Temporal Response to Mowing Wyoming Sagebrush Communities: Sagebrush and Herbaceous Species

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Two Basic Issues and Associated Questions

1. Change in sagebrush cover with time
   a. Does it reach cover values similar to those on adjacent untreated communities?
   b. How long does this take?
2. Change in native herbaceous cover and other attributes across time?
   a. How long until they become significant (statistical vs biological)?
   b. Do these changes persist?

The Data

- Reported as a “shift”
  - ✓ Treatment site, minus the untreated area
    - + value means the attribute value is greatest in the treated area
    - - value means the attribute value is largest in the adjacent untreated areas
- Five age categories used on two-year increments
  - ✓ 1-2
  - ✓ 3-4
  - ✓ 5-6
  - ✓ 7-8
  - ✓ 9-10
- 76 total mowed sites
  - ✓ 69 mowed only once

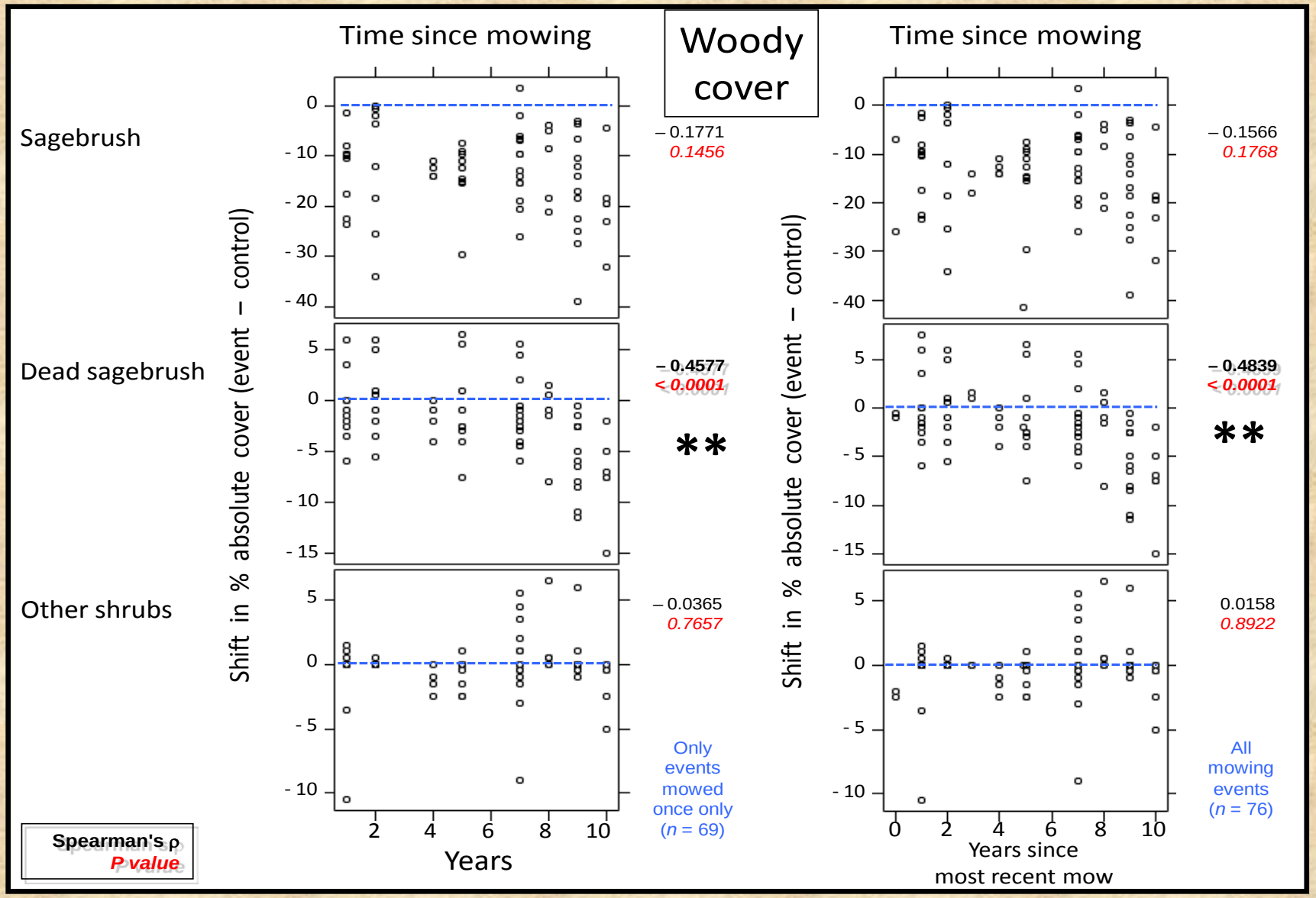
Sagebrush

Treatment age and mean sagebrush cover values and the results of ANOVA analysis of the mowing age groups. (*n* = 69).

