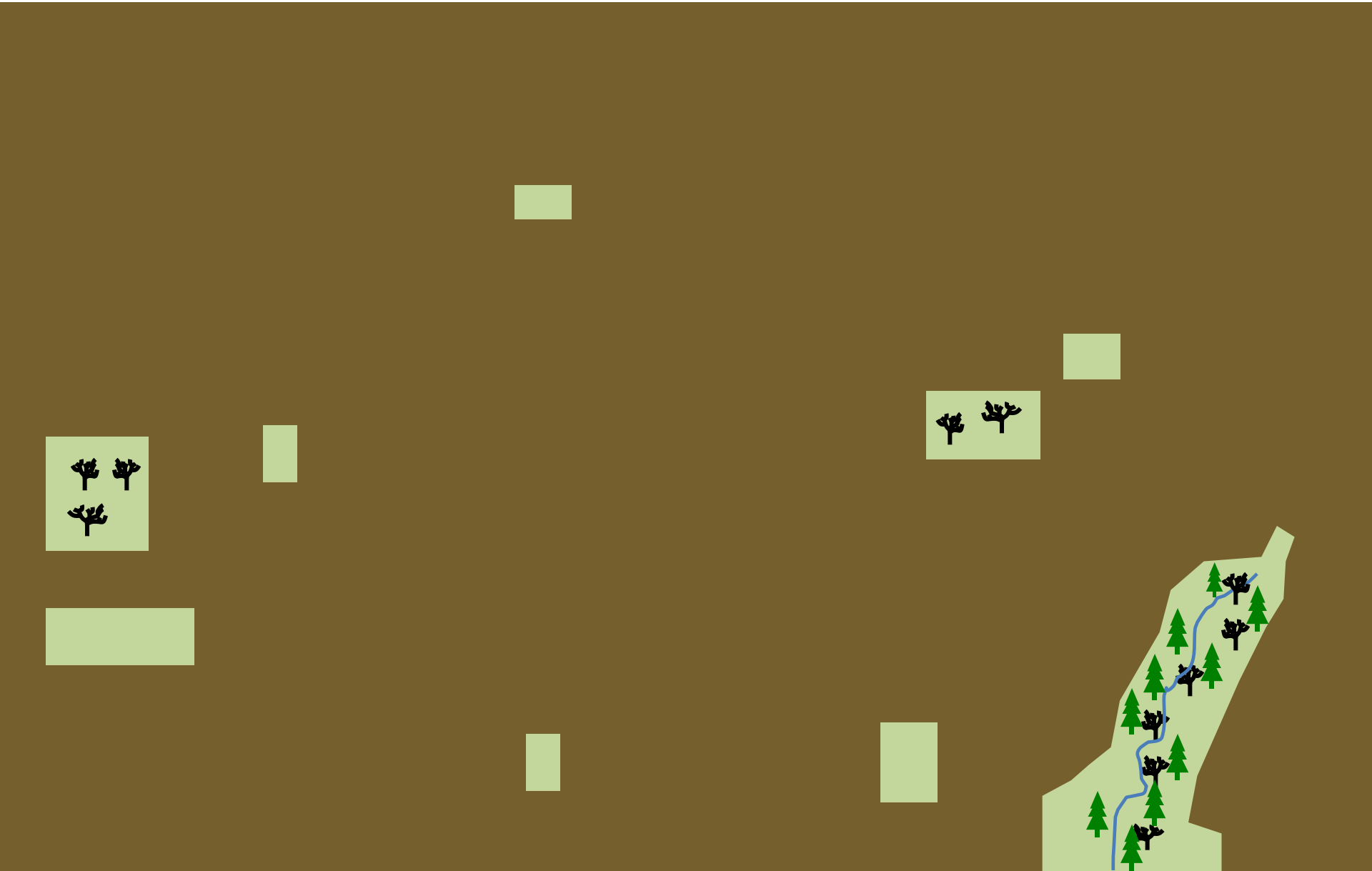
Seed harvest	- mainly by hand, 230 species or so per year
Seed cleaning	- very little
Planting	- broadcast seeding on cropfields, up to 200 ac/year
Management	- no control of annual weeds - just fire, then grazing

Upland Prairie

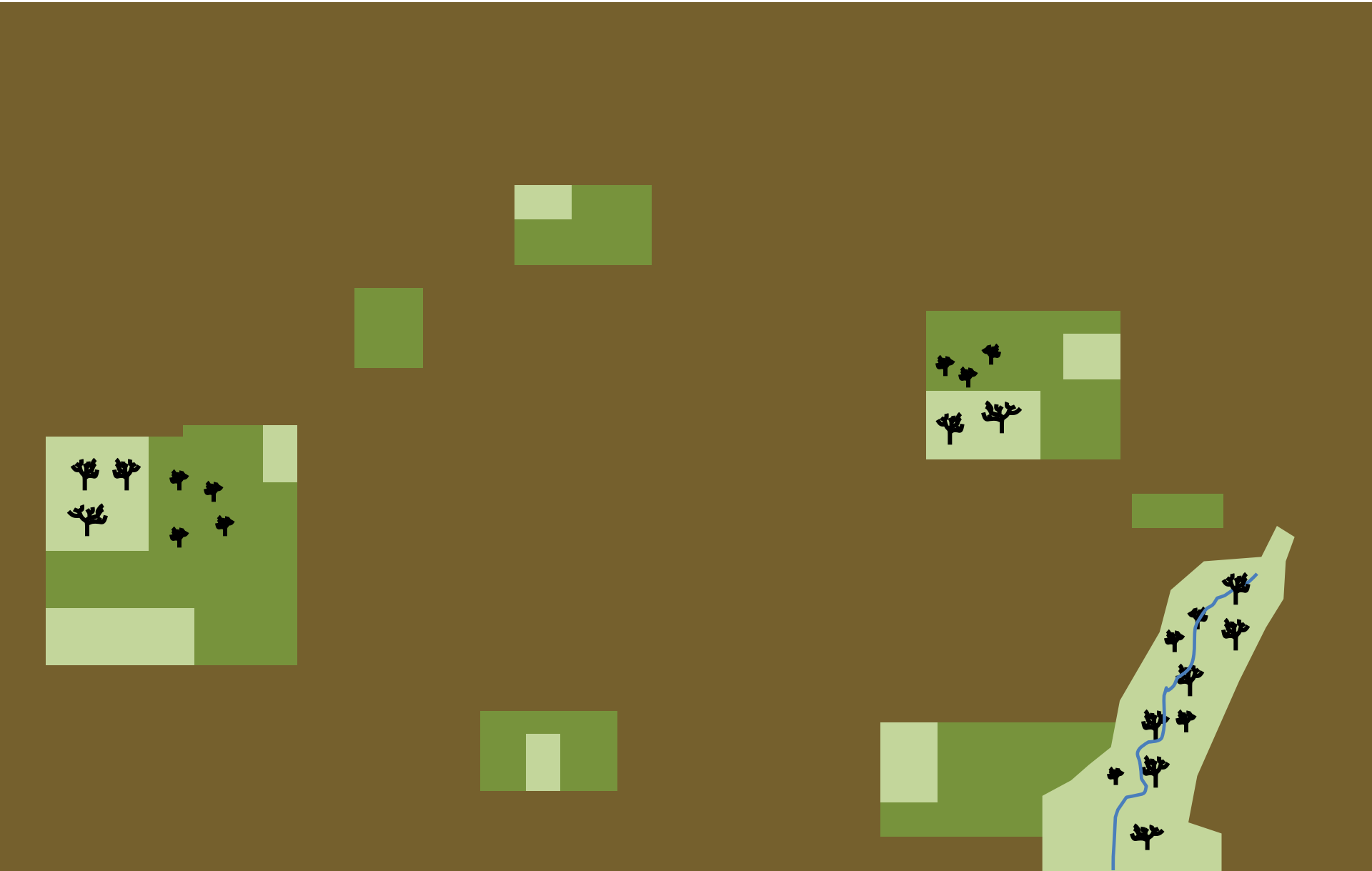
Lowland Prairie

Wetland Restoration

Habitat Loss/Fragmentation

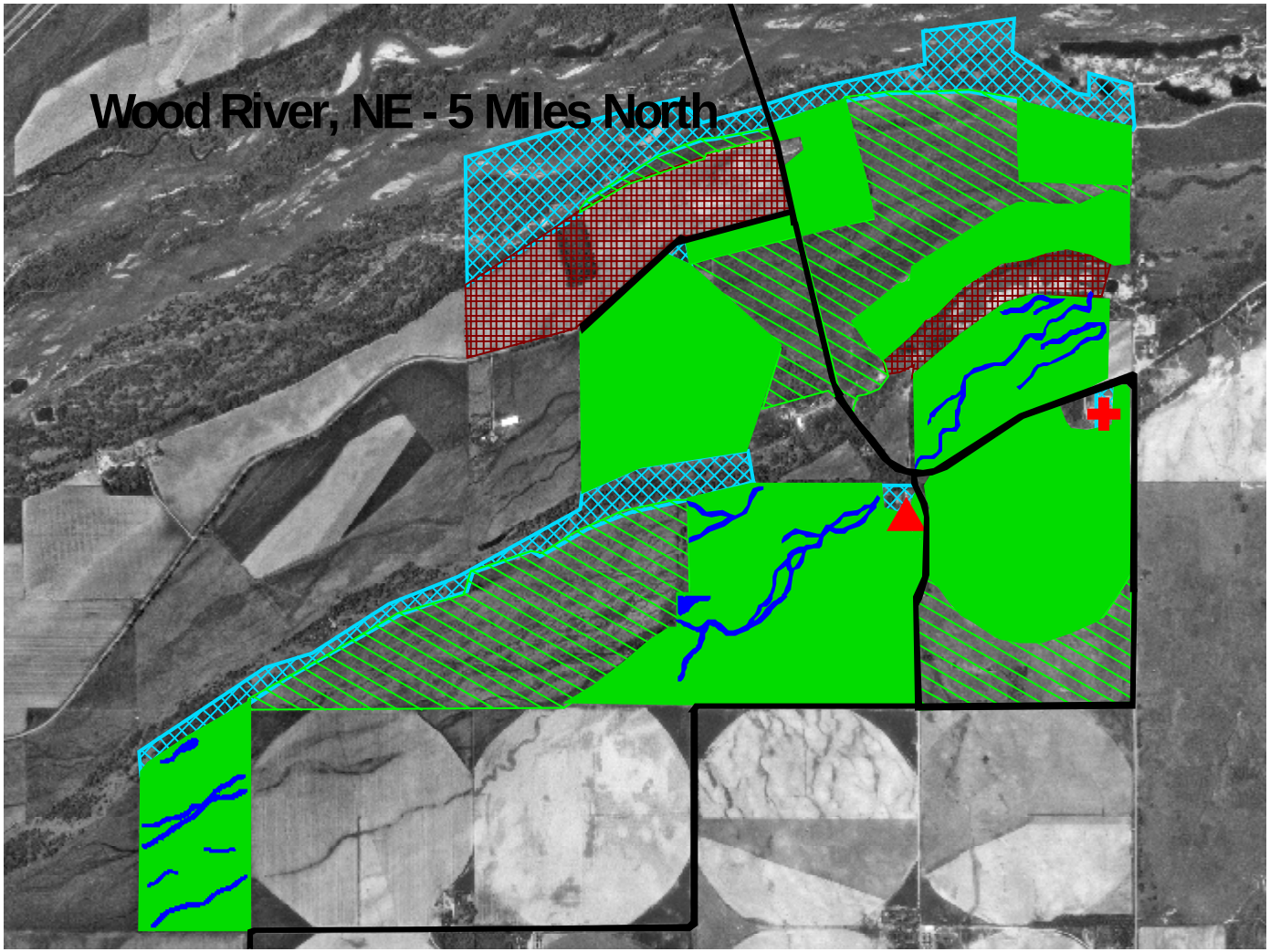


Restored Landscape



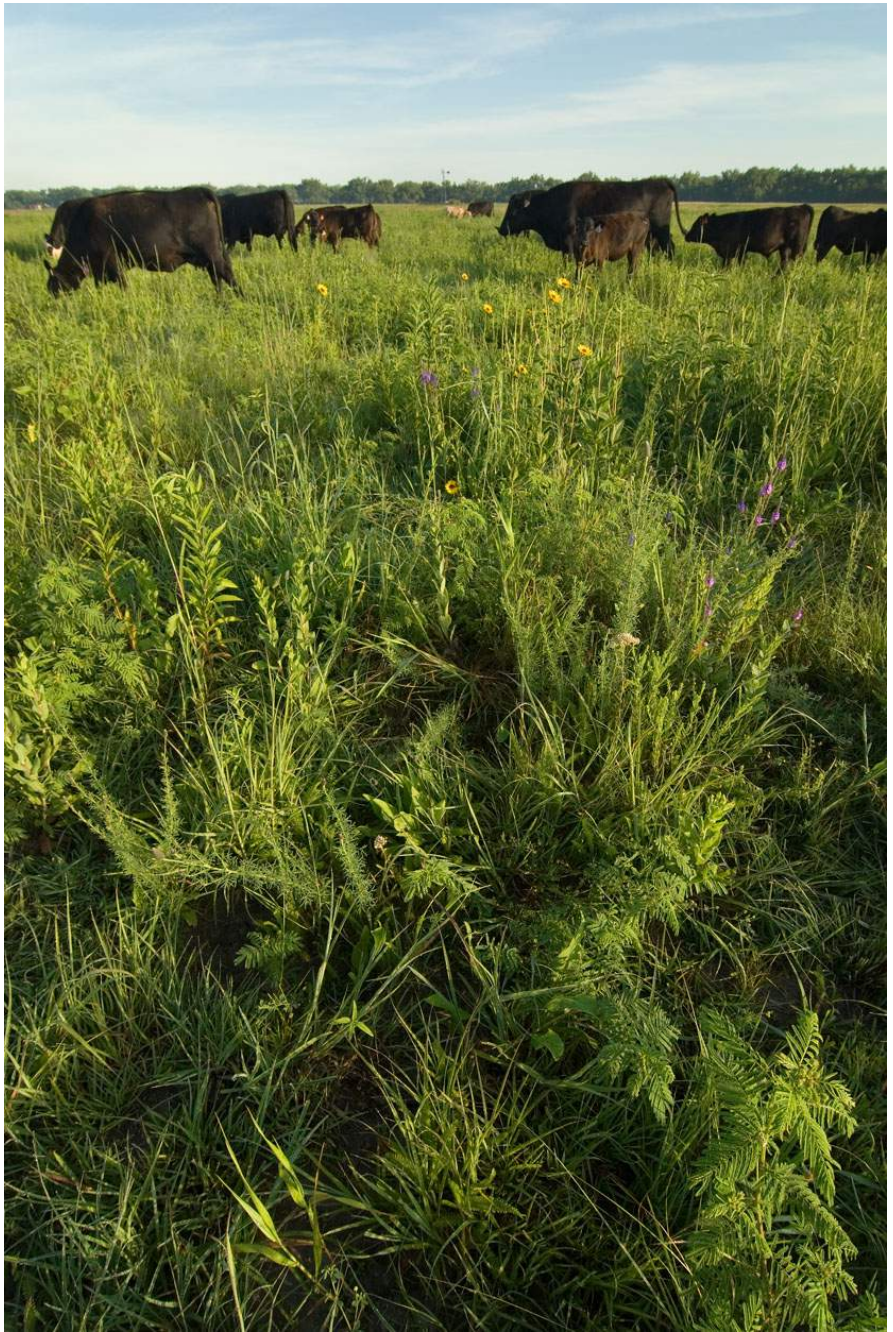
The Nature Conservancy

Example: Dahms/Derr Tract

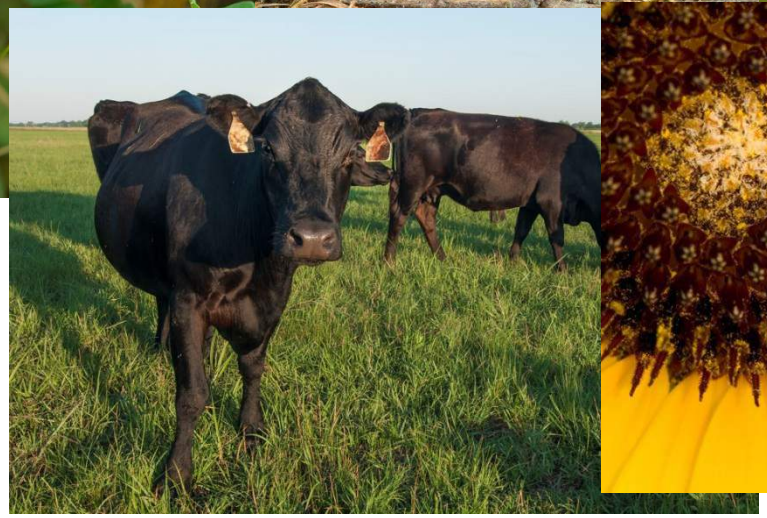


- 635 acres of restoration
-4 linear miles of wetlands
- 254 plant species found in seedings to date

Fire and Grazing Management



Why manage for biodiversity and resilience?



Overriding Goal: Maximize species diversity and ecological resilience.

Keys

1. Create a shifting mosaic of habitat patches.

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2. Allow every flower to bloom once in 3-5 years.

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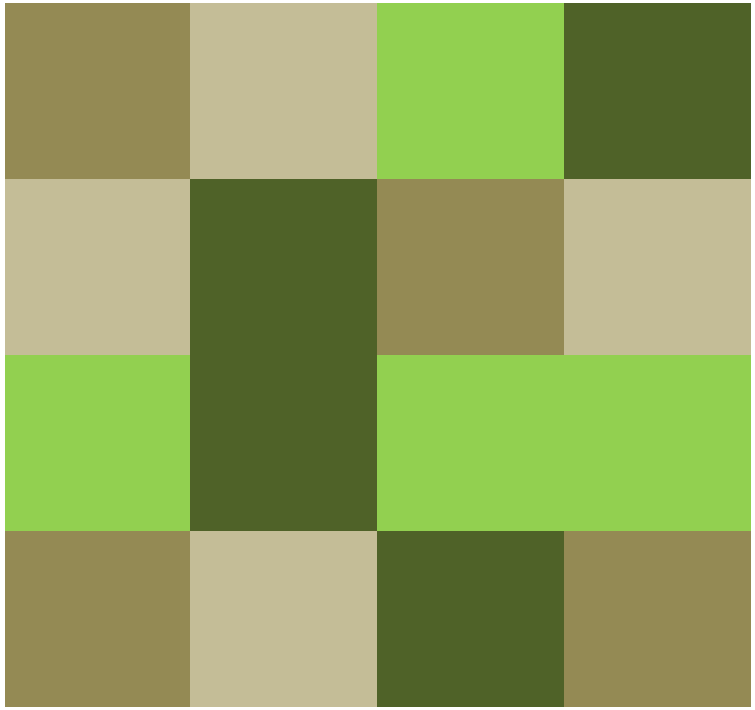
- Provide full range of vegetation structure types.
- Shift the location of those patch types and avoid repetition.

Habitat Conditions – Vegetation Structure

The scale and interspersion of habitat patches is important.

We don't know everything about this yet…



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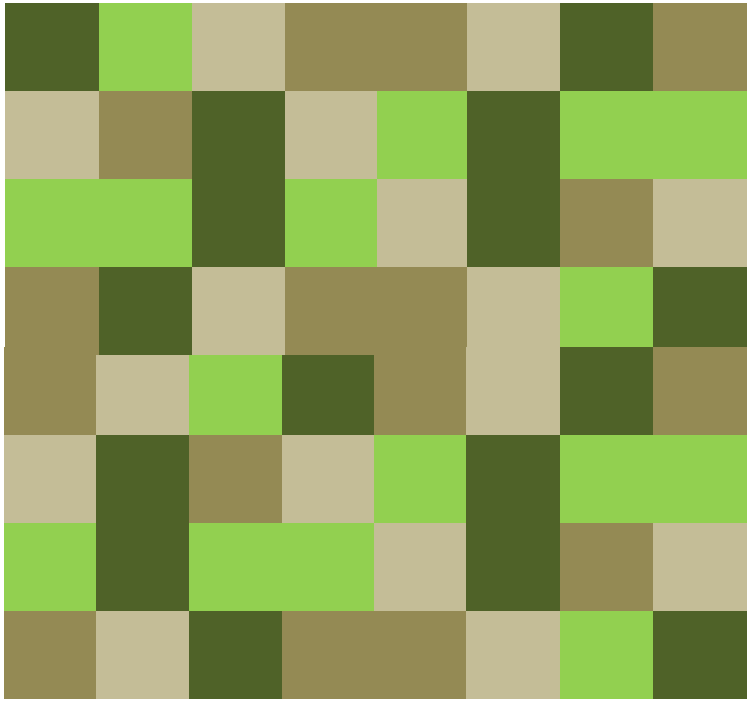
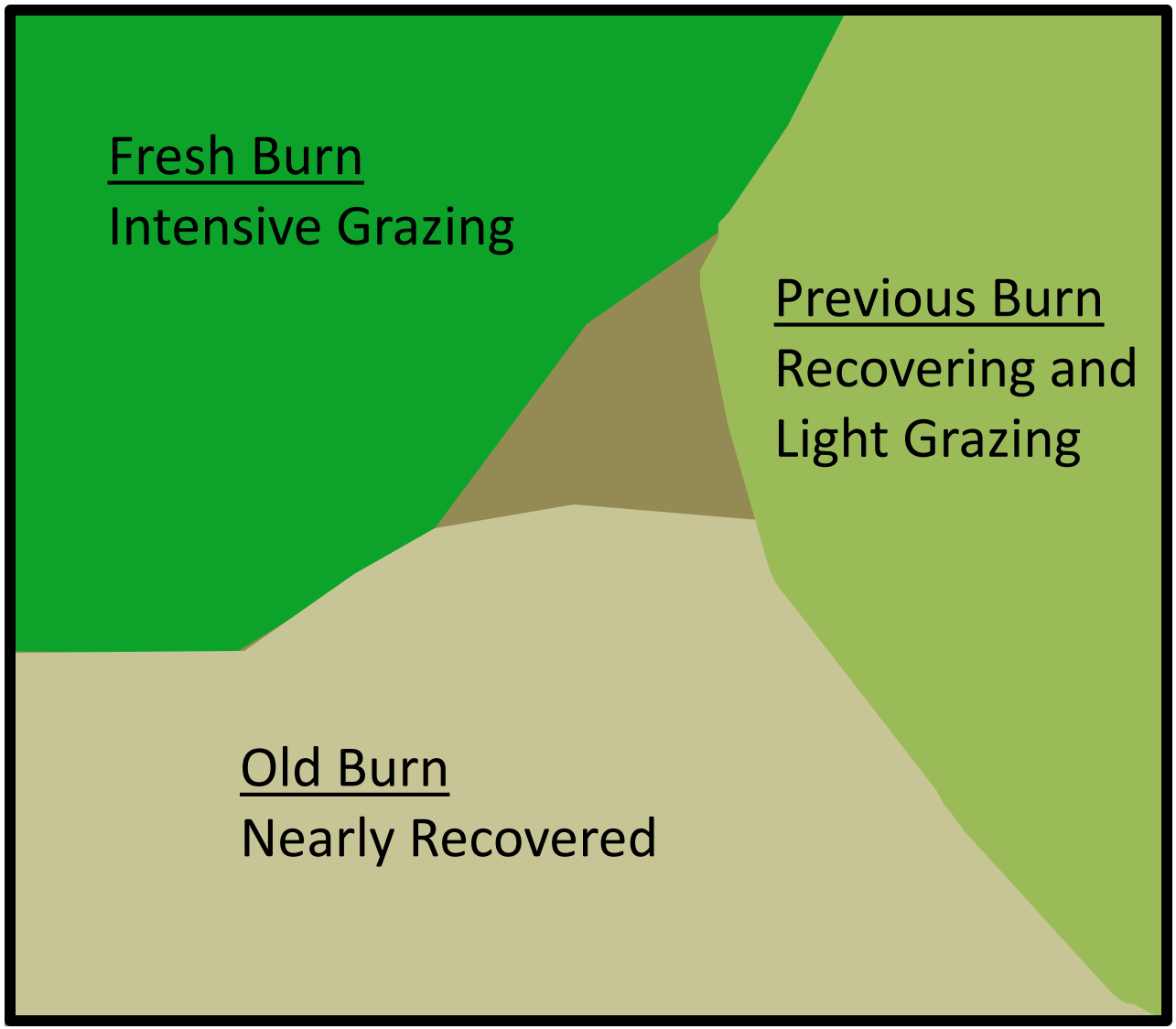



