Mid-term CRP land management

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The Conservation Reserve Program (CRP) was initially established as a cropland set-aside program offered by the United States Department of Agriculture in the 1985 Farm Bill. Over the past twenty years, priorities for this program shifted to support wildlife habitat, specifically nesting habitat, food and cover for upland birds. Consequently, fields that are dominated by cool season grasses such as smooth brome are now considered improper habitat for this program. Recently, the Farm Service Agency (FSA) has required owners to suppress cool season grasses and diversify the plant species present on the CRP properties. This management is intended to enhance wildlife habitat by increasing plant species and structural diversity as well as remove duff and control woody vegetation. While options for management are provided by the National Resource Conservation Service (NRCS), limited information exists on the effectiveness of herbicides and tillage in suppressing cool season grasses, establishing desirable forbs, and how these treatments can affect soil loss in Wisconsin.

Experiments were conducted in New Glarus and Horicon, Wisconsin to evaluate the effectiveness of glyphosate (Roundup), sethoxydim (Poast) and fluazifop (Fusilade) in suppressing smooth brome dominated stands compared to tillage and untreated plots (see Tables for rates). New Glarus was dominated exclusively by smooth brome with few other species present, while at Horicon smooth brome consisted of 30-50% of the plant cover, while the remaining was a mixture of wild parsnip (*Pastinaca sativa*), sweet clover (*Melilotus officinalis*), and goldenrod spp. (*Solidago* spp.). Herbicides and tillage were applied in the spring on 4/29/08 and 5/12/08 at each site respectively. At New Glarus, plots were inter-seeded with alfalfa (selected desirable forb) using a no-till drill one day after treatments were applied. To compare the response of a fall timing, the experiment was repeated in the fall of 2008 (11/1/08) at Horicon just after a frost damaged 50% of smooth brome leaf tissue. Control and cover were visually estimated in 2008 at each site, then transects were placed along each plot and cover of all plant species was estimated using the point-intercept method in September of 2009. Results are presented as cover which was calculated by dividing the total number of each species or group of species recorded by the total number of each species recorded in each plot.

<u>SMOOTH BROME RESPONSE FROM SPRING TREATMENTS</u> (Table 1):
Suppression of smooth brome and other cool season grasses was observed in the initial year. Control of smooth brome ranged between 75- 94% for glyphosate and 58 – 91% for fluazifop three months after treatment (3 MAT). Disking and sethoxydim provided some initial suppression, but did not consistently maintain control of smooth brome between sites and rates 3 MAT. By the fall of the initial year (4 MAT) different results were observed between Horicon and New Glarus. Only treatments containing glyphosate maintained reduced smooth brome cover at New Glarus, while the Horicon site also had reduced cover of smooth brome from treatments containing fluazifop and the highest rate of sethoxydim. Differences between sites could have been due to the later application timing at Horicon and/or the higher smooth brome cover at New Glarus. In disked treatments smooth brome recovered values of untreated plots 4 MAT at Horicon, but were still reduced at New Glarus. Suppression of smooth brome did not persist after the treatment year as no differences in smooth brome cover was observed between

any treatments in 2009 (16 MAT). This suggests that smooth brome remains the dominant species in these fields, and management methods tested, at best provided 4 months of reduced cover (Table 1).

Table 1. Percent control and resulting cover of smooth brome after spring treatments.

Treatment	Active ingredient	New Glarus 3 MAT^	Horicon 3 MAT	New Glarus 4 MAT	Horicon 4 MAT	New Glarus 16 MAT	Horicon 16 MAT
product/A	lbs/A	% control		% cover		% cover	
Fusilade (12 fl oz)[2]	fluazifop (0.19)	48	91*	71	15*	62	18
Fusilade (16 fl oz)[2]	fluazifop (0.25)	53	90*	76	6*	58	24
Fusilade (24 fl oz)[2]	Fluazifop (0.38)	58*	83*	66	5*	62	28
Poast plus (12 fl oz)[2]	sethoxydim (0.10)	42	36	89	32	56	25
Poast plus (24 fl oz)[2]	sethoxydim (0.19)	37	45	84	37	70	32
Poast plus (36 fl oz)[2]	sethoxydim (0.29)	38	17	85	16*	65	24
Roundup (14 fl oz)[3]	glyphosate (0.5 ae)	75*	88*	33*	9*	59	14
Roundup (21 fl oz)[3]	glyphosate (0.75 ae)	80*	89*	26*	13*	48	19
Roundup (28 fl oz)[3]	glyphosate (1.0 ae)	85*	94*	22*	13*	49	15
Untreated control		28	5	87	38	64	29
disking		43	60*	62*	20	61	33