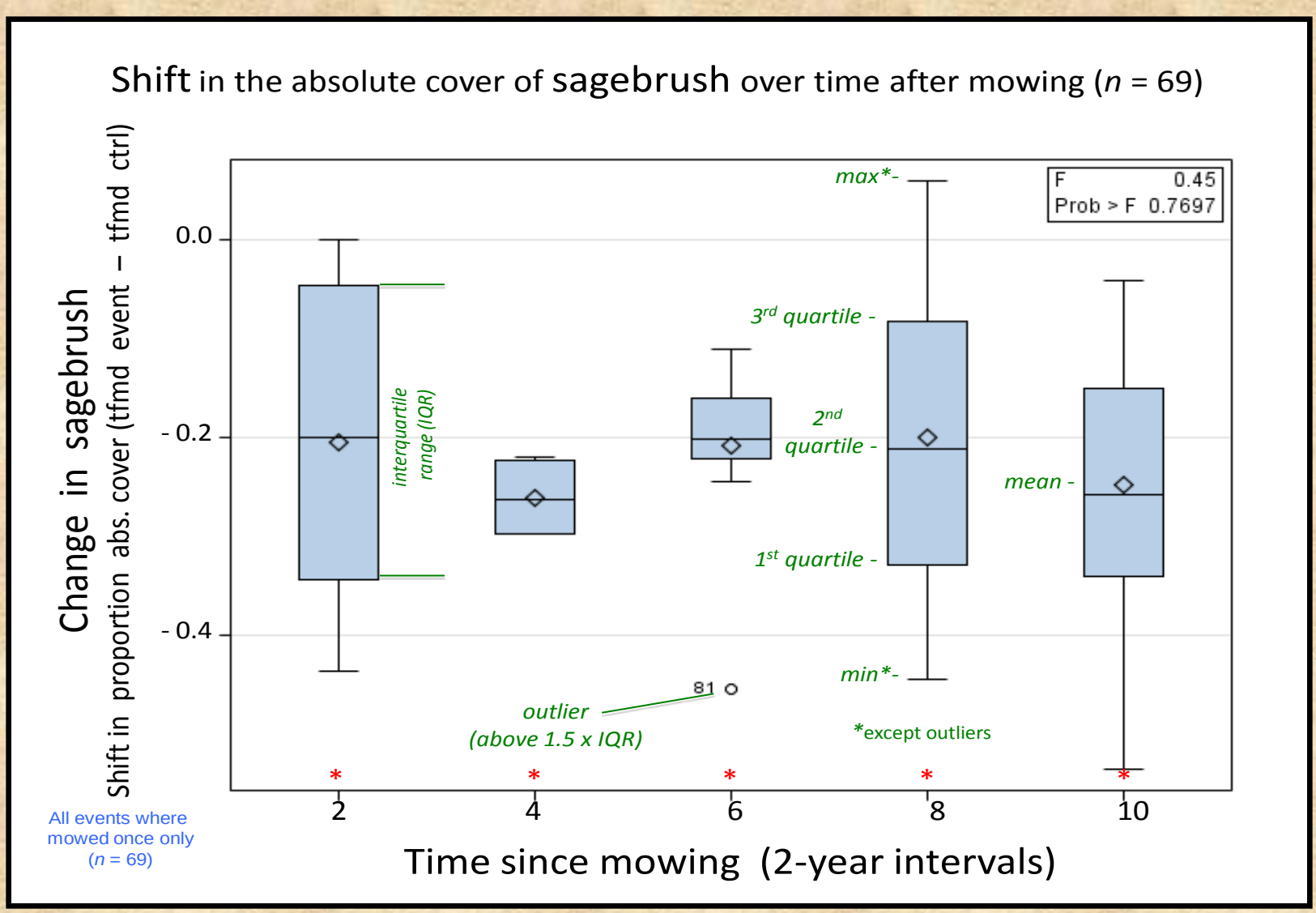
Age of Mow[1]	n	Absolute Cover (%) Mean	[SD]	Relative Cover (%) Mean	[SD]	Mean Absolute Cover Shift (%) Mean	[SD]
0-2 Years	18	6.03	[5.41]	13.84	[11.96]	-12.11	[9.64]
3-4 Years	4	2.25	[2.25]	5.86	[5.97]	-12.88	[1.44]
5-6 Years	9	7.39	[4.20]	31.41	[21.62]	-13.78	[6.54]
7-8 Years	19	7.37	[5.60]	29.82	[21.06]	-11.45	[7.58]
9-10 Years	19	9.03	[6.50]	34.38	[31.61]	-16.82	[10.19]
P		0.2094		**0.0230**		0.3742	