Old Burn
Nearly Recovered
Previous Burn
Recovering and Light Grazing
Fresh Burn
Intensive Grazing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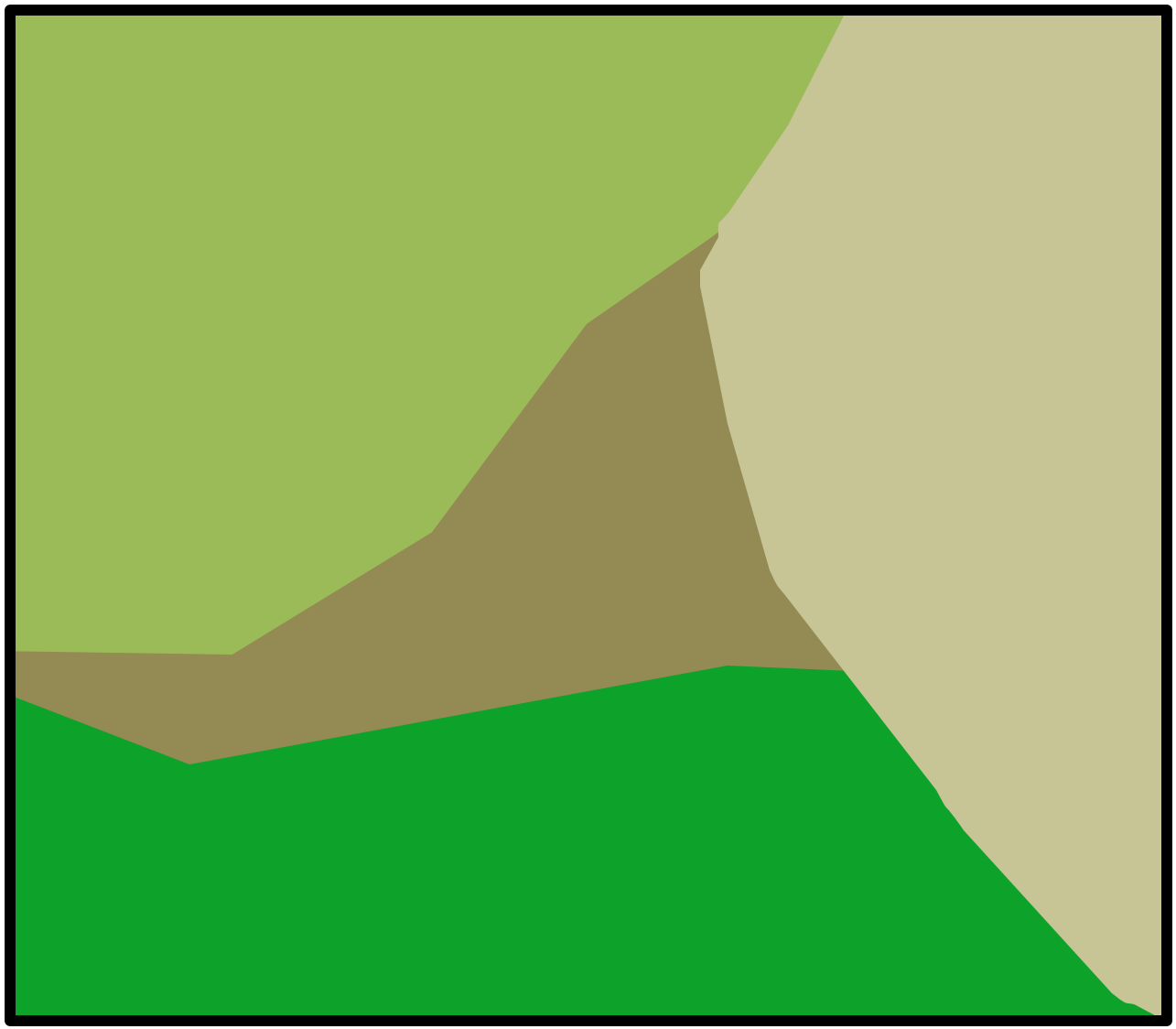

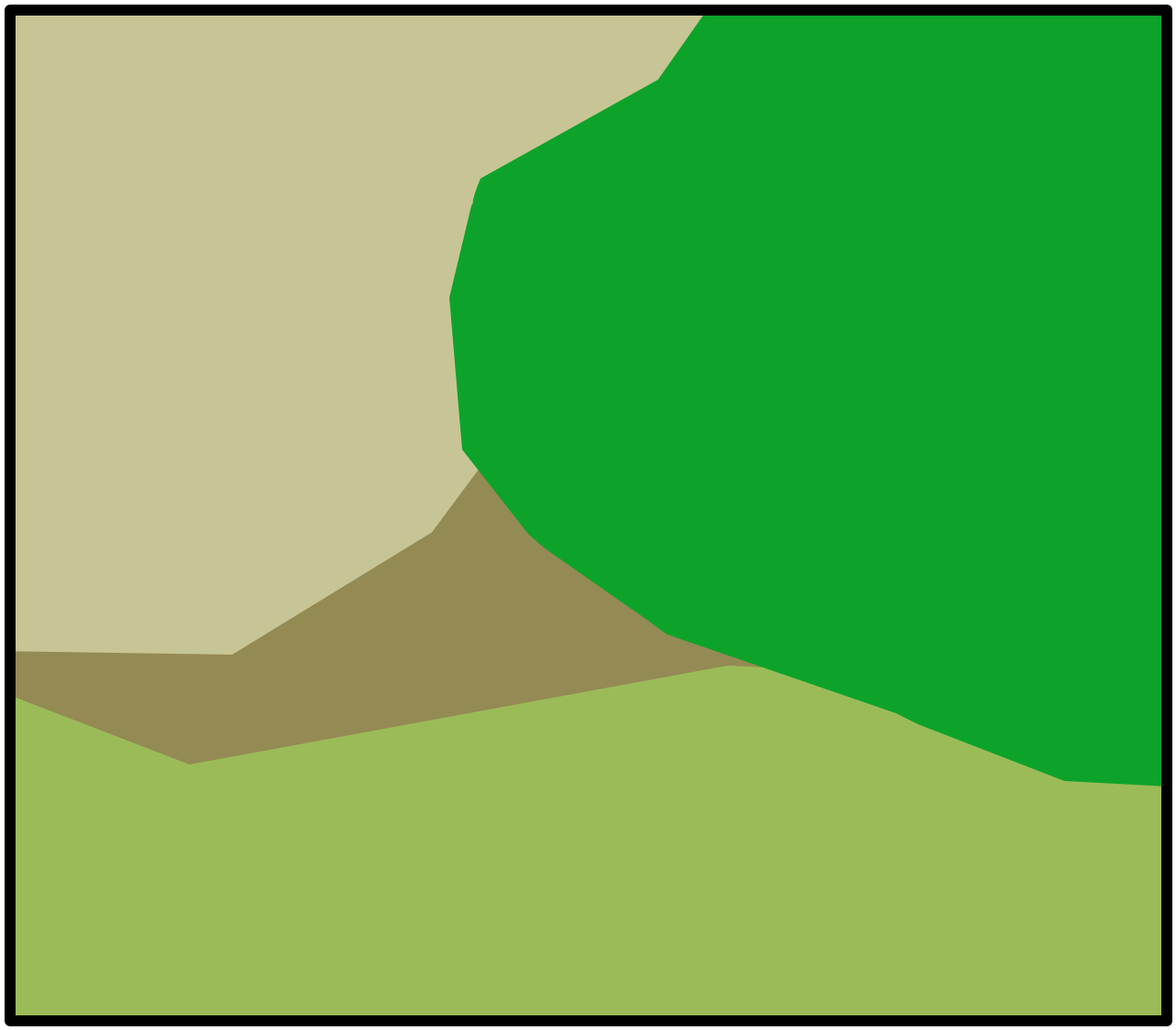

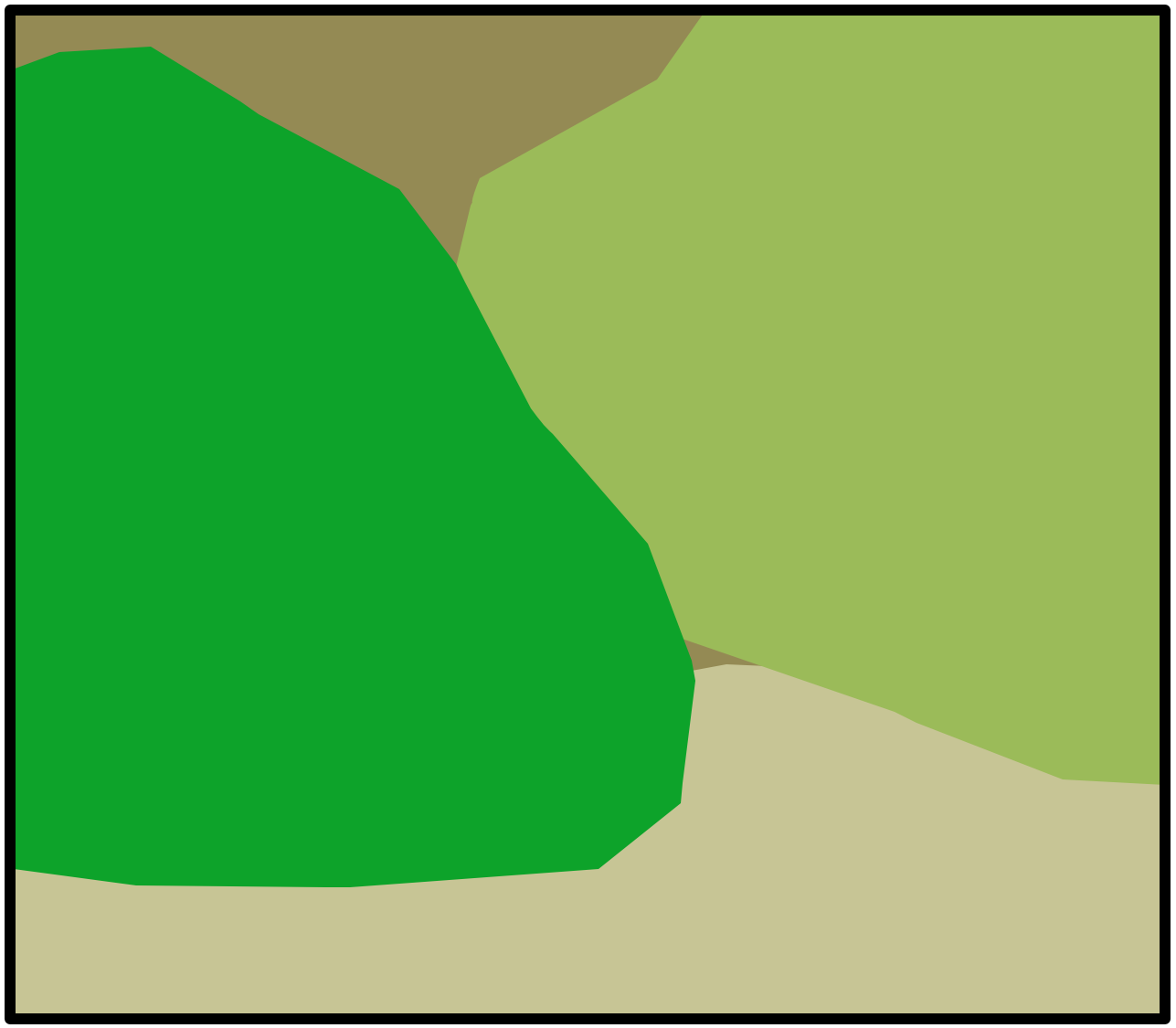

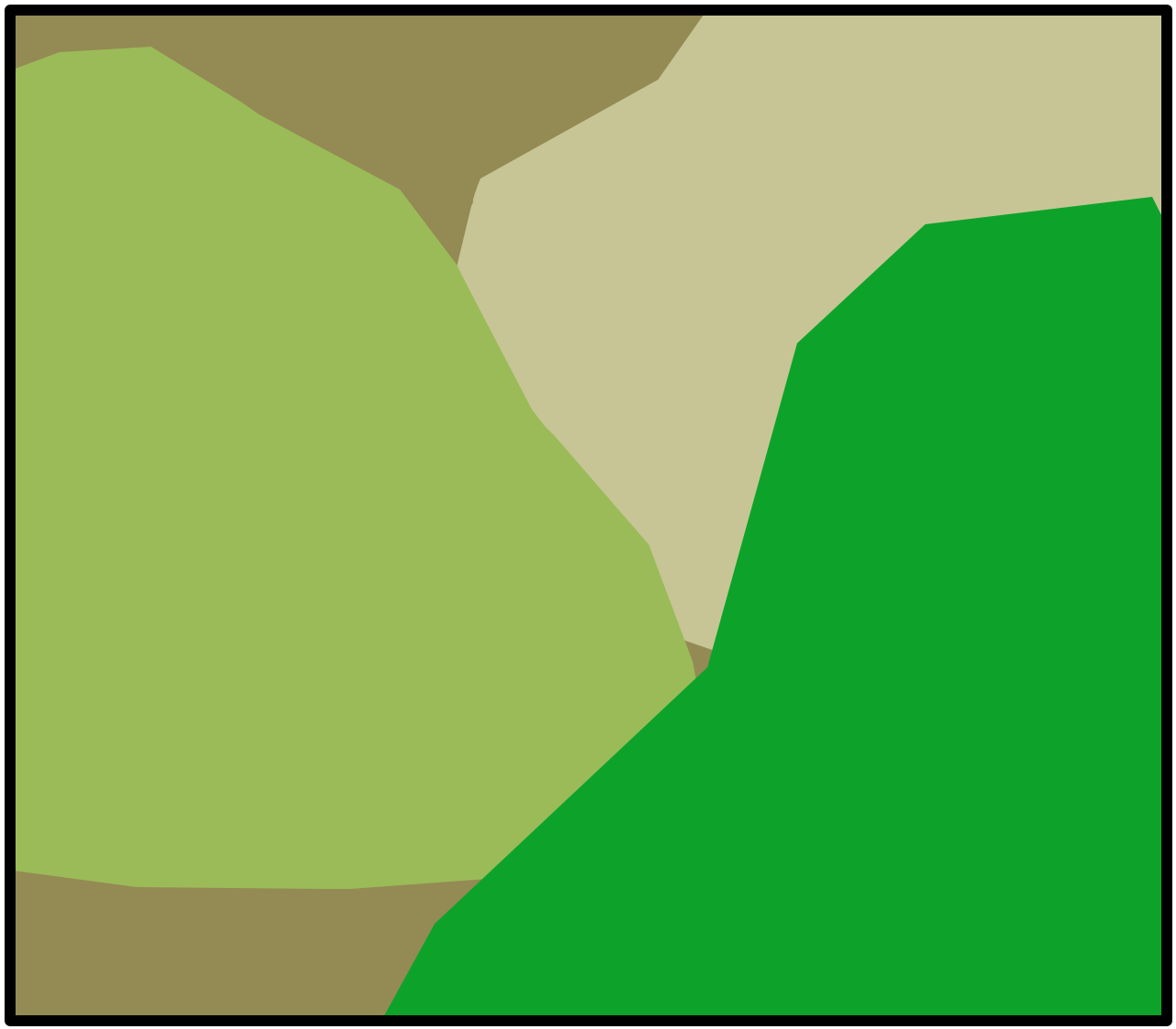

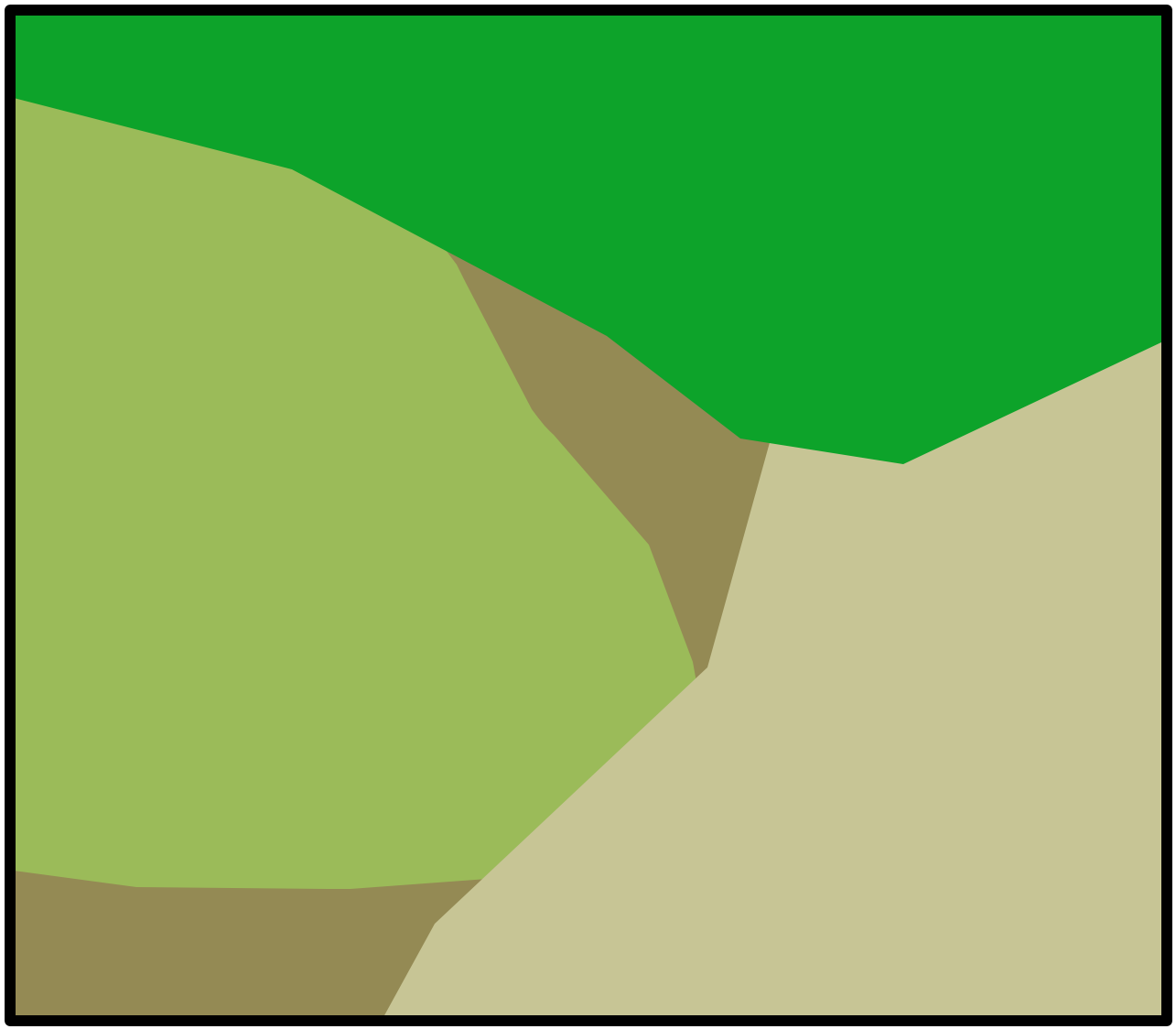

Habitat Conditions – Vegetation Structure

Examples of Habitat Structure:

- Tall dense vegetation

Habitat Conditions – Vegetation Structure

Examples of Habitat Structure:

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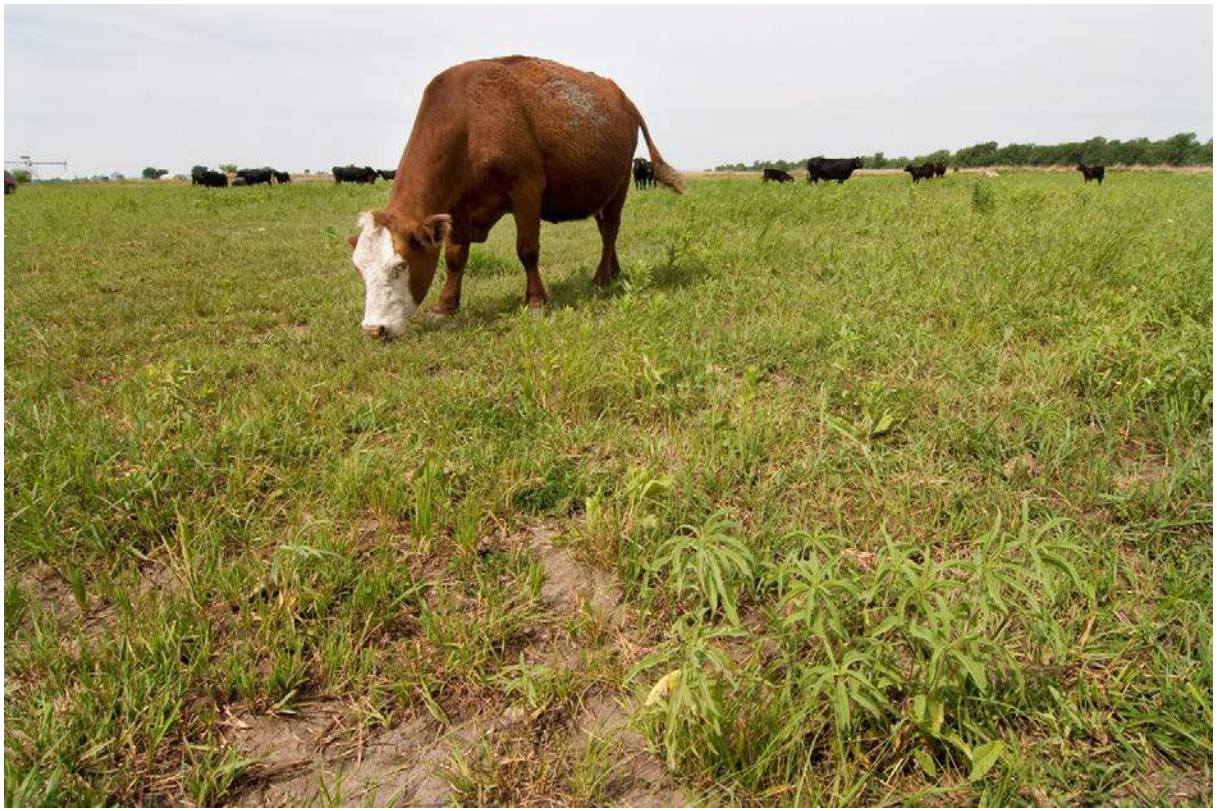
- Uniformly short vegetation



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2. Allow every plant species to bloom once in 3-5 years.

- Alter stocking rate and season of grazing between years.

- Periodic complete rest (no grazing) is needed for some plant species.

Plant Diversity – Growing Conditions

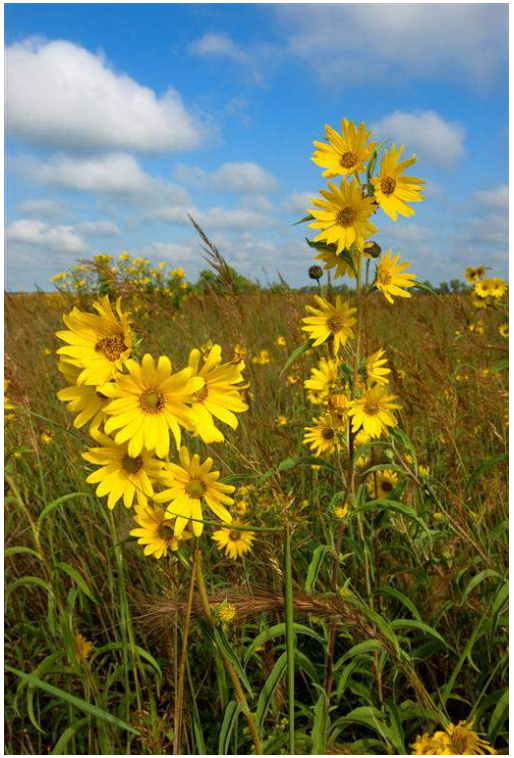
To keep a plant species in the community, it needs a good year periodically.

Indicator of success: seed head.

Plant Diversity – Growing Conditions

Each plant has a unique set of growing condition needs.

- Light
- Moisture
- Nutrients



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- Nutrients

Manipulate plant competition to periodically provide each species what it needs.

Plant Diversity – Growing Conditions

Examples of Plant Categories

Warm Season vs. Cool Season

Plant Diversity – Growing Conditions

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Warm Season vs. Cool Season

Annuals, Biennials vs. Perennials

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Colonizers vs. Occupiers

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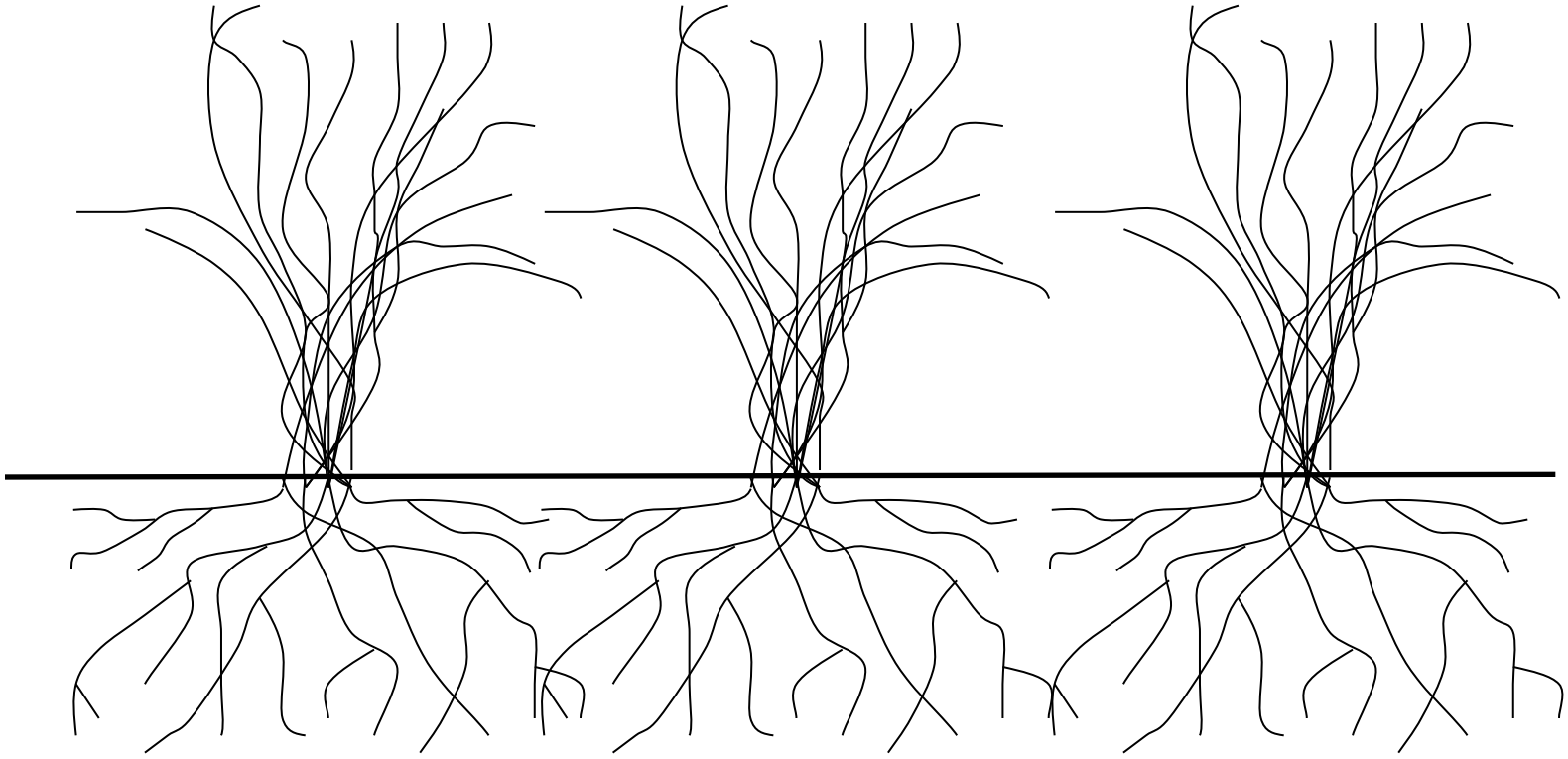
Defoliation Tolerant vs. Defoliation Intolerant

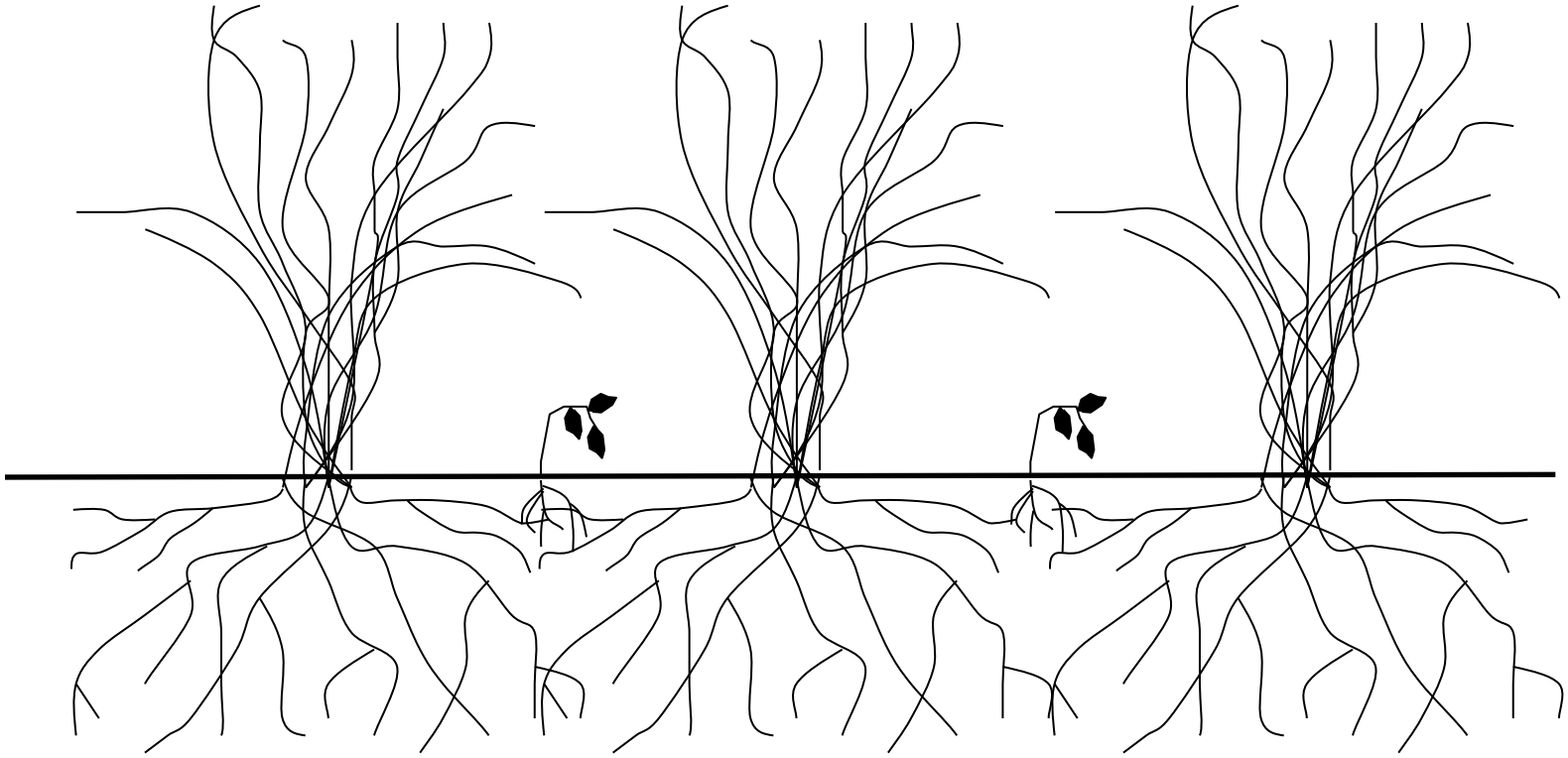
Manipulating Competition

Grassland dominated by perennial grasses



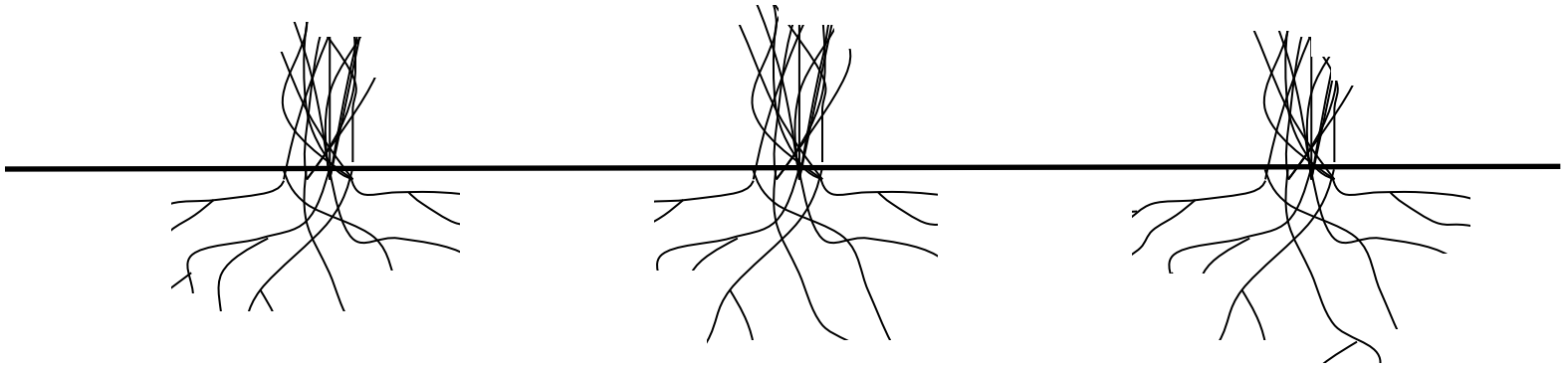
Manipulating Competition

No root space or available light for new plant establishment



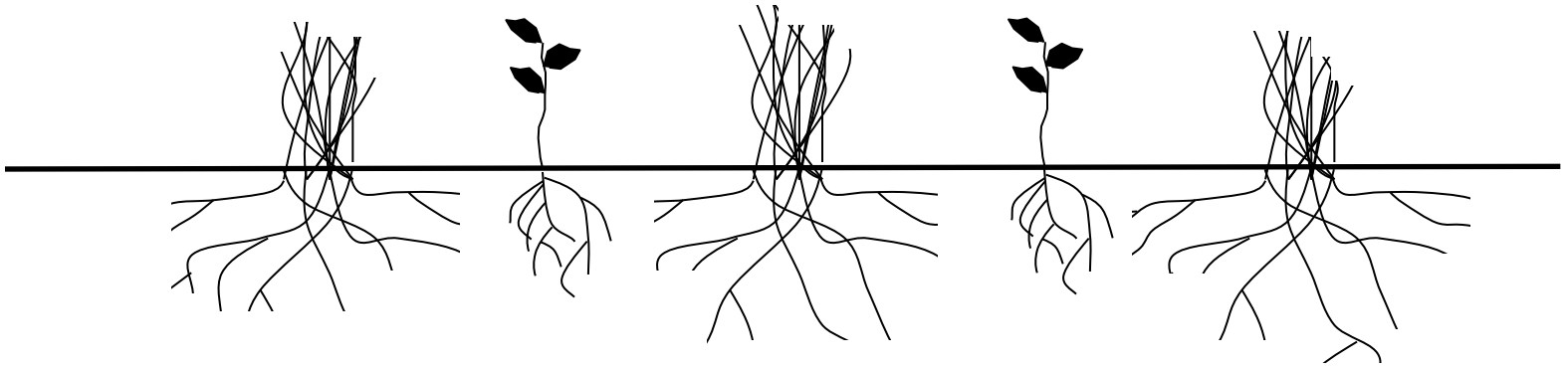
Manipulating Competition

But severe defoliation forces plants to reduce root capacity



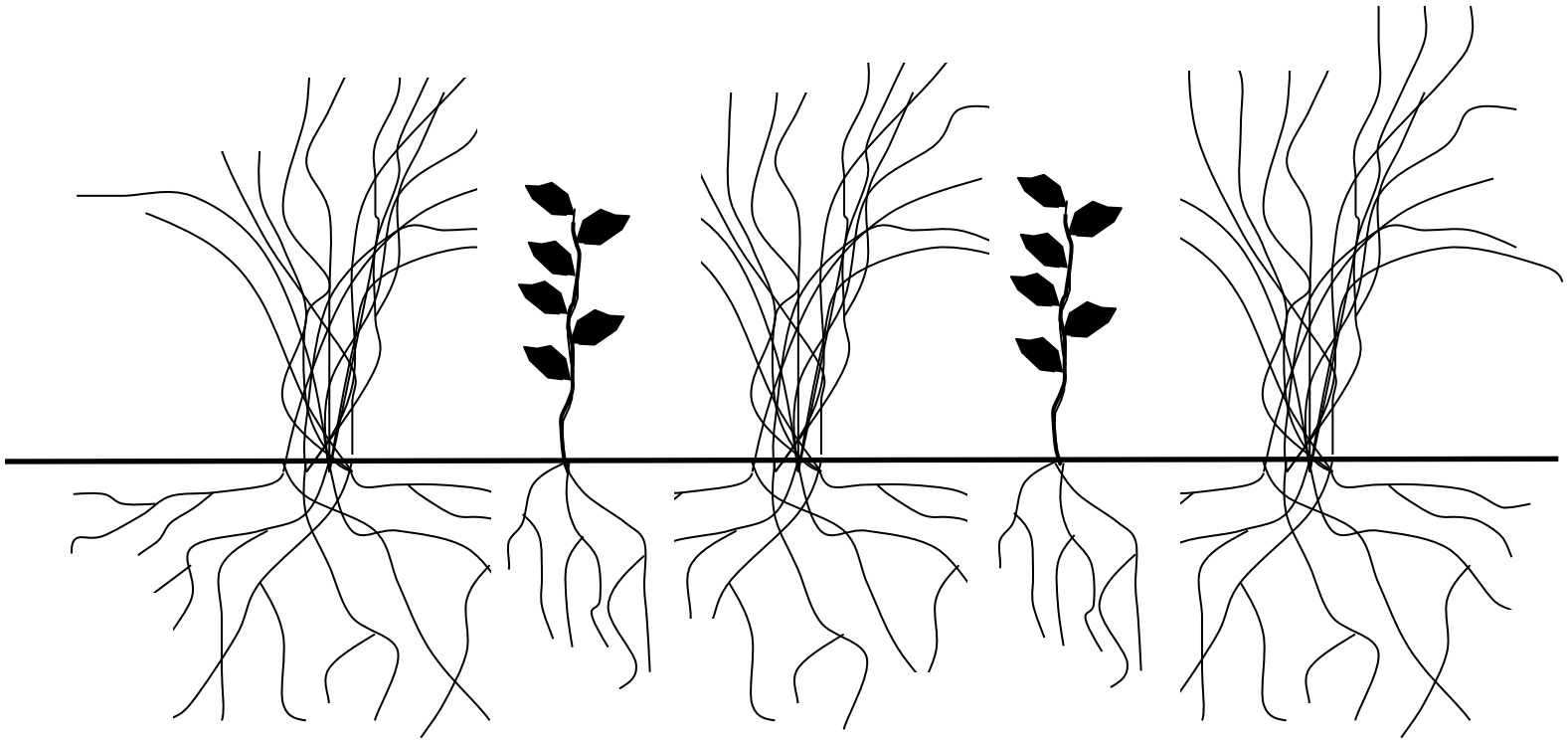
Manipulating Competition

Smaller root mass and increased light allows new plants to establish

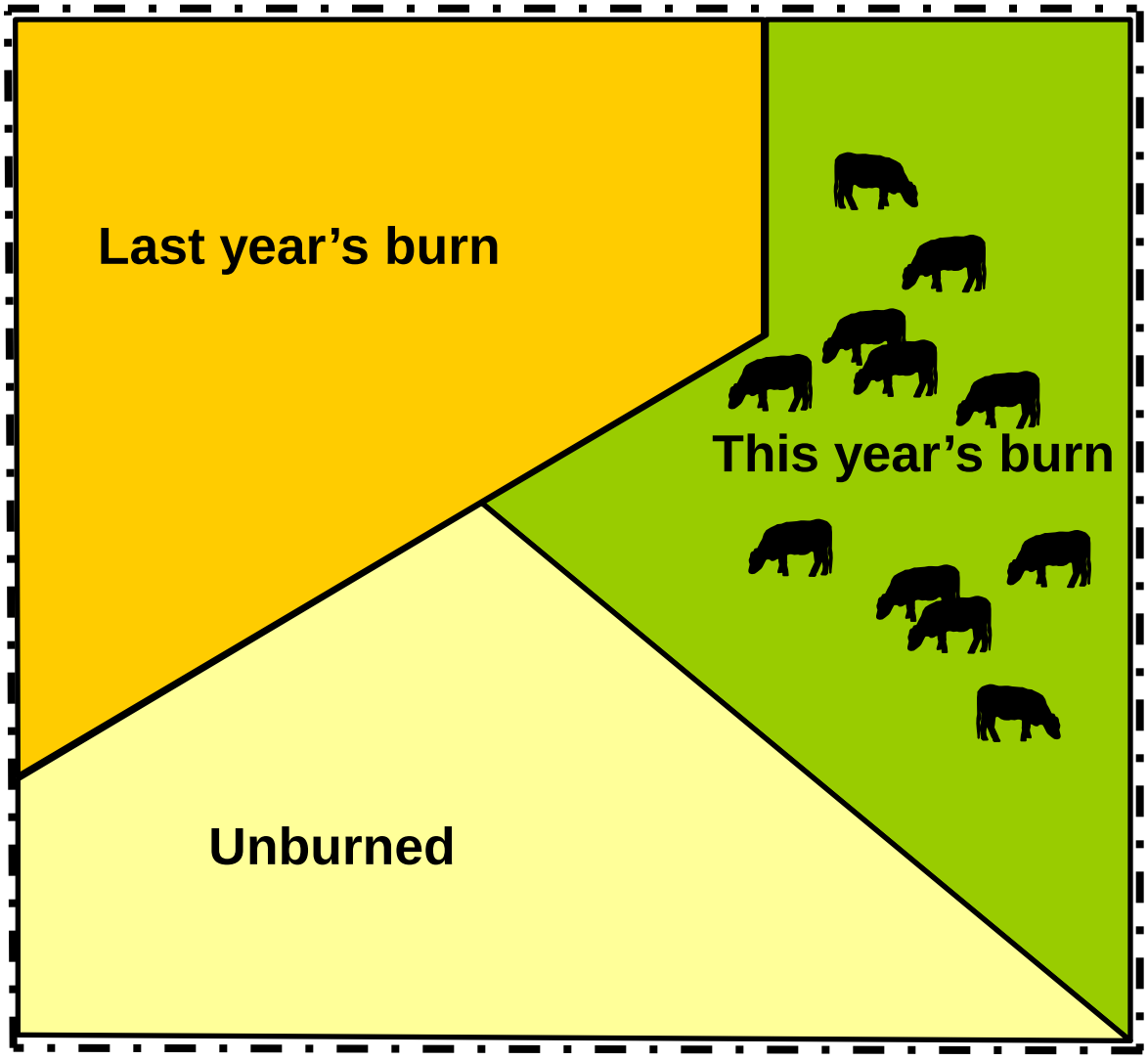


Manipulating Competition

New plants can compete for space as dominant plants recover



Patch-Burn Grazing



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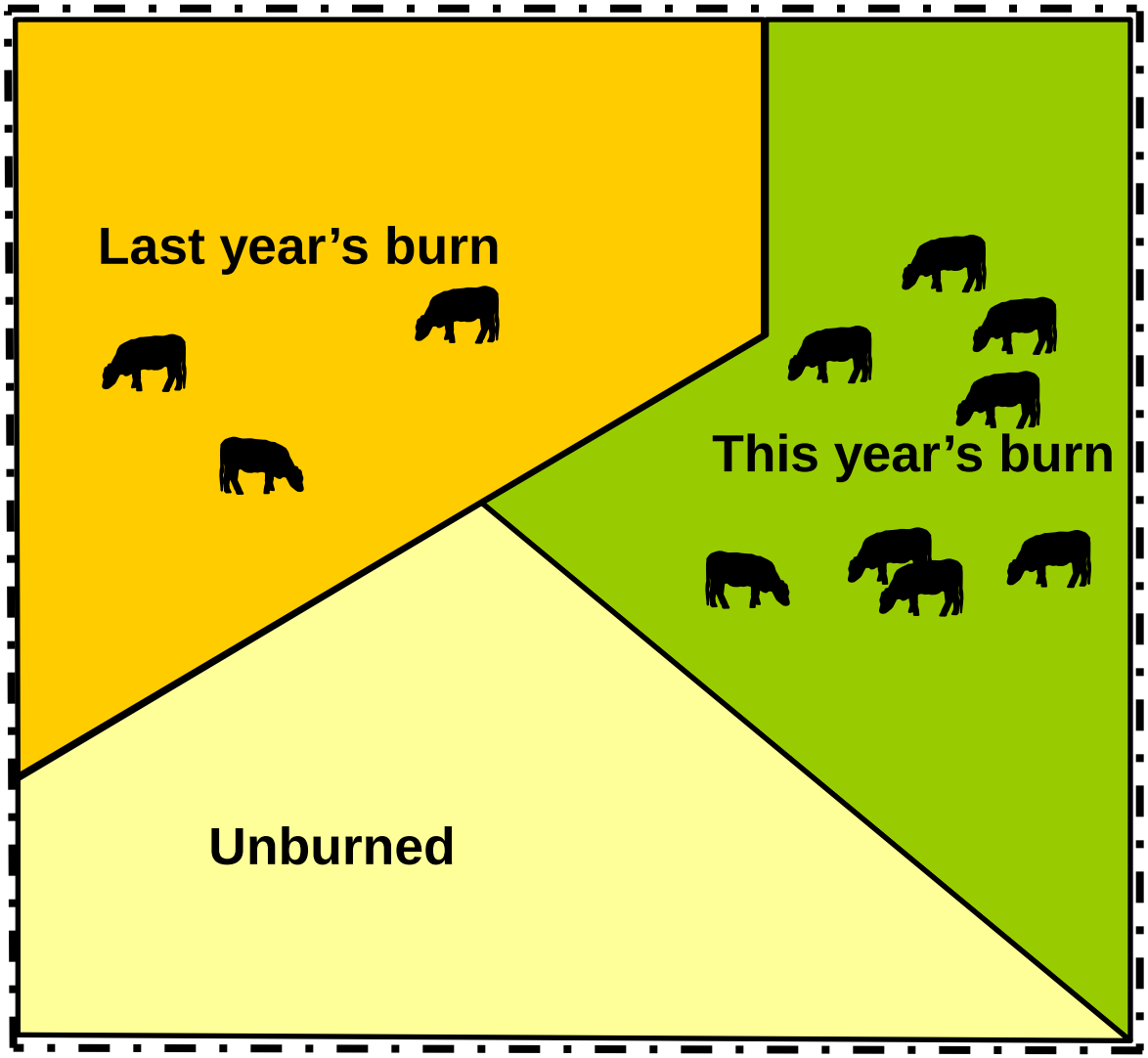