[1] At time of field sampling

Correlation of Sagebrush Cover Shift



Sagebrush Cover Shift



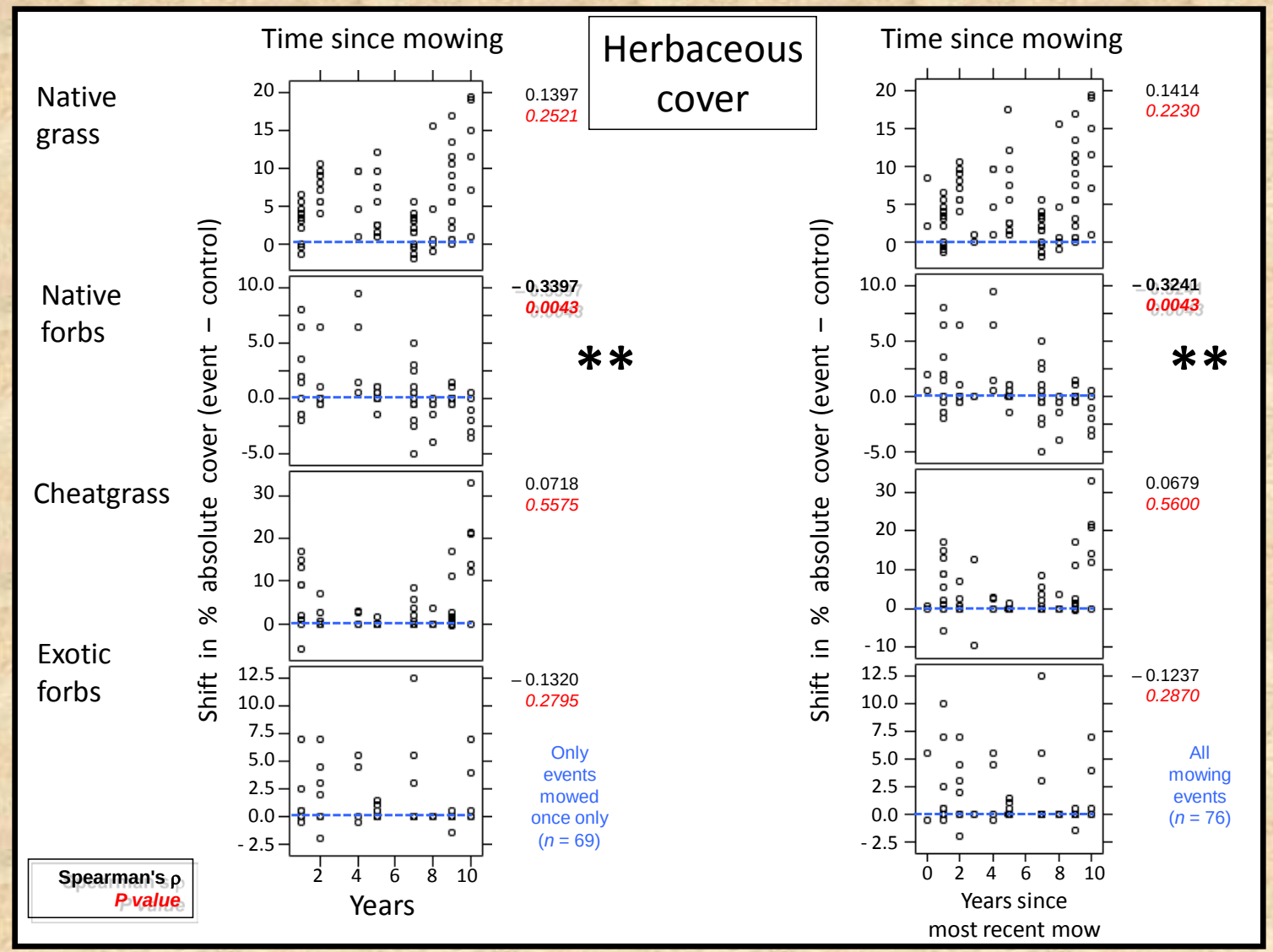
Sagebrush Conclusions

- Recovery of absolute sagebrush canopy cover takes longer than 10 years
  - ✓ Consistent with many other studies
- General trend for mowed sites is to *slowly* increase with time since treatment
- SB canopy cover is expanding faster on untreated than treated sites
  - ✓ Increased herbaceous on treated sites may be affecting rate of SB increase
  - ✓ Absolute herbaceous cover typically much less on untreated sites, not affecting SB growth and ability to continue increasing
- Ten years post-treatment, SB cover on mowed sites has not reached a threshold where it drives future vegetation change.