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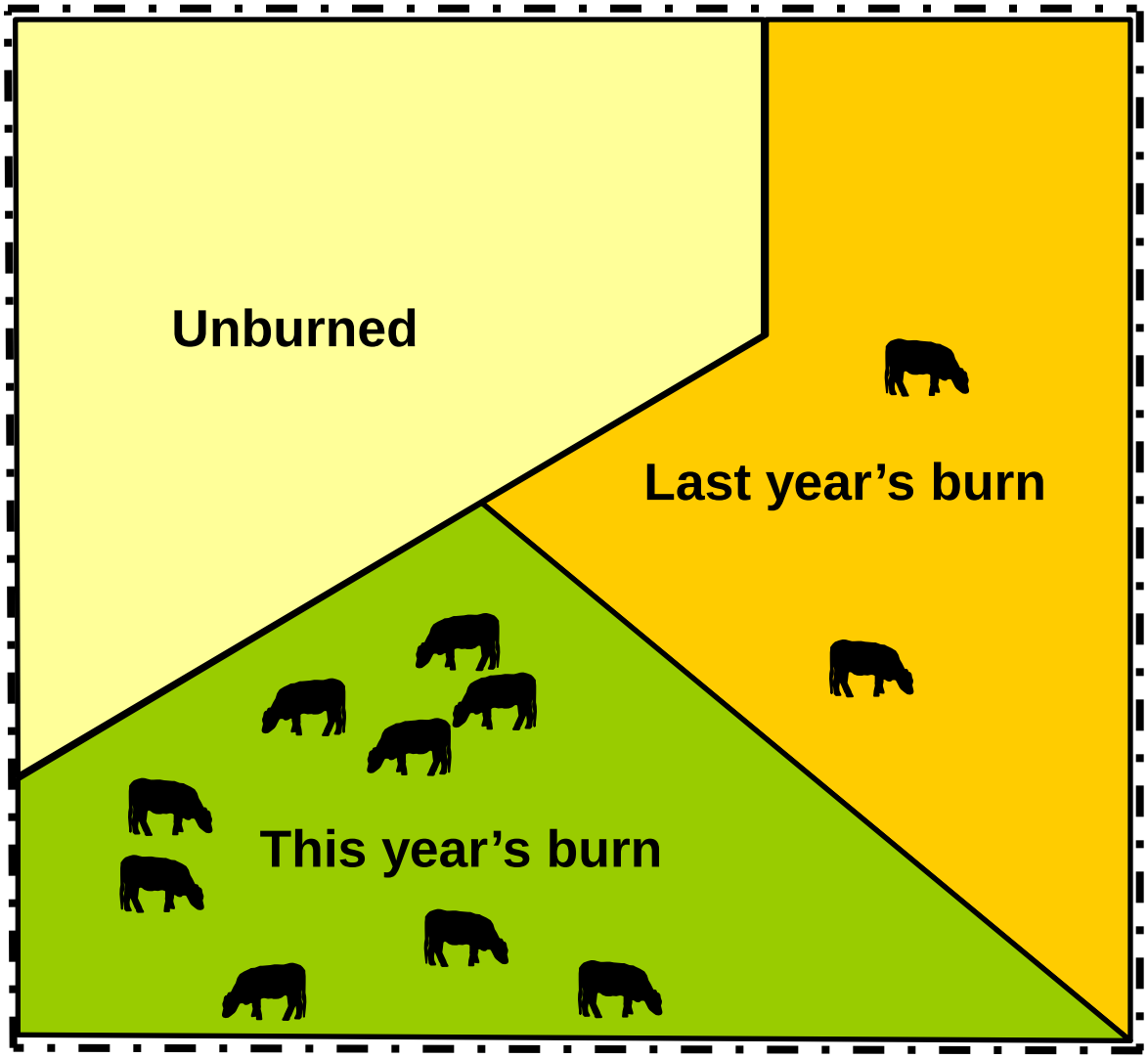

Combining Fire and Grazing For Biodiversity

What About Haying and Grazing?

And Electric Fence?

Regardless of Management “System”

Vary stocking rate, season length, burn timing, etc.

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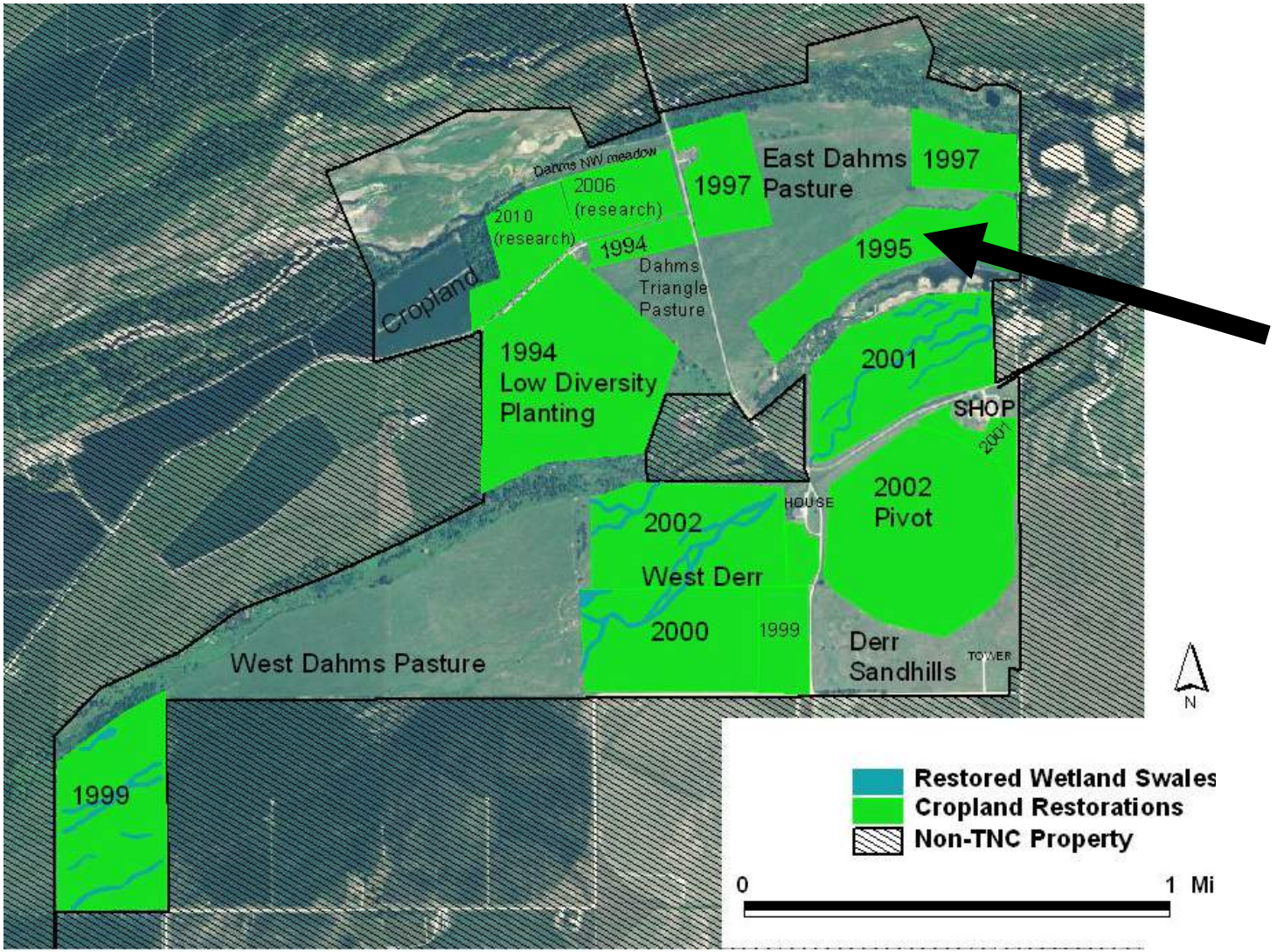
Vary stocking rate, season length, burn timing, etc.

Adjust each year's plans based on previous year's results

Example: Dahms 1995 Prairie Restoration

45 acre former cropfield adjacent to degraded remnant prairie



1995 Seeding Through Time

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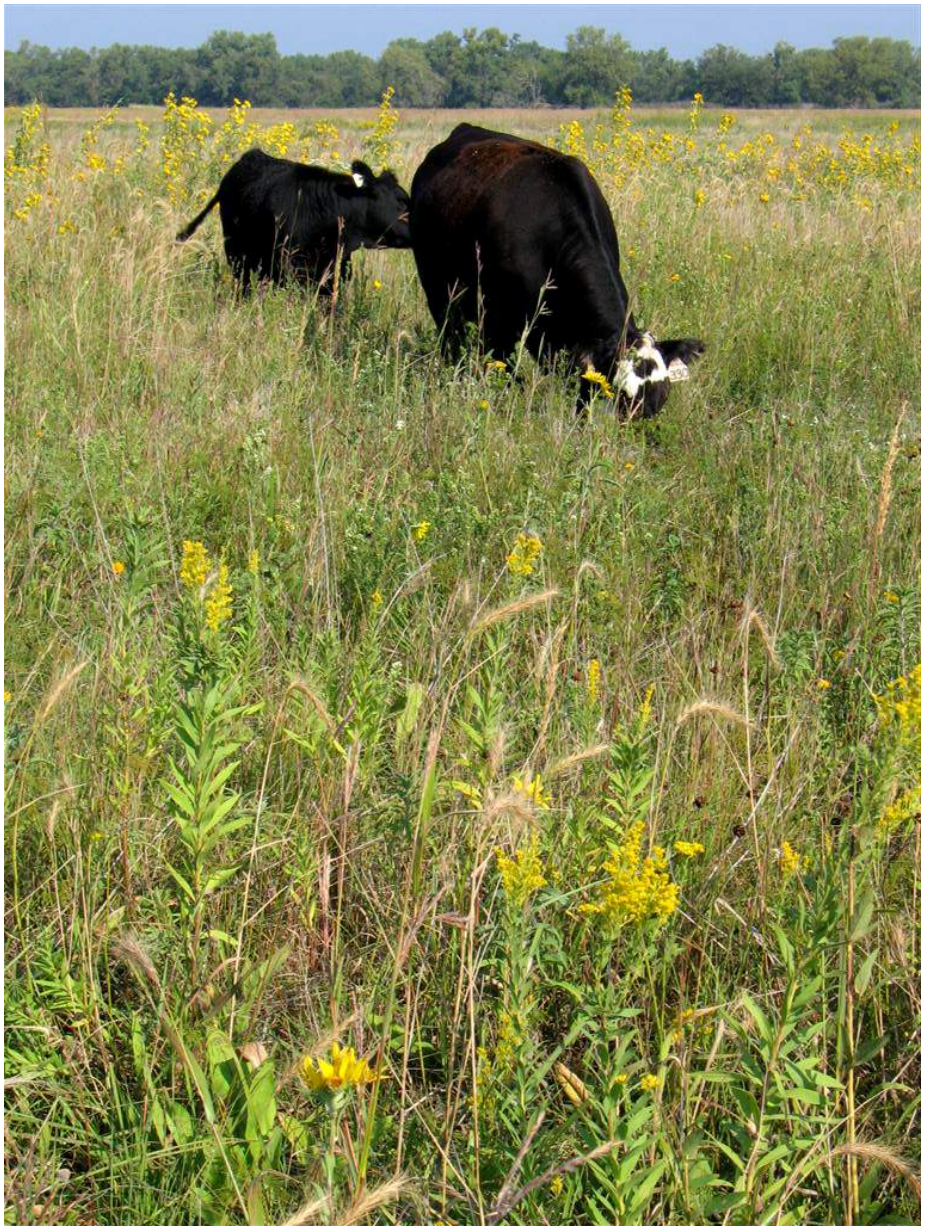

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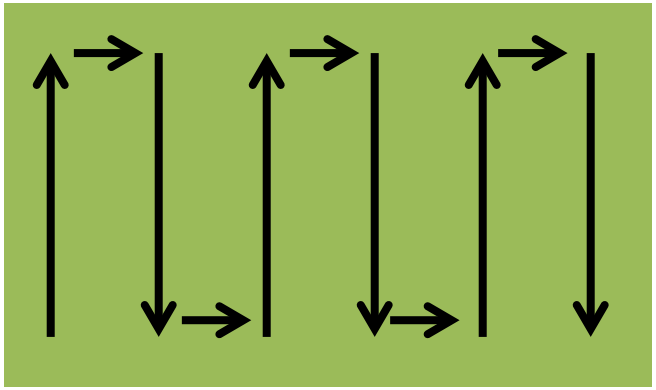
Plotwise Floristic Quality Assessment

Plant diversity, but accounts for “conservatism” of species

1m square sampling plots
Approx 100 samples – stratified randomly
- List plant spp in each plot

Calculate mean spp richness and FQI

Can also get species frequency



Lessons from Fire/Grazing Management

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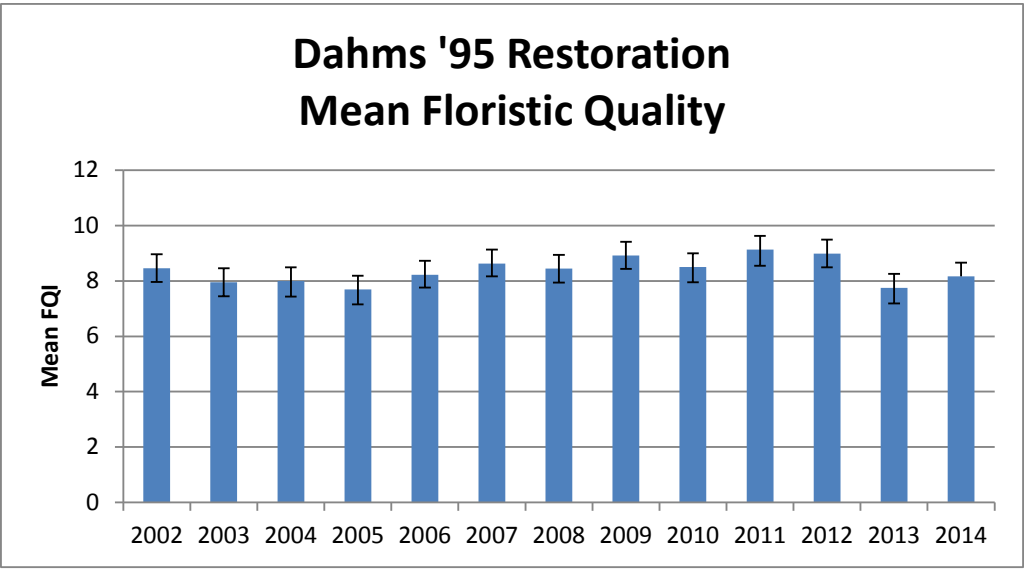

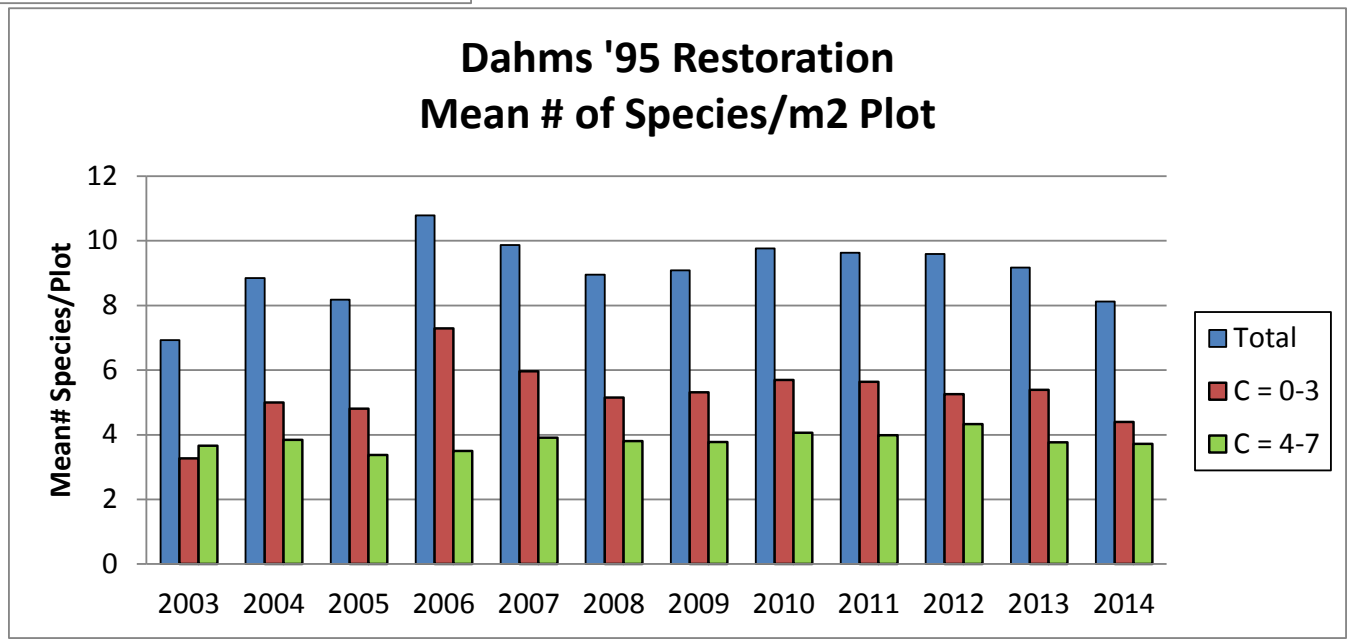

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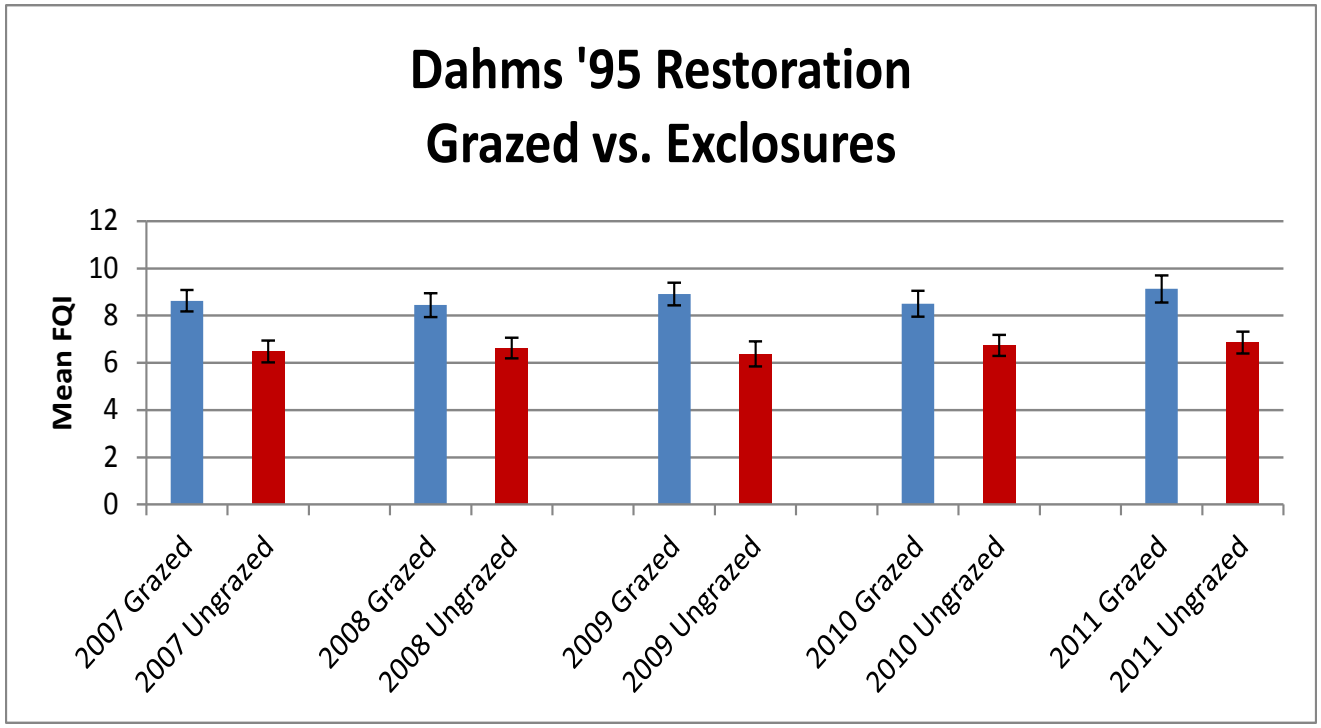