Herbaceous Change with Time

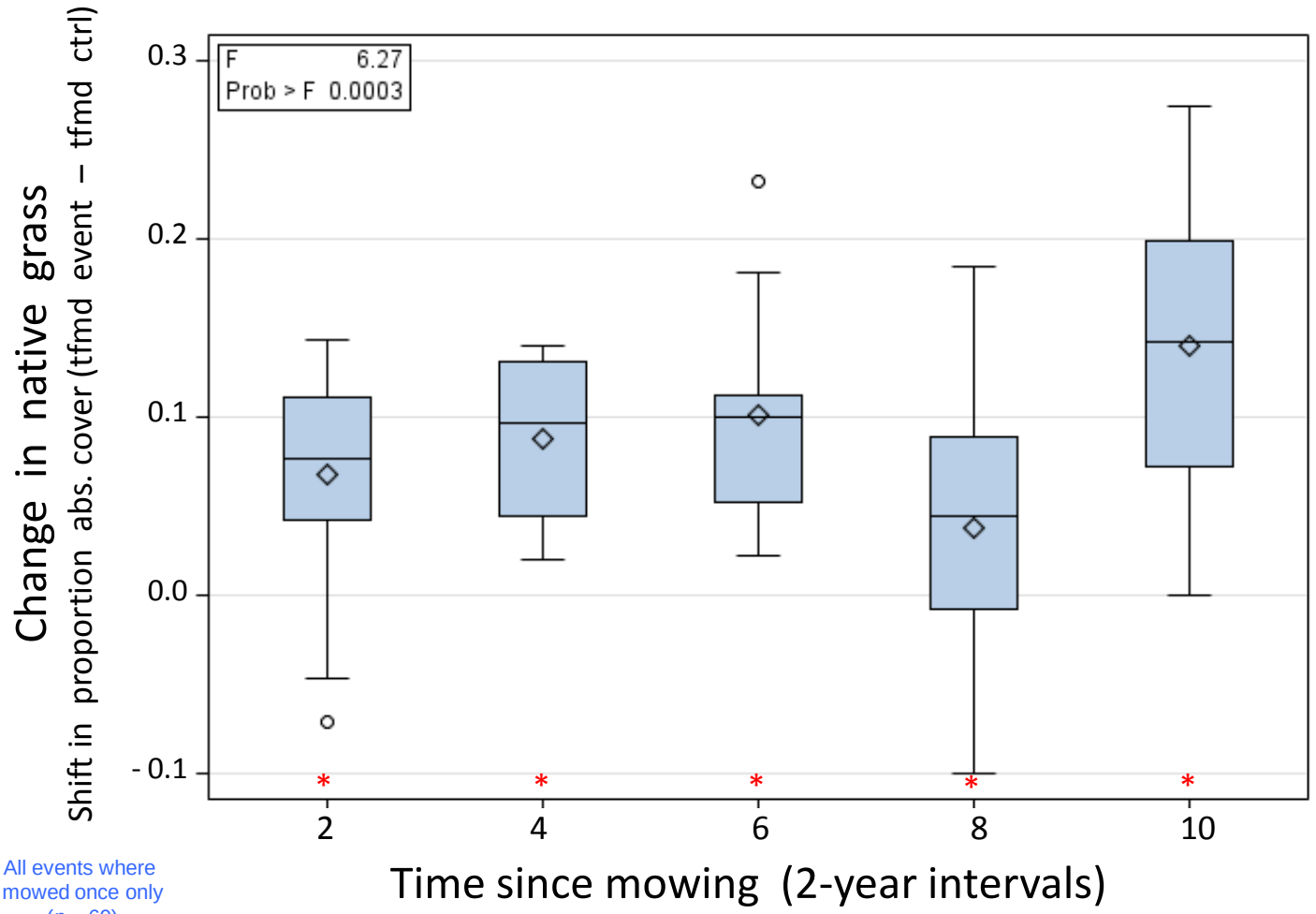
Cover Variable	1 – 2 yrs (n = 18) Mean	3 – 4 yrs (n = 4) Mean	5 – 6 yrs (n = 9) Mean	7 – 8 yrs (n = 19) Mean	9 – 10 yrs (n = 19) Mean	ANOVA Result P
Foliar Cover						
Native forbs	1.39	4.50	0.17	-0.26	-0.39	0.04
Exotic forbs	1.36	2.38	0.33	1.11	0.55	0.96
Introduced grasses	-0.08	NP	NP	0.18	0.05	0.36
Perennial grasses	4.69	6.13	4.94	2.21	8.42	0.00
Cheatgrass	3.97	1.38	0.17	1.26	7.18	0.01

Correlations Herbaceous Cover and Time Since Mowing



Cover Shift – Native Grasses (transformed data)

Shift in the absolute cover of native grass over time after mowing (*n* = 69)

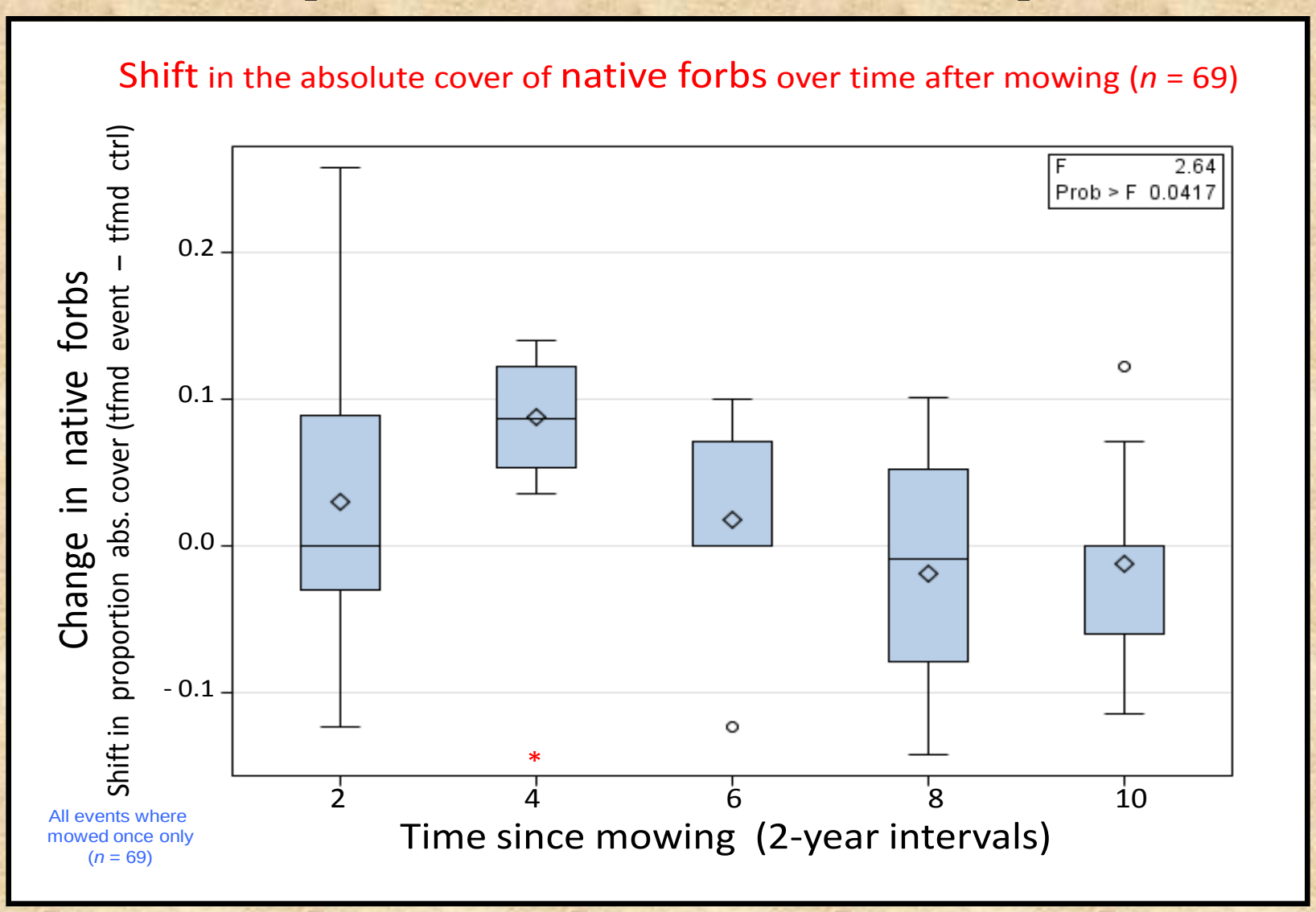


All events where mowed once only (*n* = 69)

Conclusions
Herbaceous Changes

- **Native grasses**
  - ✓ Native grasses increase with age of mowing
  - ✓ Difference between mowed and unmowed generally increases with time
  - ✓ Mowed sites generally become more resilient with time due to increased bunchgrasses
    - ***Caveat***: had to have them to start with