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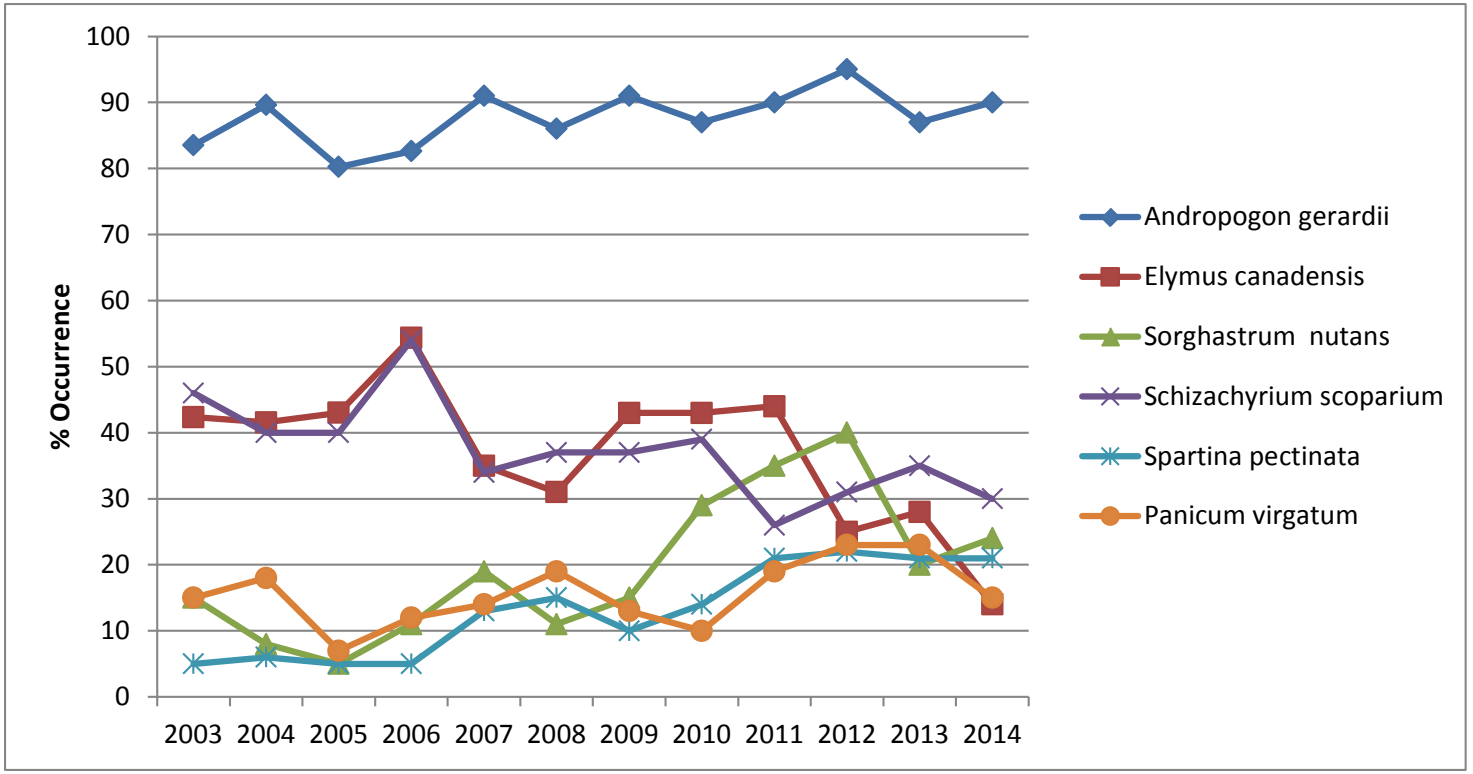

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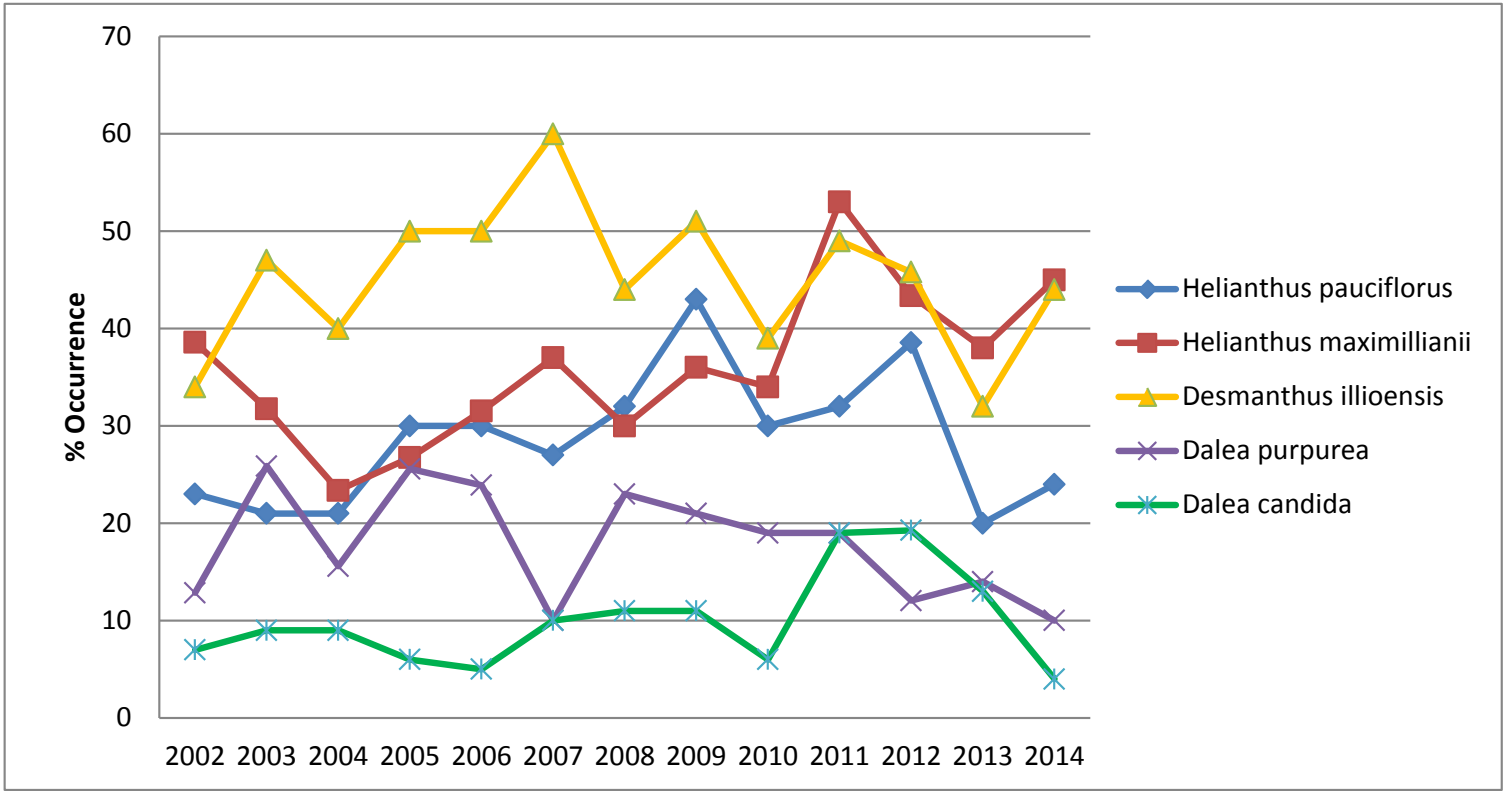

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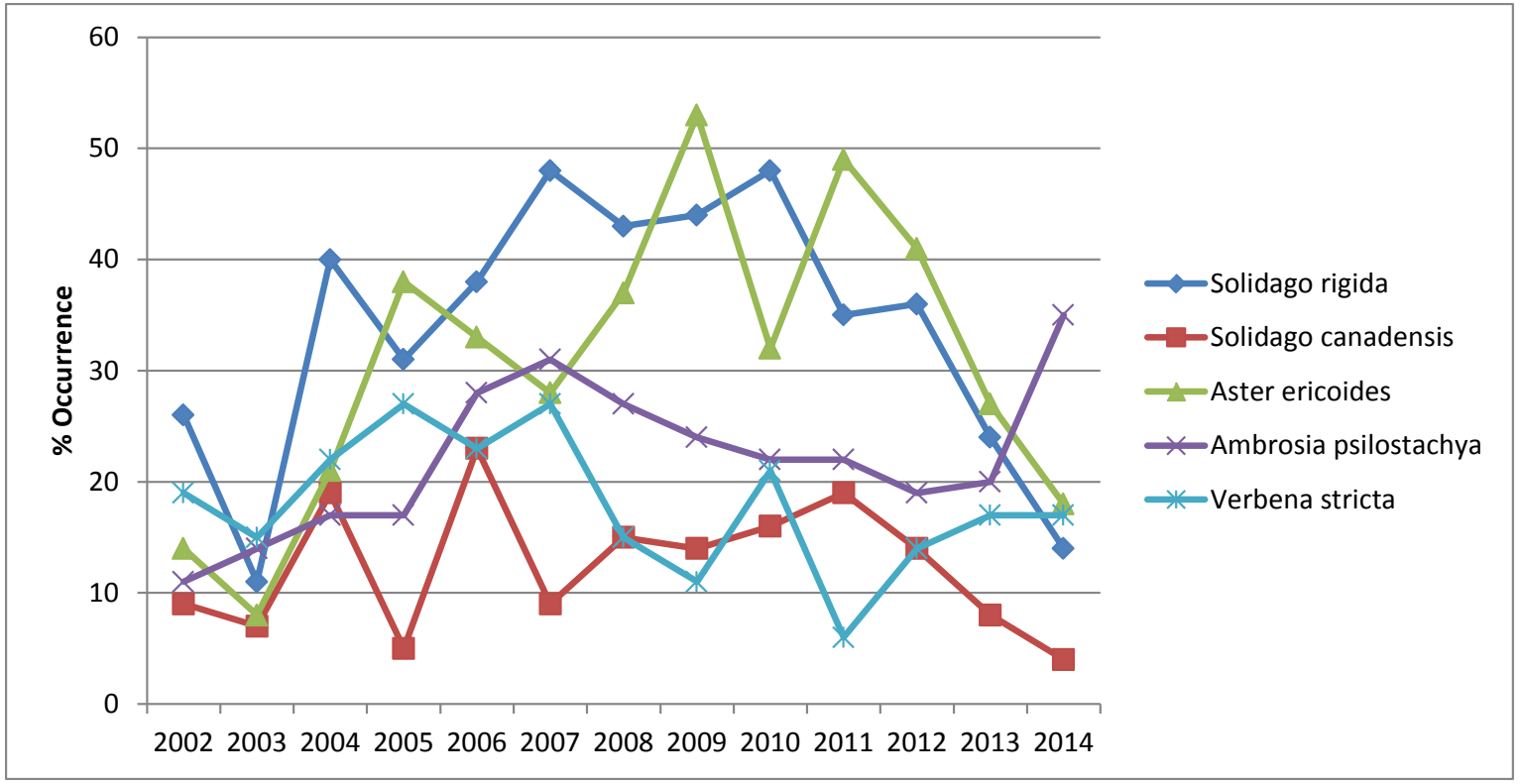

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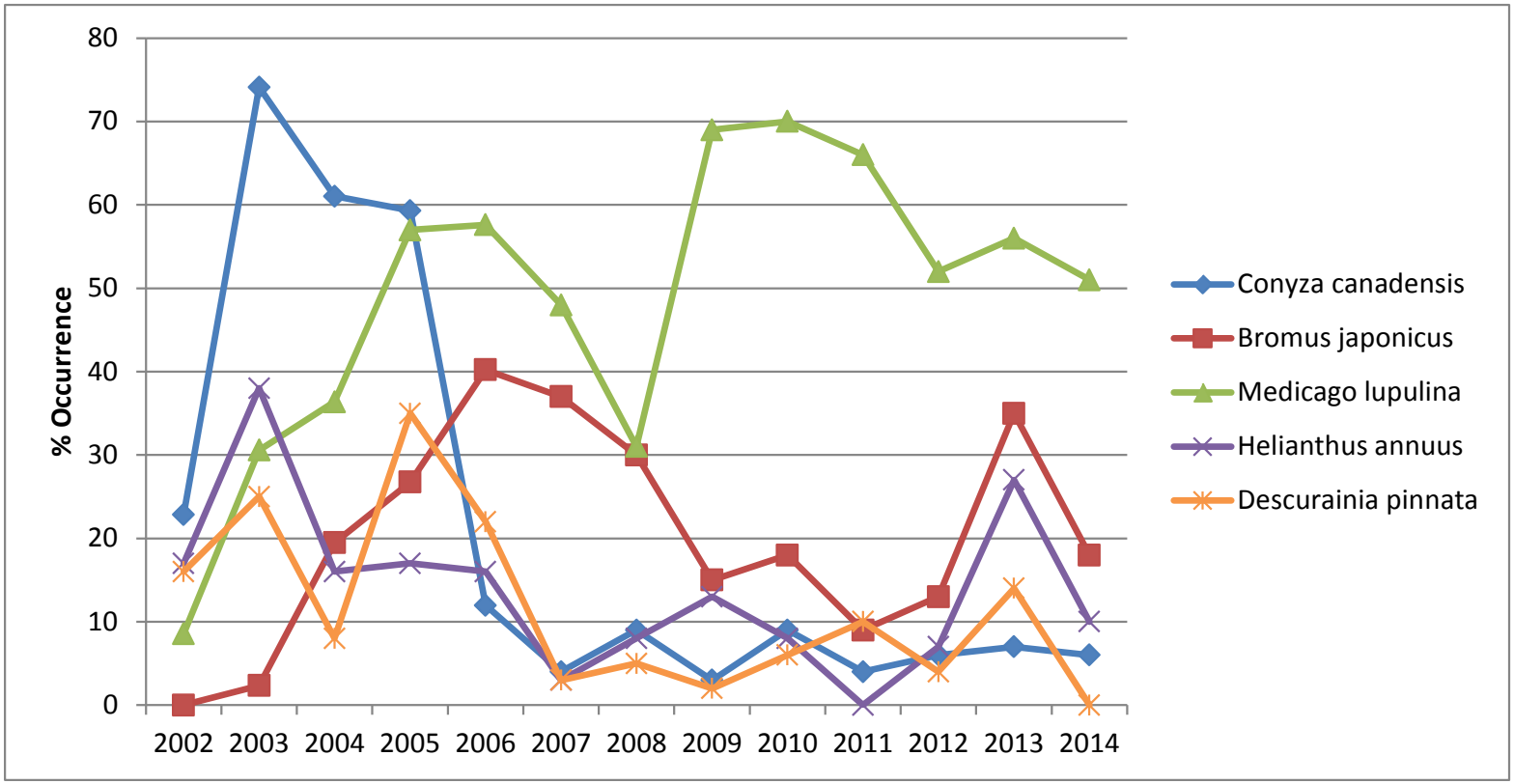

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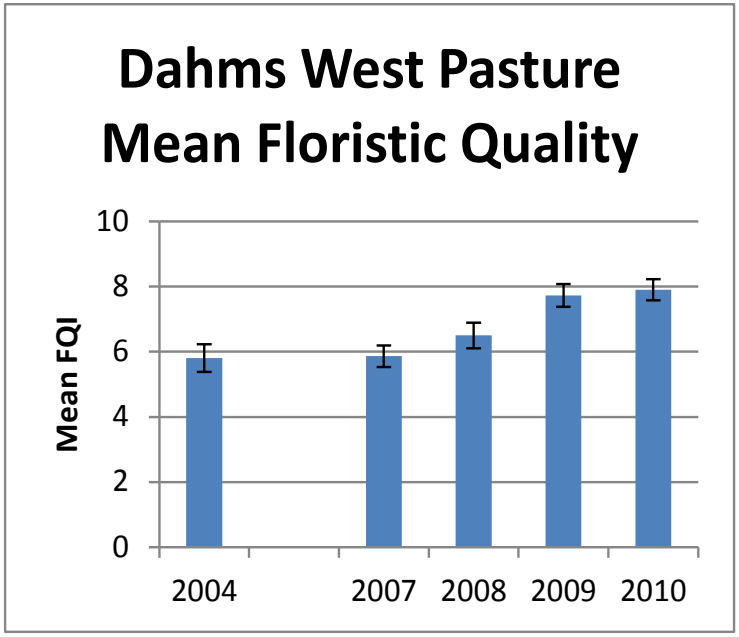

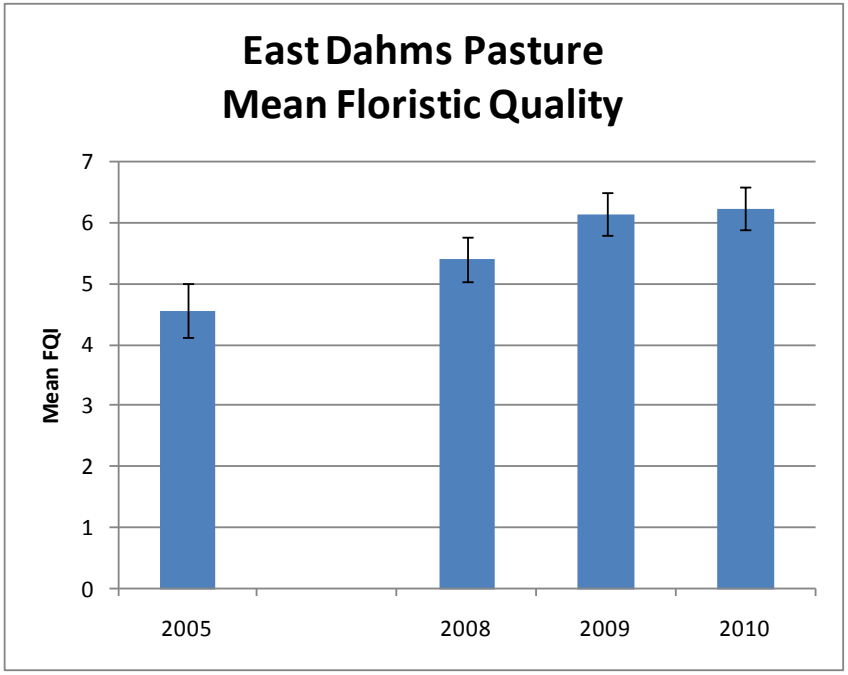

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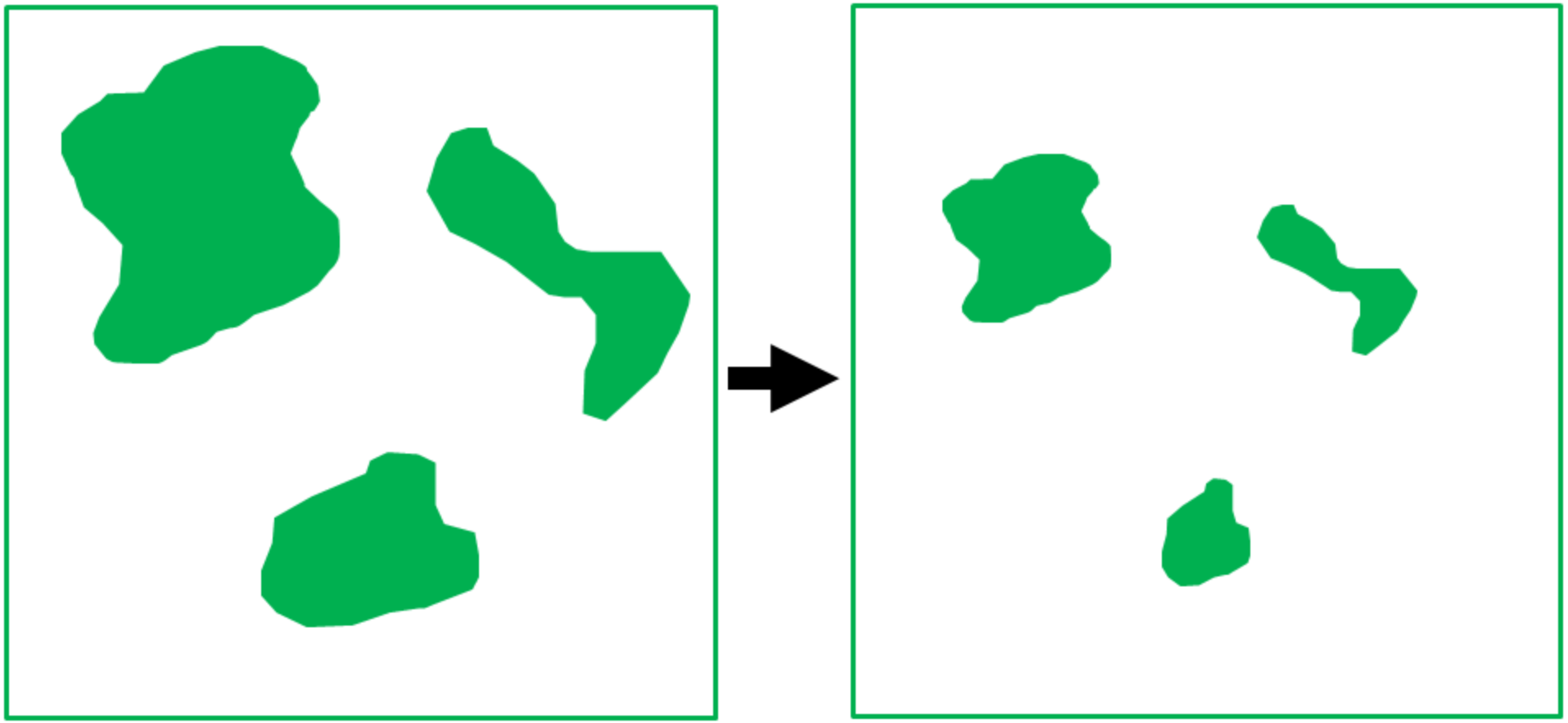
2. Floristic quality of degraded remnants is positive but forb diversity not increasing.