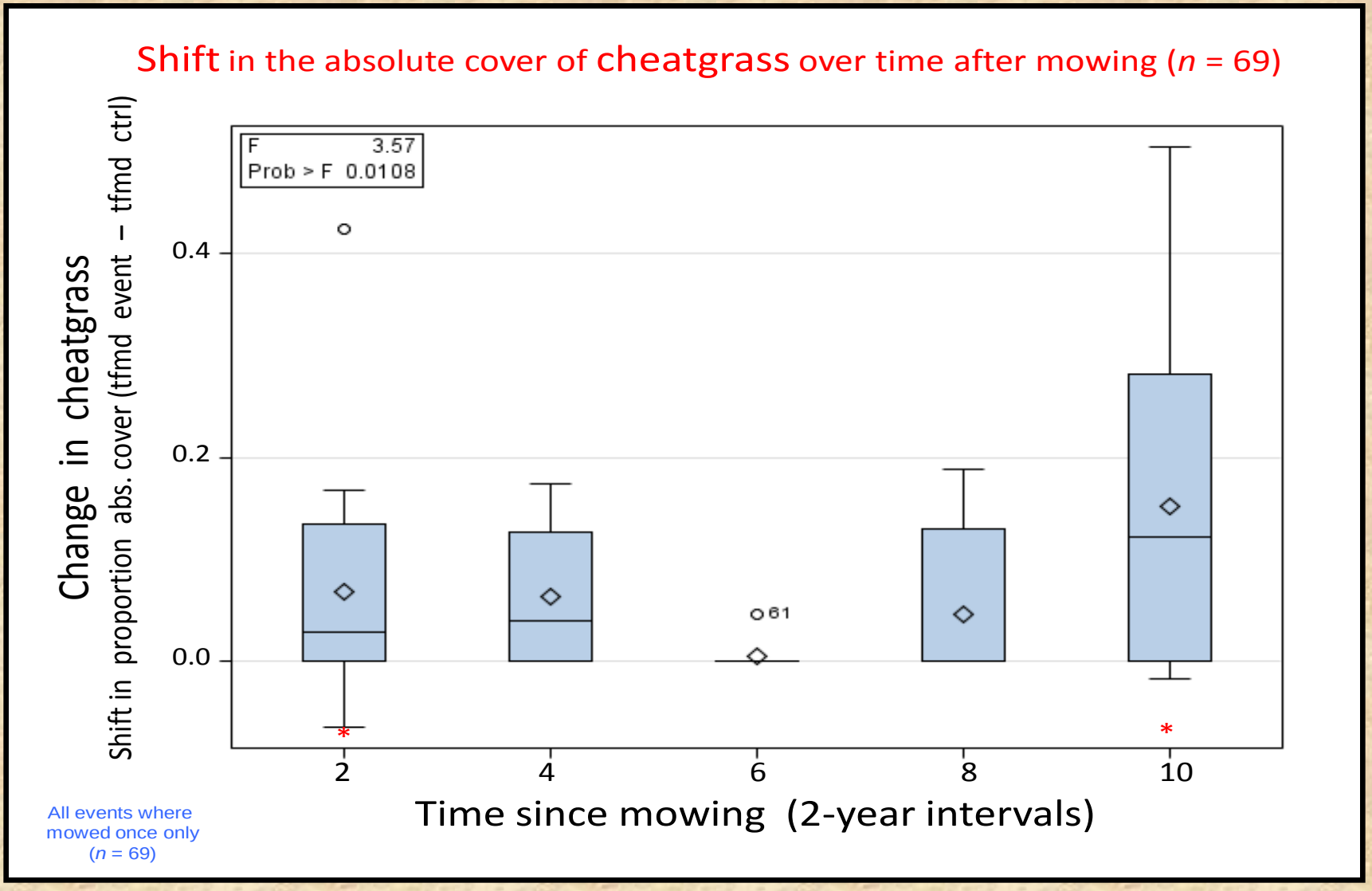
Cover Shift Native Forbs (transformed data)



Conclusions
Herbaceous Changes

- **Native Forbs**
  - ✓ Generally increase in first four years and decrease through year 10
    - Small sample size in 3-4 year class weakens interpretation
  - ✓ Very similar cover in mowed and unmowed from years 6-10
  - ✓ No evidence mowing increases native forbs for more than a few years

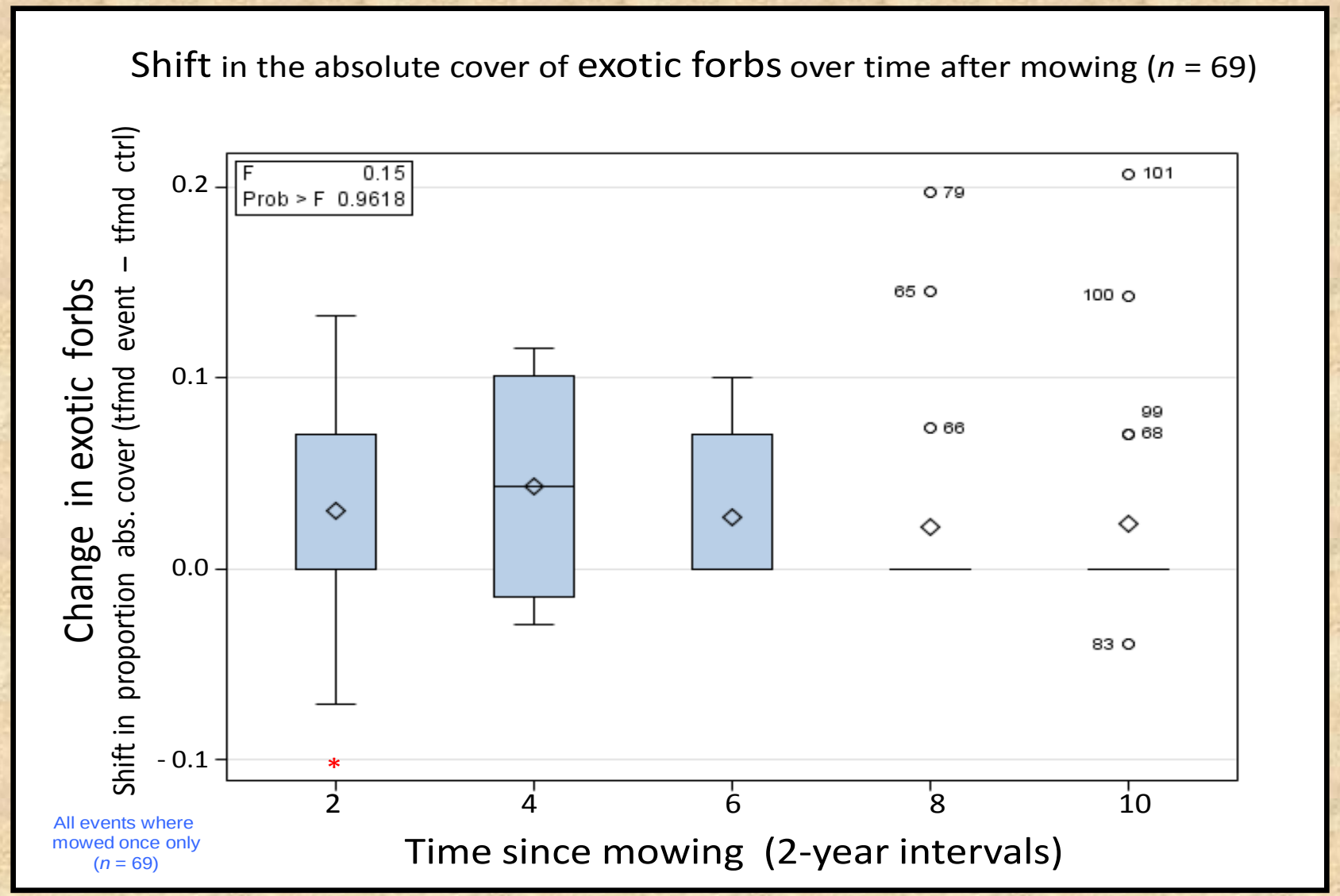
Cover Shift in Cheatgrass (transformed data)



Conclusions
Herbaceous Changes

- **Cheatgrass**
  - ✓ Most mowed sites had more cheatgrass
    - Differences between mowed and unmowed generally small except yrs 1-2 and 9-10
    - Possible nitrogen release yrs 1-2
    - Cheatgrass also germinates better when litter present, mowed sites had more litter
  - ✓ Time since mowing did not affect cheatgrass cover – similar in each age class
    - Different than our expectation of decline with time

Cover Shift in Exotic Forb Cover (transformed data)