3. Plant diversity not necessarily correlated with invasive grass frequency.

Weed Suppression Strategy for Patchy Infestations

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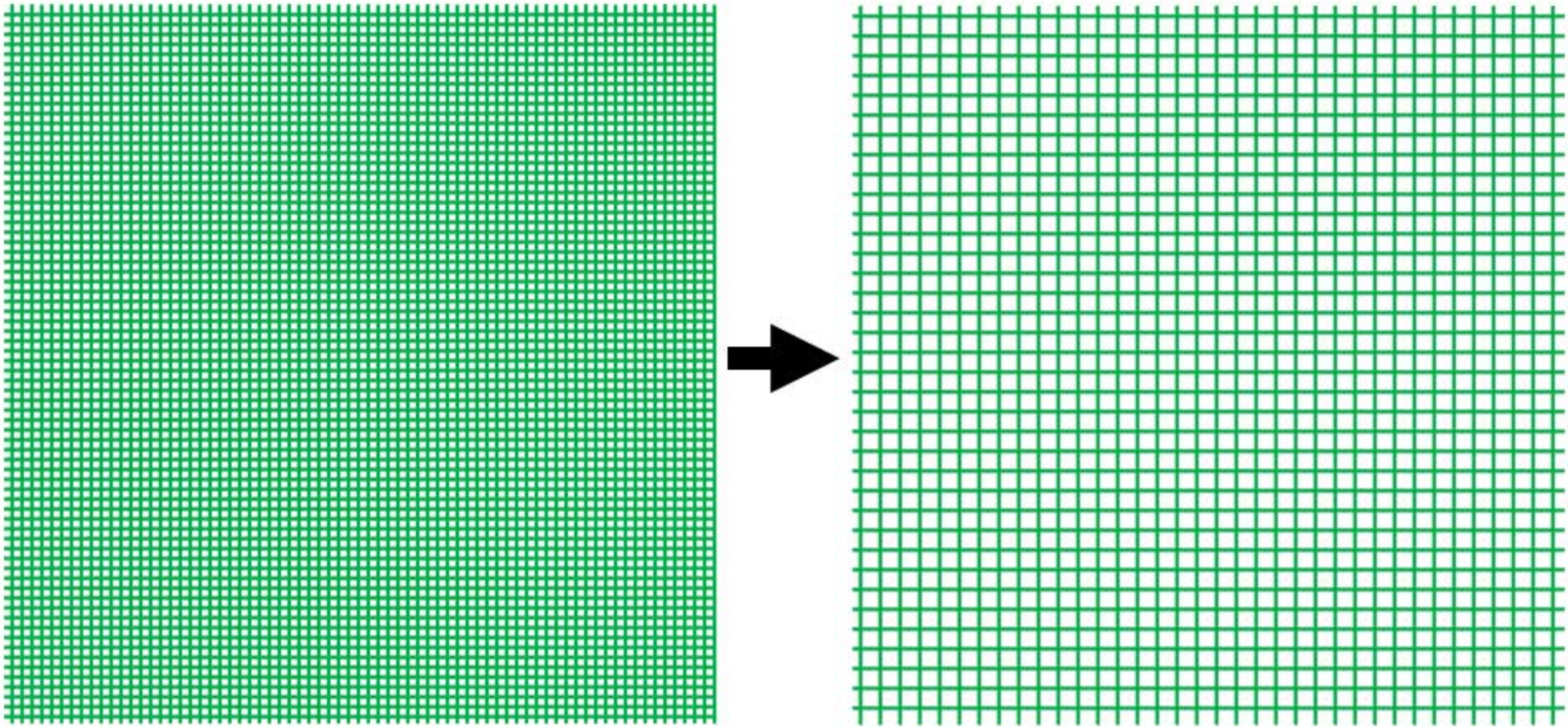
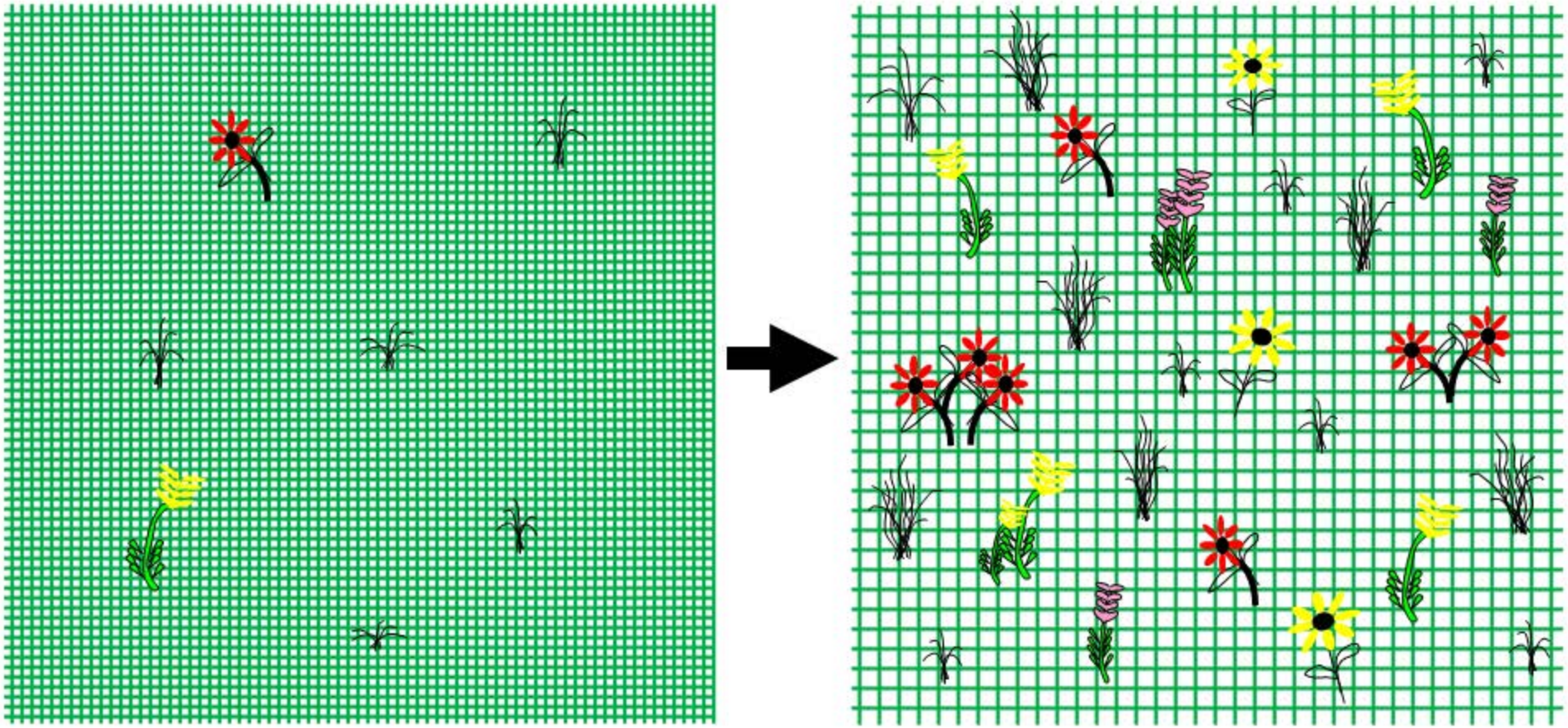
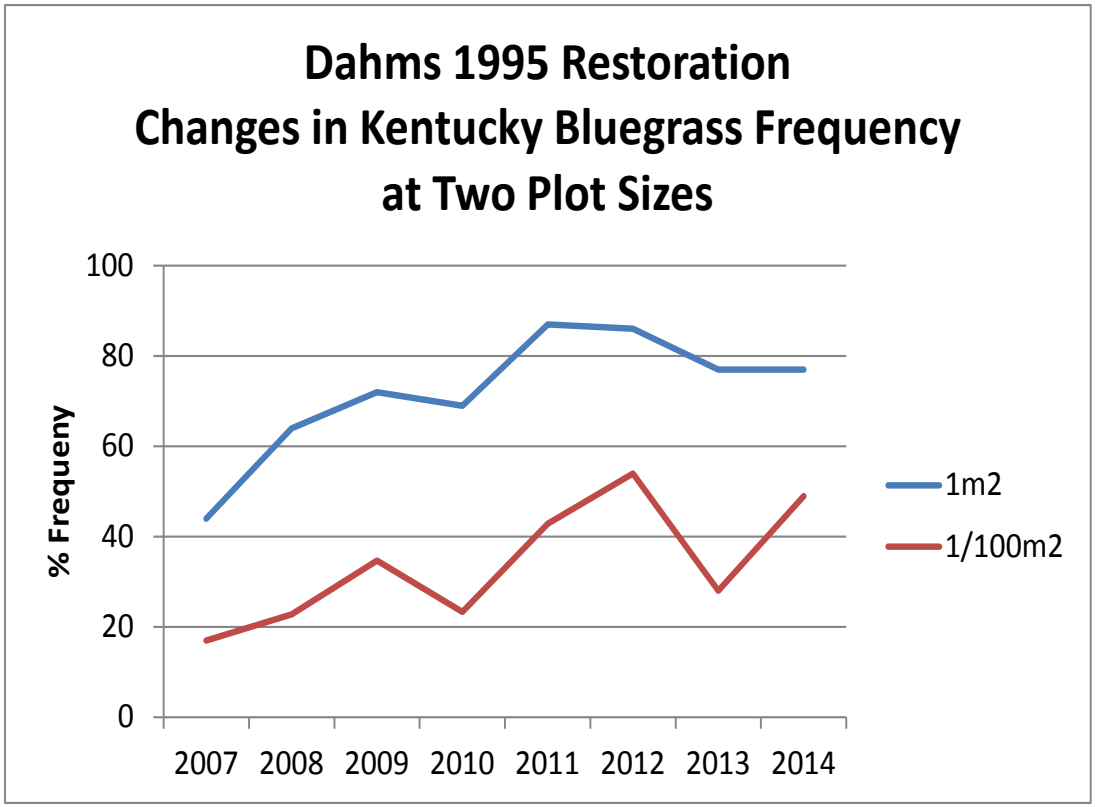
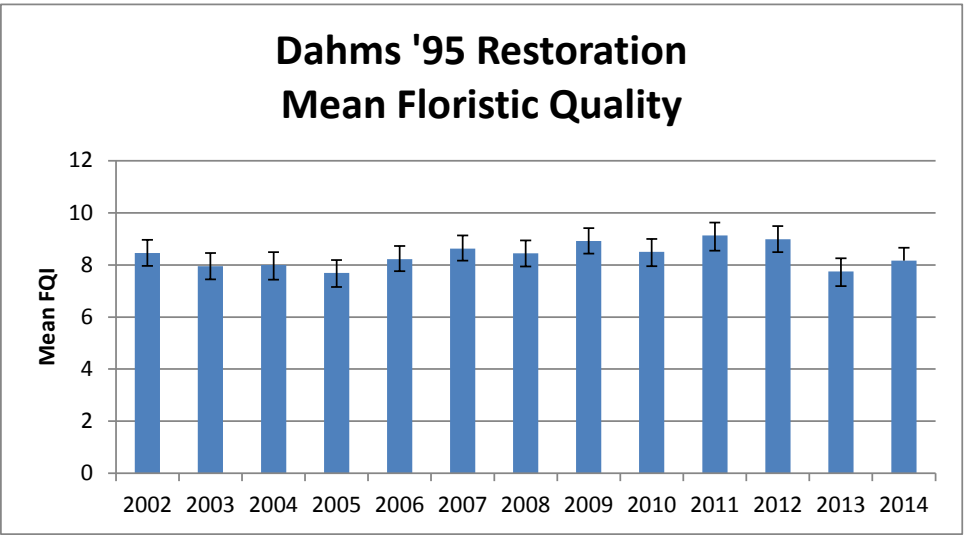
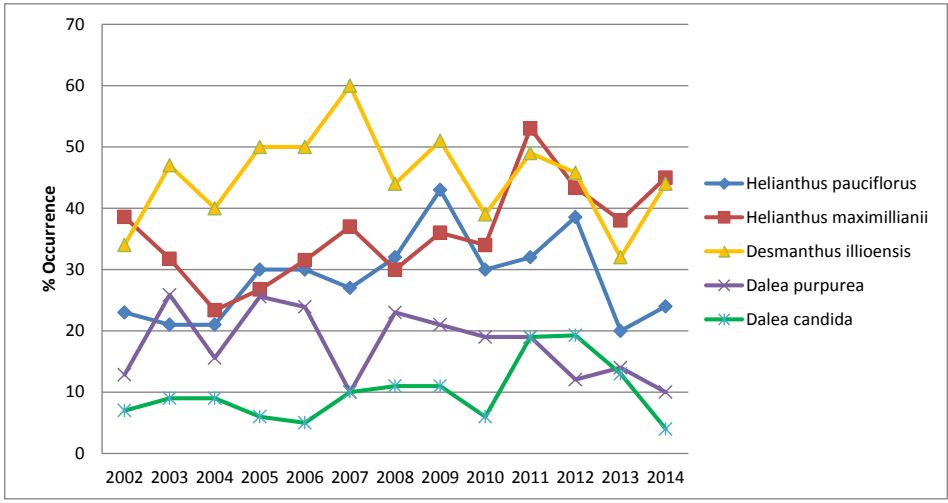





Dahms 1995 Restoration
Changes in Kentucky Bluegrass Frequency
at Two Plot Sizes
% Frequeny
100
80
60
40
20
0
2007 2008 2009 2010 2011 2012 2013 2014
1m2
1/100m2


Dahms '95 Restoration
Mean Floristic Quality
Mean FQI
12
10
8
6
4
2
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014


% Occurrence
70
60
50
40
30
20
10
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Helianthus pauciflorus
Helianthus maximillianii
Desmanthus illioensis
Dalea purpurea
Dalea candida

Lessons from Fire/Grazing Management

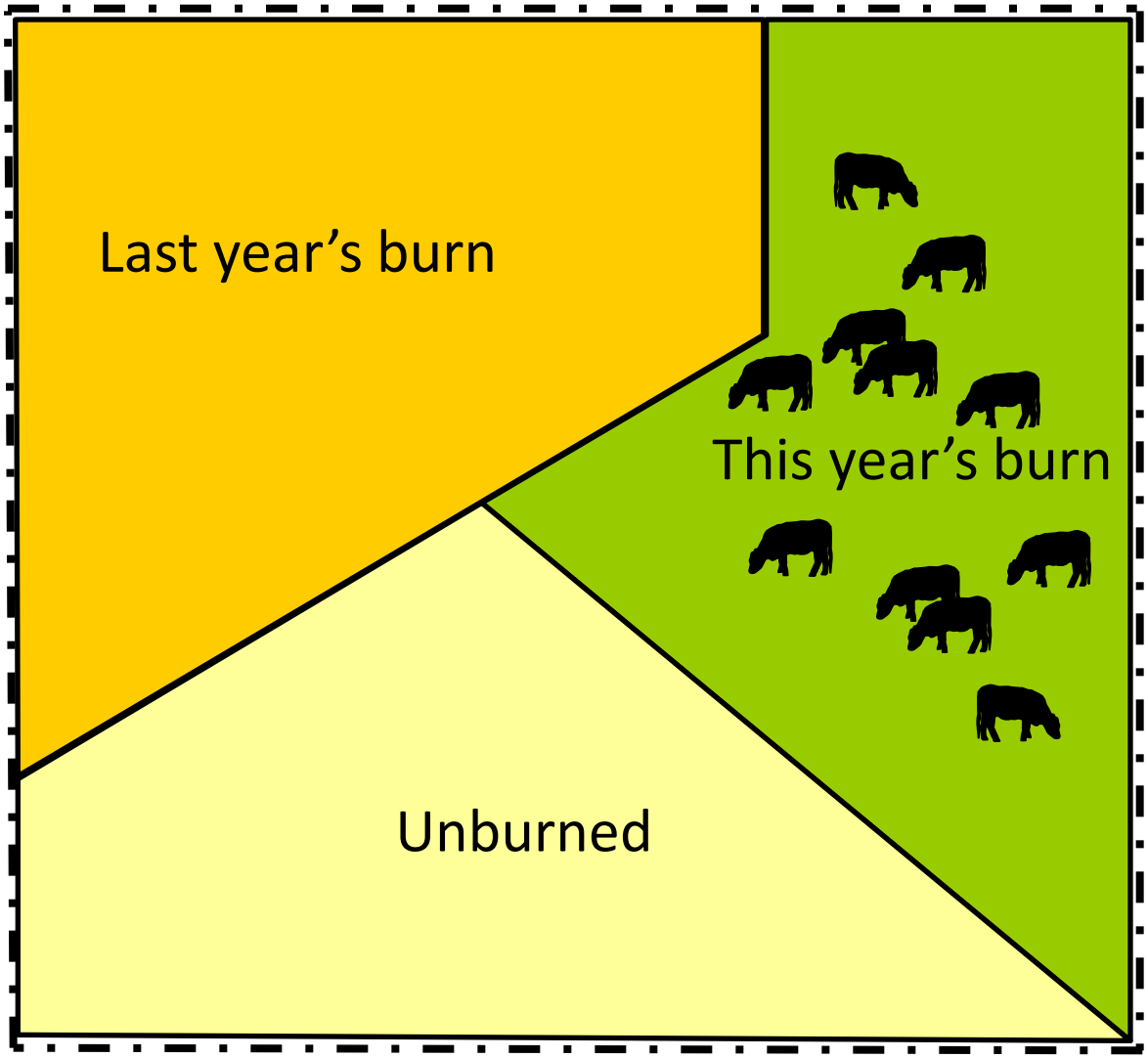
1. Ecological resilience of plant community seems high in restored prairies.

2. Floristic quality of degraded remnants is positive but forb diversity not increasing.

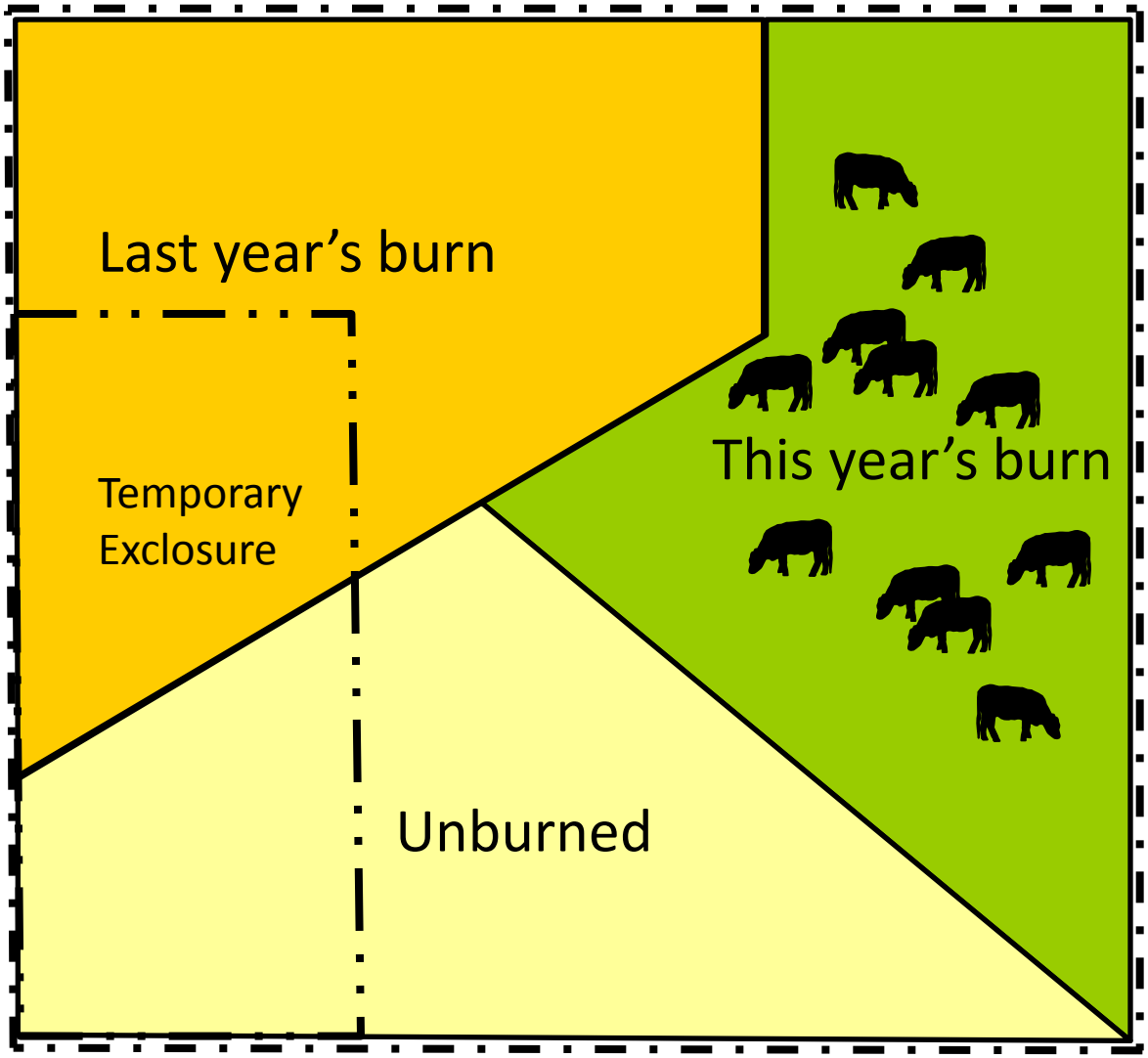
3. Plant diversity not necessarily correlated with invasive grass frequency.

4. Grazing seems compatible with plant diversity, but rest is important too.

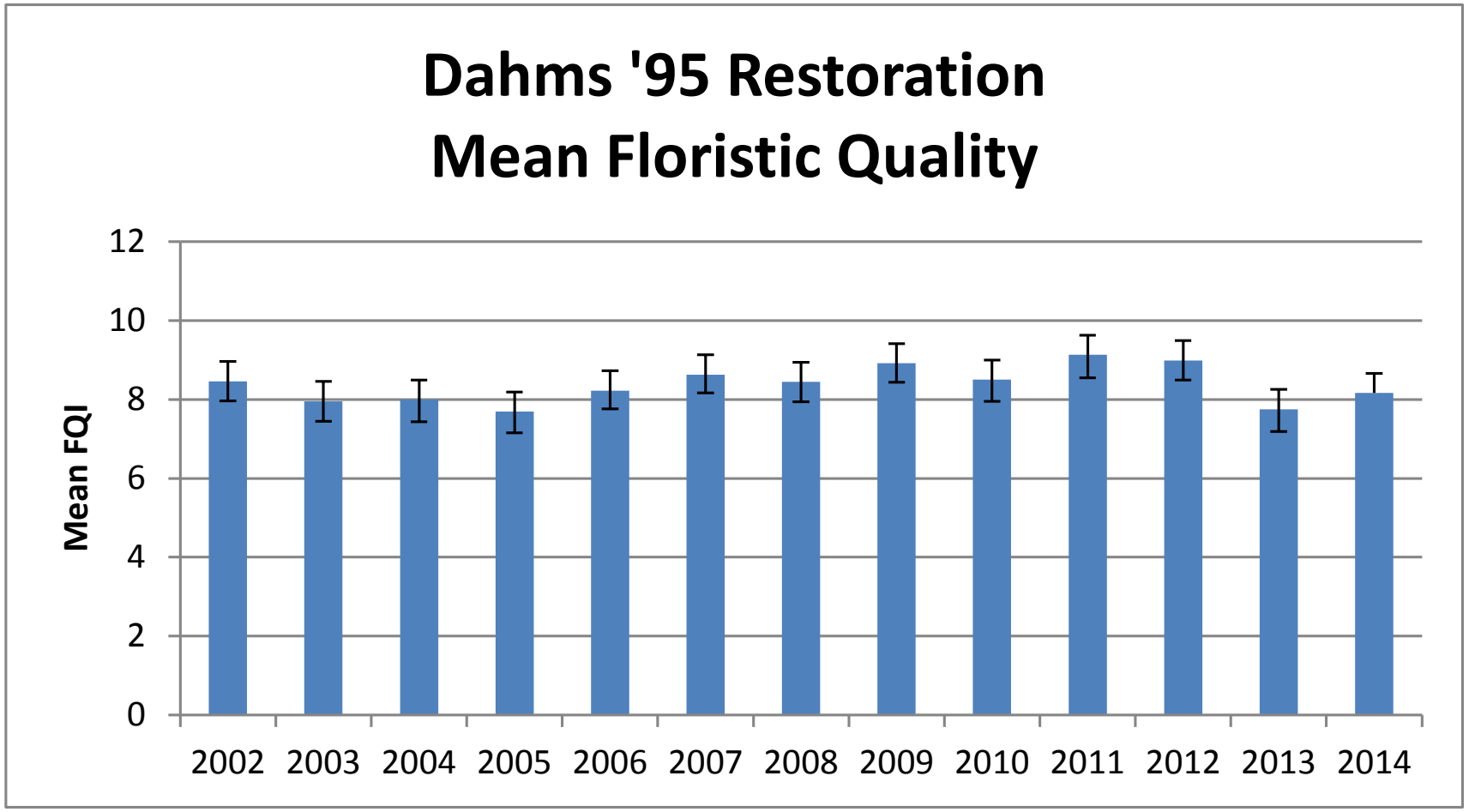
Be Adaptable



Be Adaptable



Is This A Reasonable Measure of Ecological Resilience?