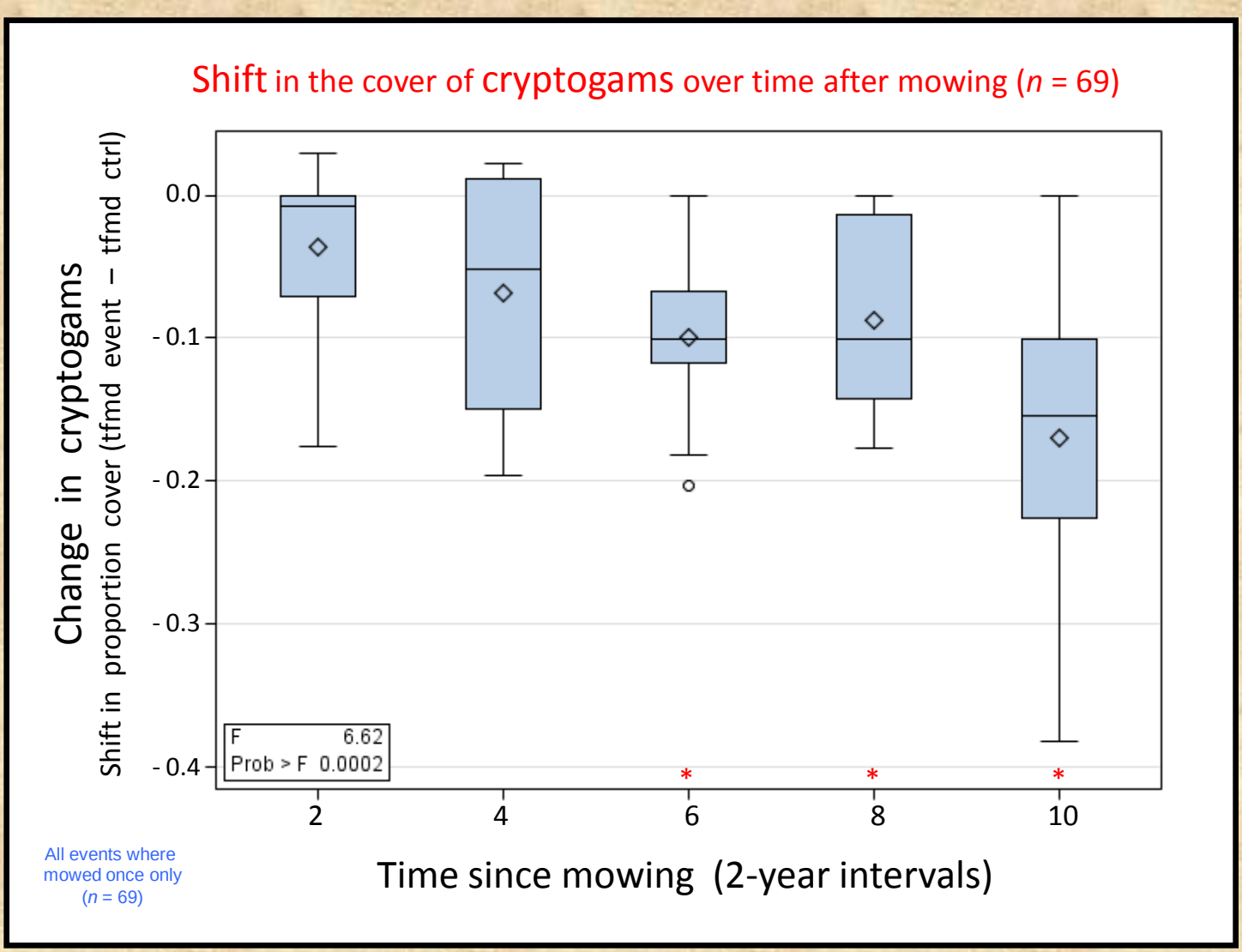
Conclusions
Herbaceous Changes

- **Exotic Forbs**
  - ✓ Consistently more cover in mowed areas
    - Mow/untreated difference only significant in the 1-2 year age class
  - ✓ Similar cover in each treatment age class
  - ✓ Mowing treatments “generally” not a serious threat to increase exotic forbs longterm

Soil Surface Features

Cover Variable	1 – 2 yrs (n = 18) Mean	3 – 4 yrs (n = 4) Mean	5 – 6 yrs (n = 9) Mean	7 – 8 yrs (n = 19) Mean	9 – 10 yrs (n = 19) Mean	ANOVA Result P
Basal cover						
Bare soil	-13.50	-18.38	-9.61	-8.39	-13.21	0.14
Rock	-1.06	0.00	-0.61	-1.08	-0.71	0.85
Cryptogams	-1.81	-2.63	-4.33	-2.39	-5.87	**0.00**
Litter	15.39	19.25	13.17	11.58	18.03	0.28

Cover Shift in Cryptogams



Conclusions

- **Soil surface features**
  - ✓ Differences between mowed and untreated sites will persist for 10 years of longer
    - More bare ground in untreated
    - More litter in mowed areas
    - Greater cryptogam cover in untreated, influence of microclimate under shrubs
  - ✓ ***Important caveat***, if it all burns, it all goes to zero on a much larger area

Broader Conclusions

- Results applicable primarily Wyoming SB in the 8-10 inch ppt zone
- Reduction of SB as a medium to heavy fuel persists 10+ years
- Both bunchgrasses and annual grasses increase on mowed areas and persist
  - ✓ Additional actions may be needed to address cheatgrass– it's a long-term integrated vegetation management issue
  - ✓ SB/cheatgrass site vs SB/bunchgrass site

Broader Conclusions

- Mowing probably not the tool, at least as a stand alone treatment, to increase perennial forbs across large areas, but:
  - ✓ Do the forbs present in mowed areas stay green longer? If so, every year or only wet years?
  - ✓ Many quantity vs quality vs duration of availability unknowns that need to be documented to understand potential uses of the tool
- Exotic forbs (mostly mustards) are a minor issue if bunchgrasses increase and occupy the site

Broader Conclusions

- Mowing is not a “silver bullet” tool, but
  - ✓ A “risk management” tool
  - ✓ Size, shape, and location issues
- Need to know all the potential steps needed to meet management goals and have the resources to implement them before anything is done

Questions