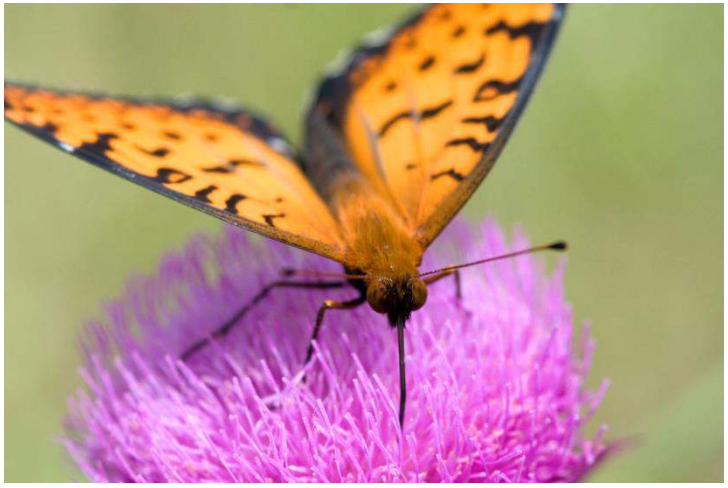
What about non-plants?

Assumption:

Maintaining plant diversity and habitat heterogeneity will provide for most species.

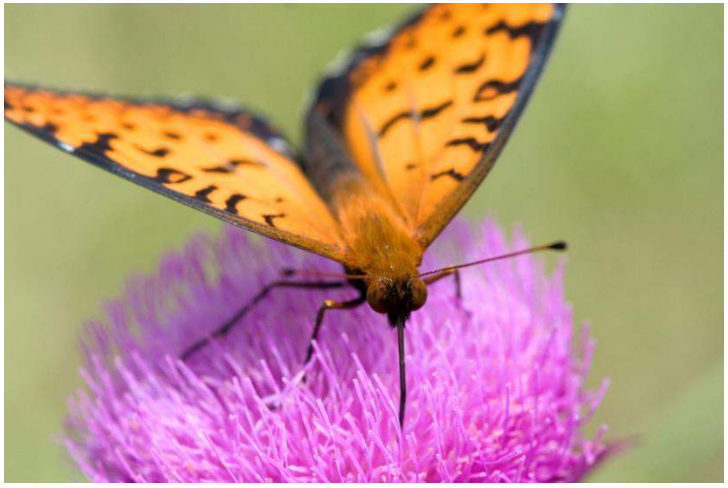
Need to test that assumption better…

Regal Fritillary Butterflies



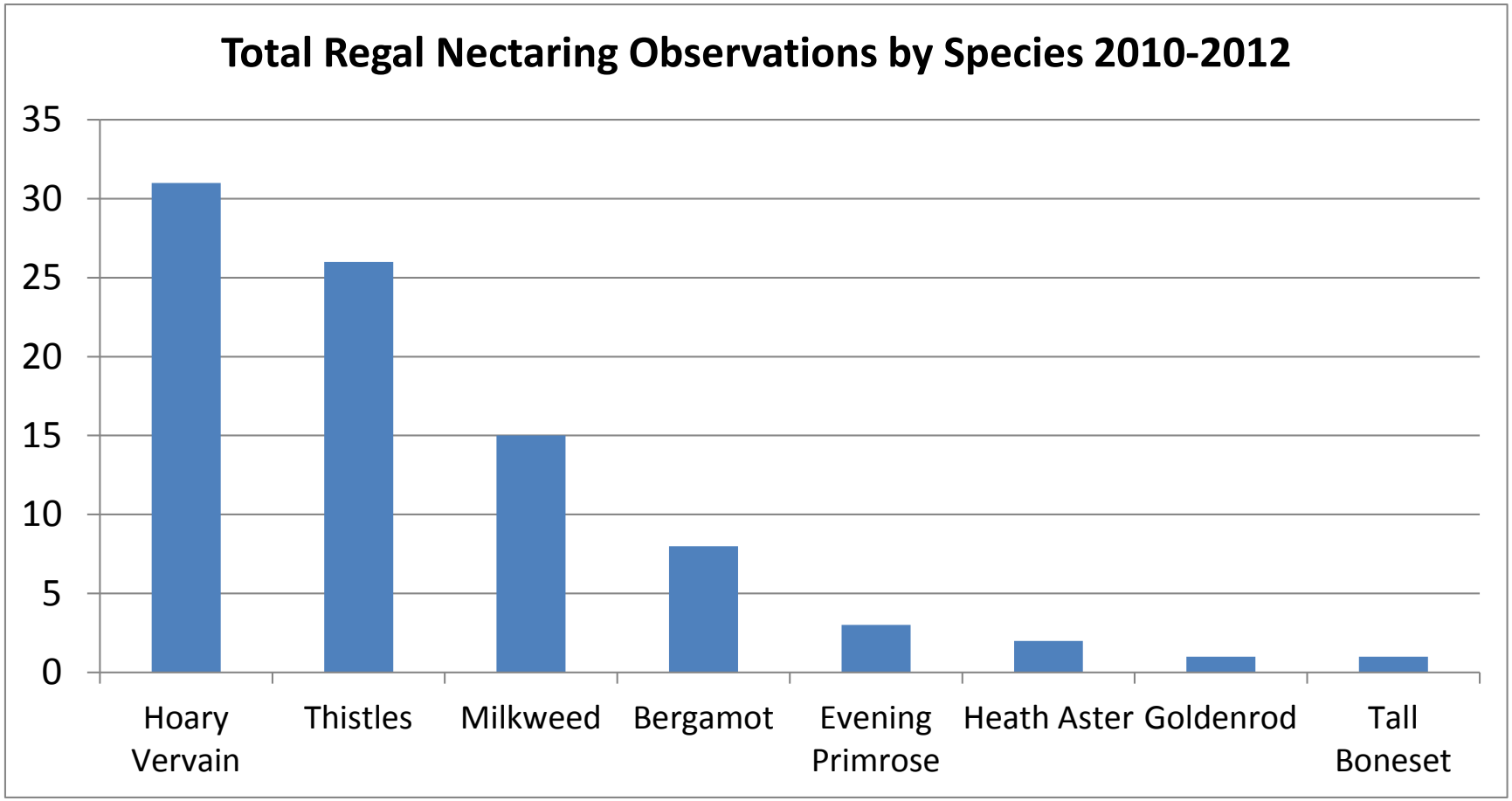
Regal Fritillary Butterflies

- Caterpillars feed only on violets
- Males emerge in late June, females 2 wks later
- Mating, then dispersal, feeding, diapause
- Egg laying September



Lessons from Regal Fritillary Surveys

1. Weedy flowers are very important.



Lessons from Regal Fritillary Surveys

1. Weedy flowers are very important.

2. Recovery from fire/grazing is very quick

Highest Weekly Counts of Fritillaries by Transect (Emergence Period)

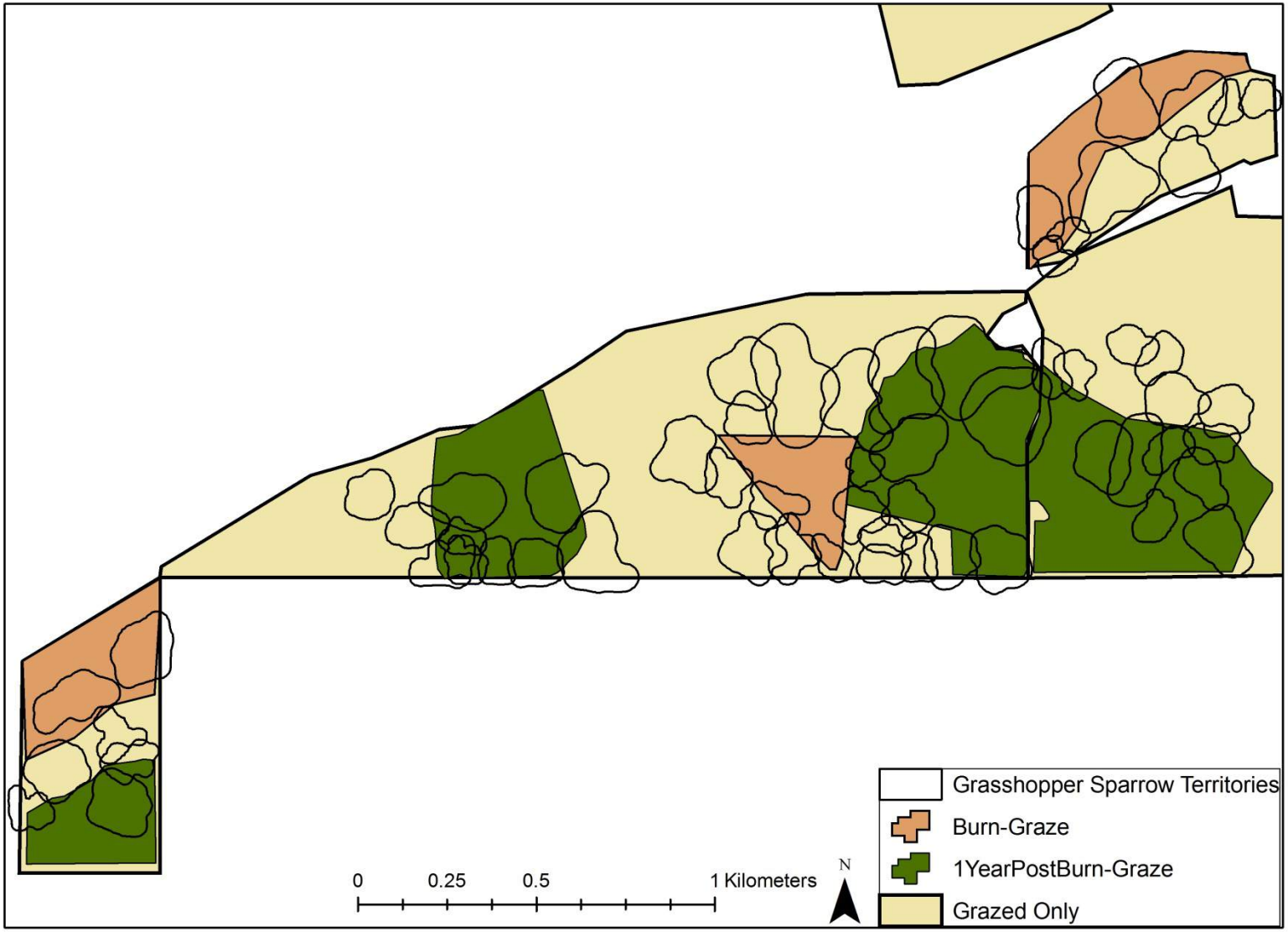
Transect #	2011	2012	Fire Year
13	26	**1**	2012 (grazed hard)
9	**2**	19	2011 (grazed hard)
17	34	31	2010 (light-moderate grazing)

THE EFFECTS OF PATCH BURN GRAZING ON BREEDING GRASSLAND BIRDS

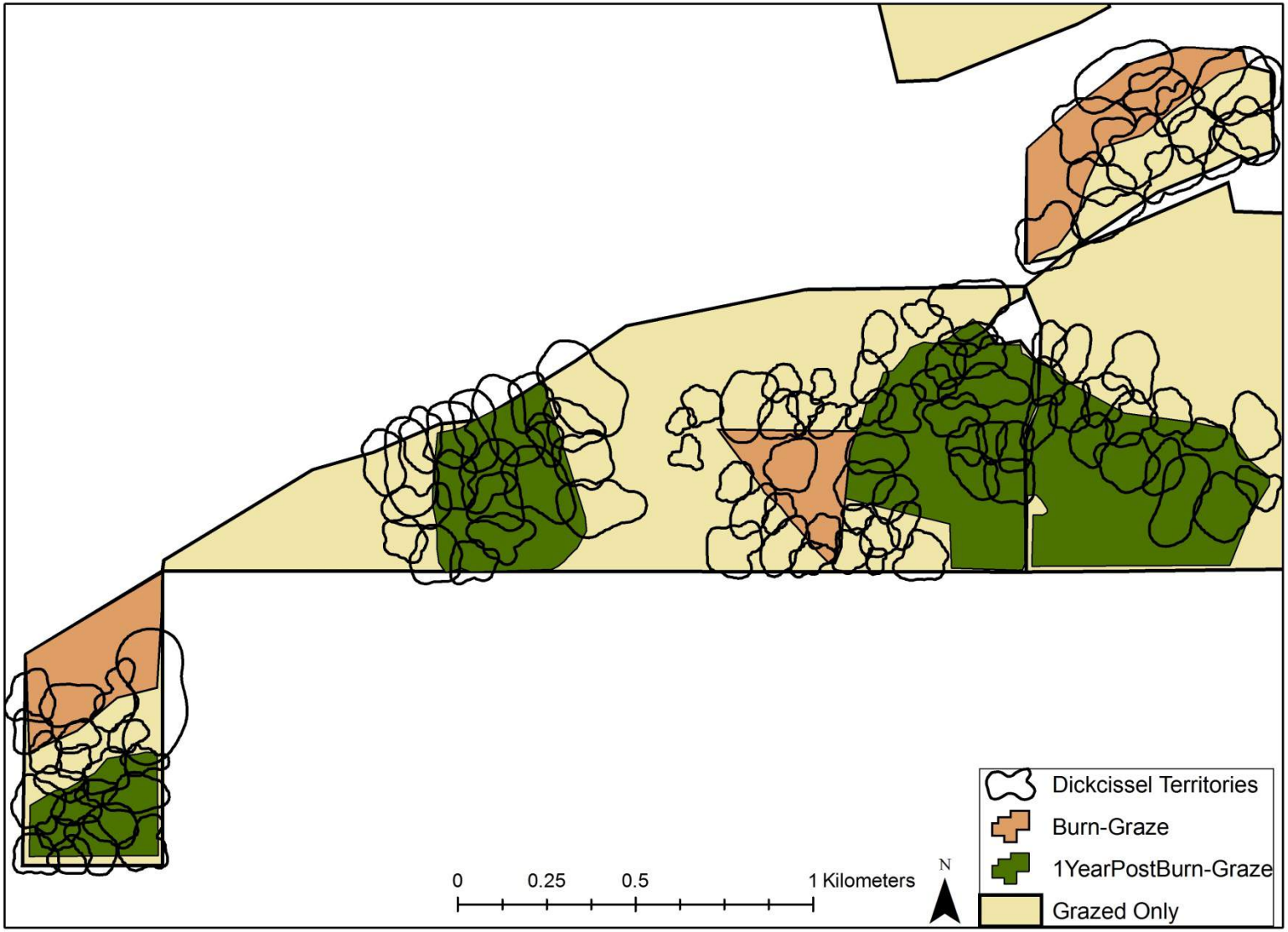
Michelle C. Biodrowski

Master of Science
University of Nebraska at Omaha
December 2013

Grasshopper Sparrow Territory Placement 2013

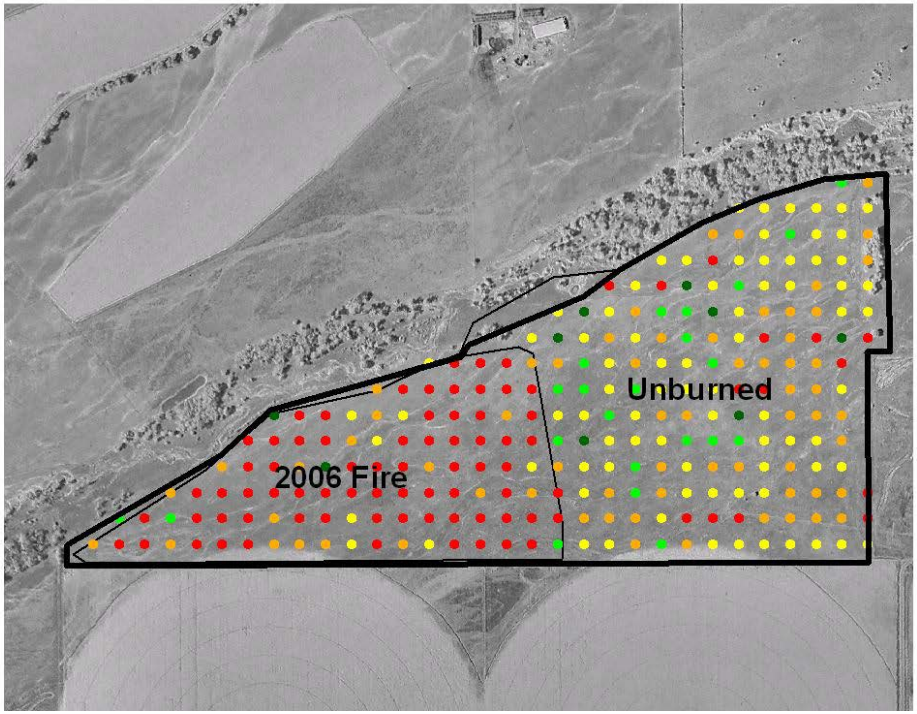


Dickcissel Territory Placement 2013

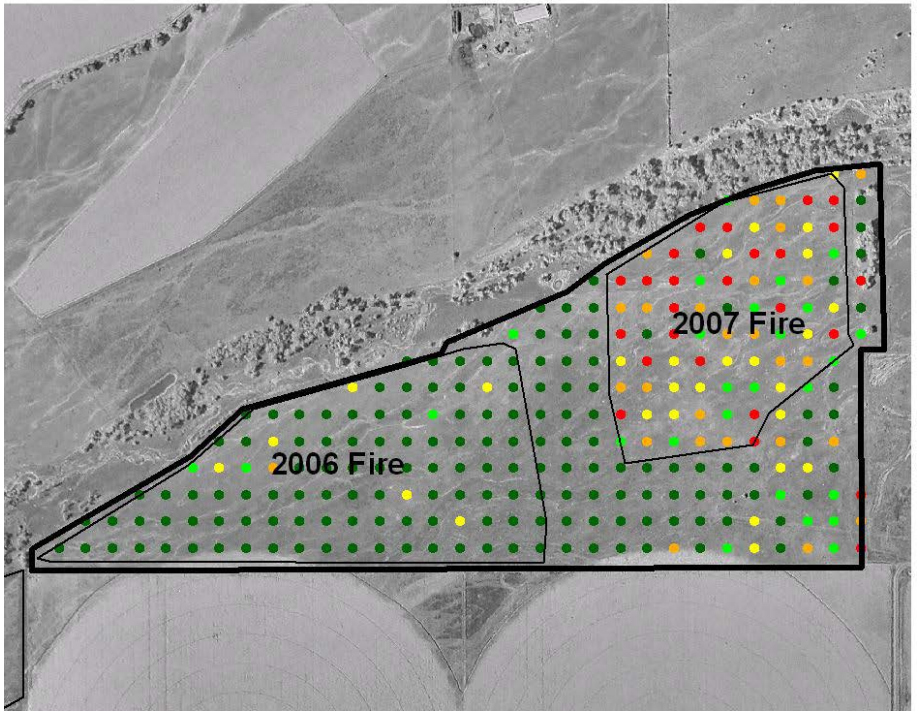


2nd Strata

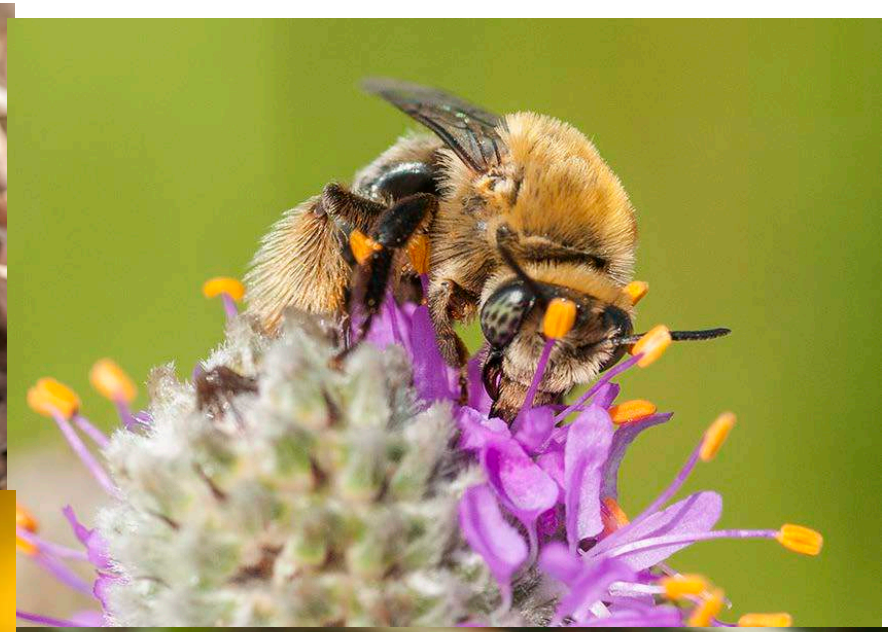
2006

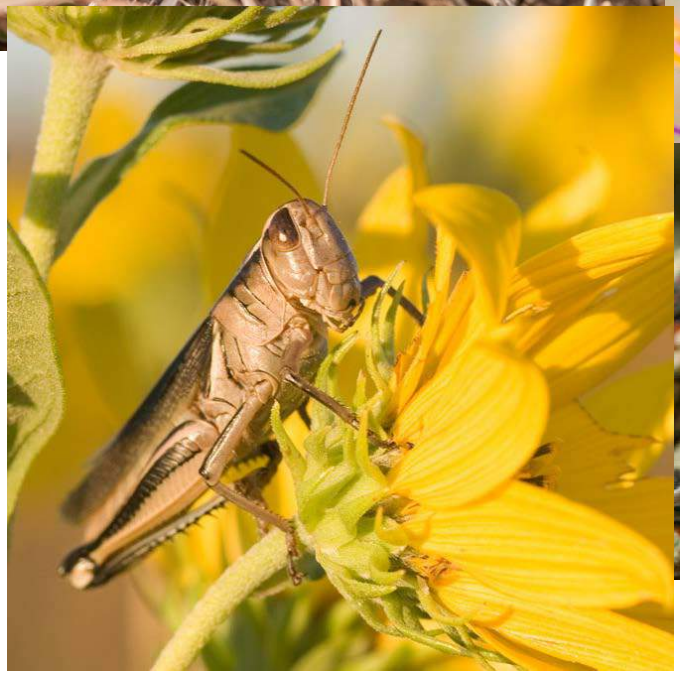


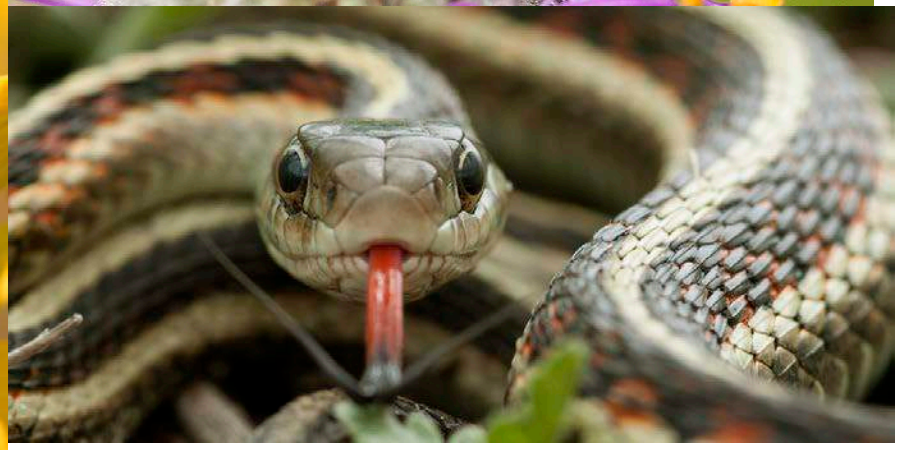
2007



- 0-5%
- 6-20%
- 21-50%
- 51-80%
- 81-100%

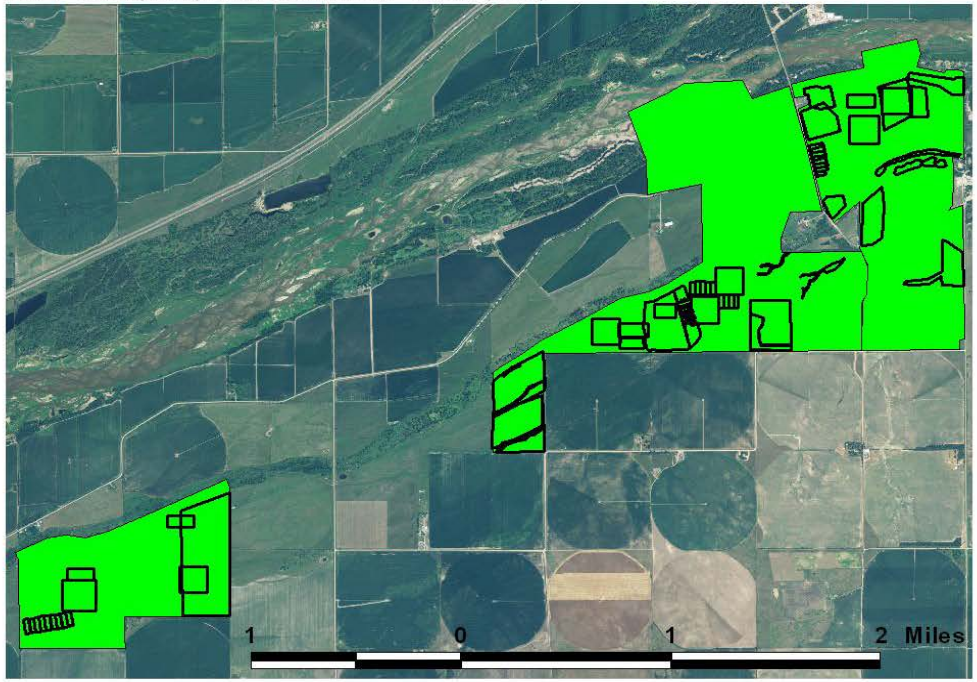




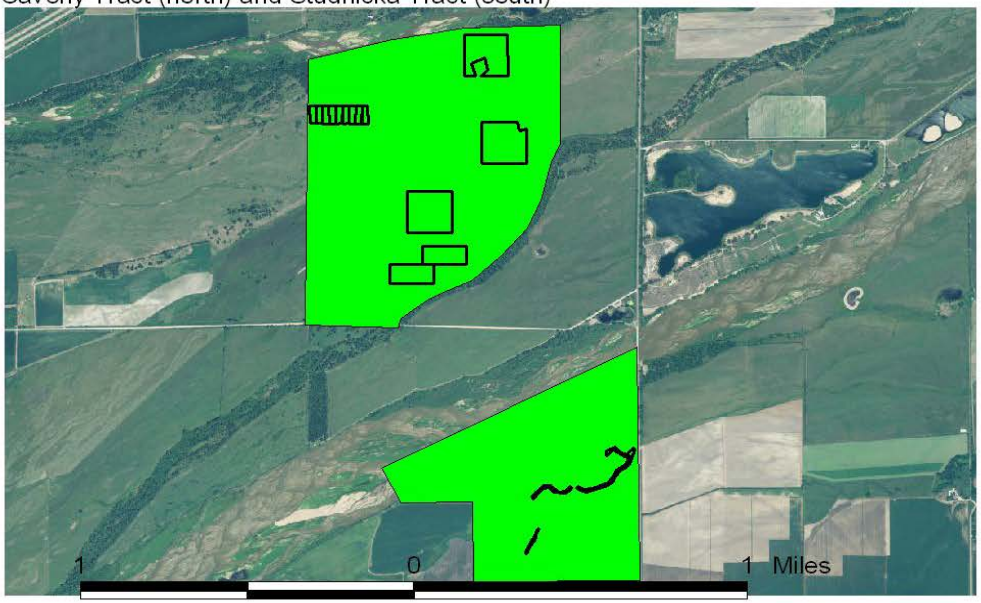


Overseeding Degraded Prairies

Miller Tract (west) and Dahms/Derr Tracts (east)

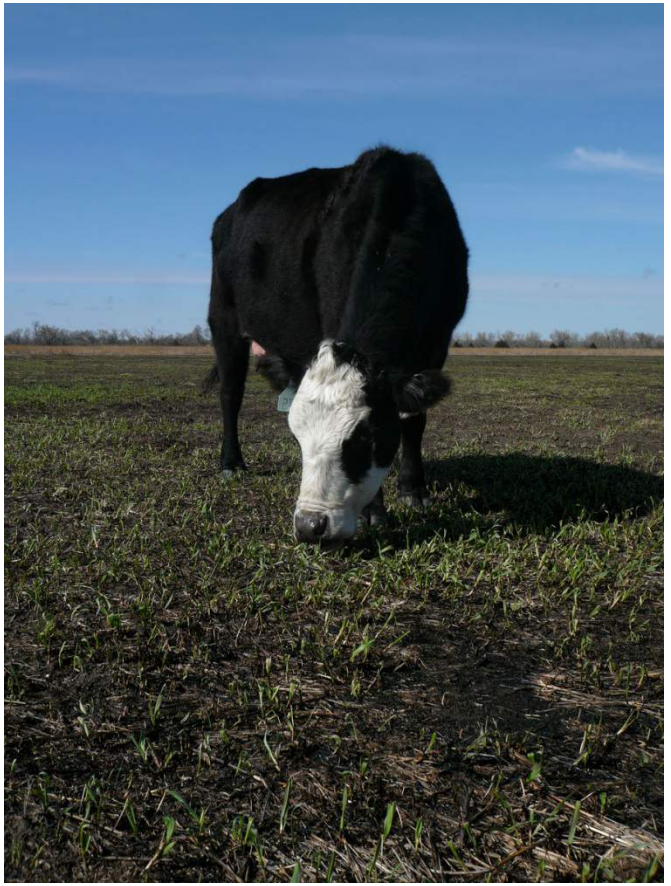


Caveny Tract (north) and Studnicka Tract (south)



Lessons from Overseeding

1. Broadcast seeding after fire and before grazing is effective.



Lessons from Overseeding

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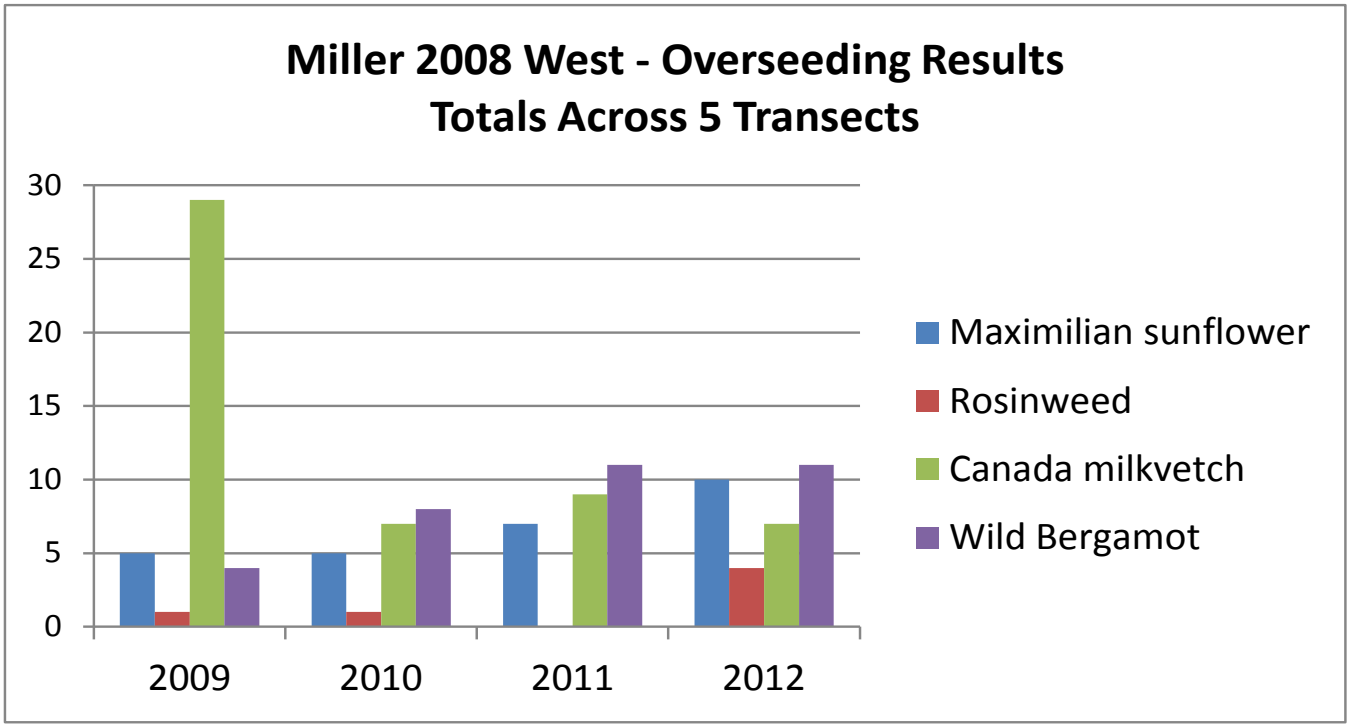
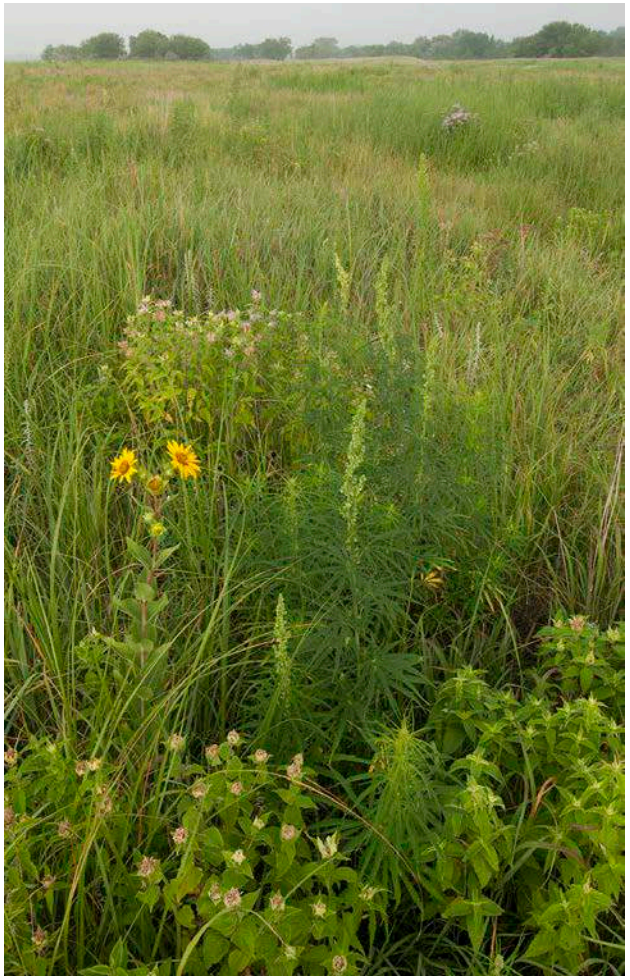
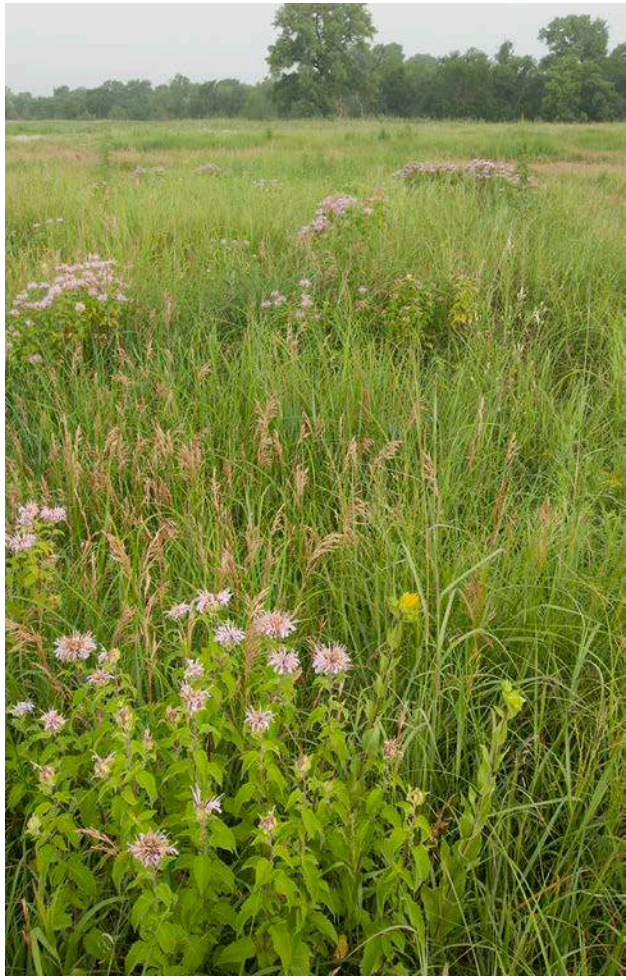


Other plant species that establish well:

- Prairie clovers
- Illinois bundleflower
- Stiff sunflower/Sawtooth sunflower
- Black-eyed susan

Lessons from Overseeding

1. Broadcast seeding after fire and before grazing is effective.

Lessons from Overseeding

1. Broadcast seeding after fire and before grazing is effective.

2. Seeding after grazing can work too.

Lessons from Overseeding

1. Broadcast seeding after fire and before grazing is effective.

2. Seeding after grazing can work too.

3. Light tillage *might* help, but be careful.

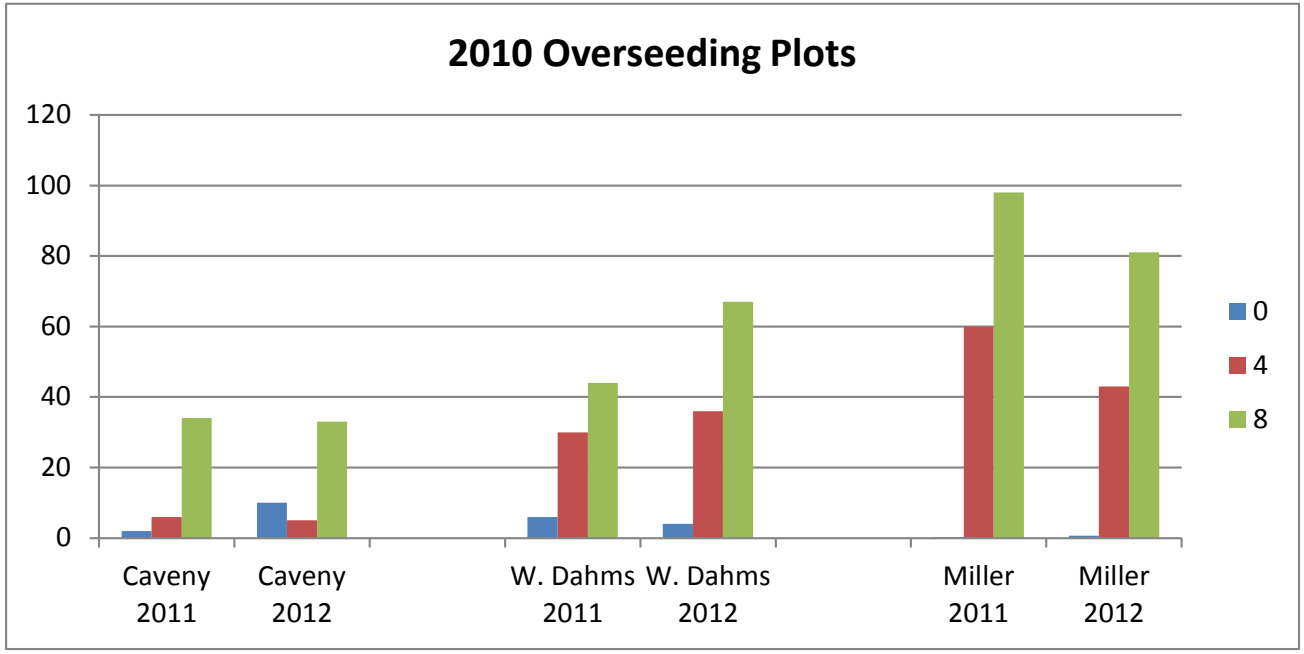
Lessons from Overseeding

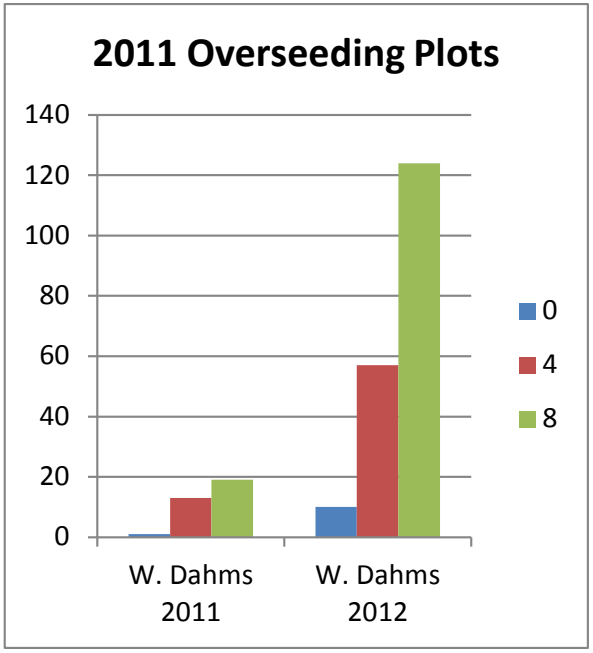
1. Broadcast seeding after fire and before grazing is effective.

2. Seeding after grazing can work too.

3. Light disking *might* help, but be careful.

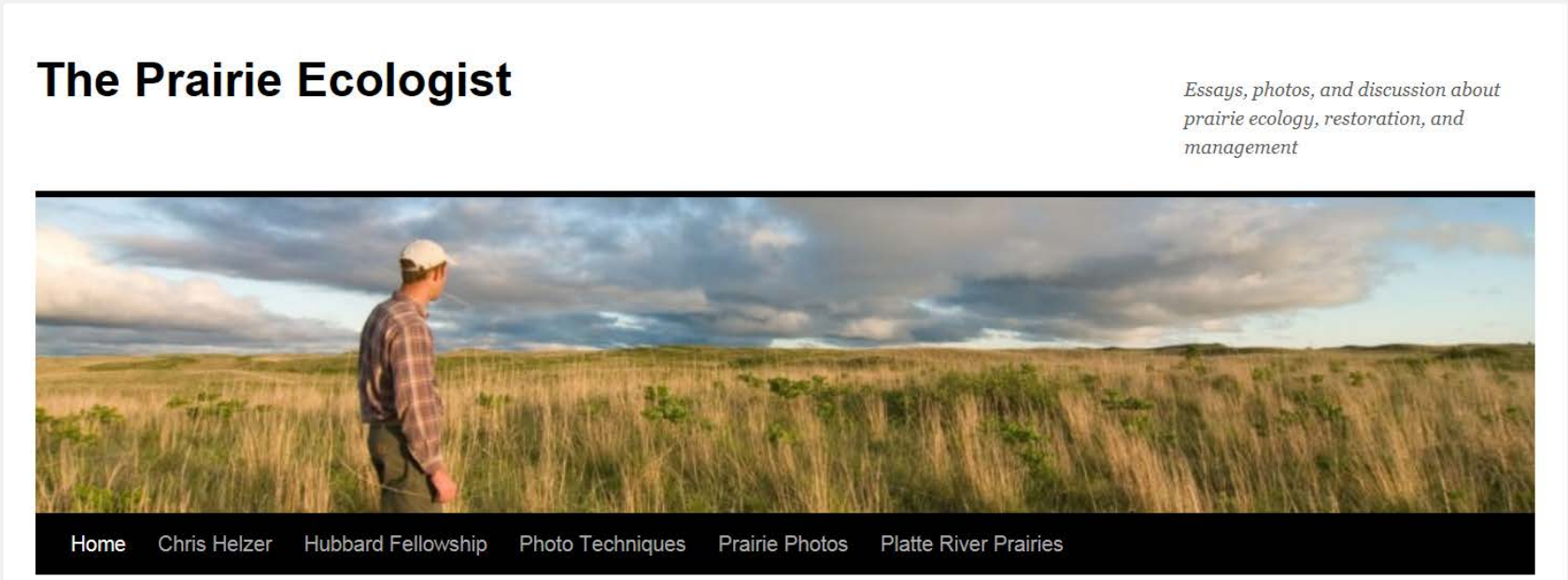
4. More seed = more plants.





Outreach

- Help people recognize importance of plant div and heterogeneity,
- Provide examples of how to create it,
- Let them incorporate those ideas into their own management.



Outstanding Questions/Challenges

- Patch size/configuration?
- Species relationships with habitat structure
- Rest periods: how often, how long?
- Diverse ways to achieve “shifting mosaic”
- Different strategies for restoration vs. management?