[2] included 1% crop oil concentrate and 2.5 lbs/A of ammonium sulfate
[3] included 10 lbs/A of ammonium sulfate
* indicates value is different than untreated controls within the column
^ MAT=Months After Treatment

BROADLEAF PLANT RESPONSE (Table 2):

Broadleaf plant response to treatments was variable between sites. Four months after treatment, glyphosate treatments resulted in an increase in cover of broadleaf plants at New Glarus. However, at Horicon, no differences in broadleaf cover were seen 4 MAT. This difference in the establishment year is likely due to the different plant species present at each site, and level of dominance of smooth brome. At Horicon, broadleaf plants (wild parsnip and sweet clover) were common in the field before the experiment was initiated. These broadleaf plants were already emerged by the time of application, therefore treatments that suppressed smooth brome the best in 2008 (glyphosate and disking) also suppressed these species. While grass specific herbicides did not harm these species, they did not significantly increase their cover 4 MAT. At New Glarus, the cover of broadleaf plants 4 MAT (nearly entirely alfalfa) was increased by treatments that were effective in suppressing smooth brome (data not shown).

In 2009, the reverse response was observed as New Glarus did not have any difference in broadleaf cover, whereas Horicon did. At New Glarus most of the broadleaf cover consisted of alfalfa. Although alfalfa cover was enhanced by glyphosate treatments in 2008, all treatments had similar cover in 2009 ranging between 29-51%. At Horicon, the highest glyphosate treatment showed an increase in broadleaf cover 16 MAT. This is likely due to the suppression of smooth brome the previous year and growth of the biennial plants wild parsnip and sweet clover. Although this plot did not differ from untreated areas in cover in 2008, these biennial plants may have had significant first year plants that did not contribute to cover in 2008, but had an increase in cover in 2009 as they flowered. Thus results indicate that areas can respond differently to treatments depending on the plants present at the time of treatment and dominance of smooth brome.

Select treatments improved plant diversity compared to untreated plots. At New Glarus glyphosate at 1 lbs ae/A resulted in improved plant diversity compared to other treatments, while no treatments increased plant diversity at Horicon. While areas remained diverse at Horicon, the majority of these species that dominated are non-native plants. Additional research is required to document costs and benefits of these plants to upland birds. Plant diversity was altered by the highest rate of glyphosate at New Glarus only, but structure of plants was visibly still altered by all treatments at both sites. At Horicon, it appears that broadleaf plant cover is returning to the pre-treatment levels, but remaining elevated at New Glarus 16 MAT. This suggests that the seeding of additional desirable plant species like alfalfa will result in retention of broadleaf plants and have the potential to improve plant diversity if multiple species are seeded.

Table 3. Resulting cover of broadleaf plants and plant diversity after spring treatments.

		Cover of broadleaf plants				Plant Diversity[1]	
Treatment	Active ingredient	New Glarus	Horicon	New Glarus	Horicon	New Glarus	Horicon
product/A	lbs/A	4 MAT		16 MAT		16 MAT	
Fusilade (12 fl oz)[2]	fluazifop (0.19)	20	36	36	55	0.5	1.1
Fusilade (16 fl oz)[2]	fluazifop (0.25)	22	50	41	52	0.7	1.0
Fusilade (24 fl oz)[2]	Fluazifop (0.38)	32	53	37	49	0.5	0.9
Poast plus (12 fl oz)[2]	sethoxydim (0.10)	19	37	44	48	0.7	1.2
Poast plus (24 fl oz)[2]	sethoxydim (0.19)	17	41	29	44	0.6	1.1
Poast plus (36 fl oz)[2]	sethoxydim (0.29)	11	36	35	56	0.4	1.1
Roundup (14 fl oz)[3]	glyphosate (0.5 ae)	63*	55	41	73*	0.9	1.1
Roundup (21 fl oz)[3]	glyphosate (0.75 ae)	46*	64	51	66*	0.9	1.1
Roundup (28 fl oz)[3]	glyphosate (1.0 ae)	72*	45	51	76*	1.1*	1.2
Untreated control		11	41	36	40	0.7	1.0
disking		28	22	29	50	0.6	1.4

[1] Plant Diversity was calculated using the Shannon Weaver Index.
[2] included 1% crop oil concentrate and 2.5 lbs/A of ammonium sulfate
[3] included 10 lbs/A of ammonium sulfate
* indicates value is different than untreated controls within the column

SMOOTH BROME AND BROADLEAF RESPONSE FROM FALL TREATMENTS (Table 3)
Unlike spring herbicide applications, fall timings of glyphosate resulted in continued suppression of smooth brome in 2009 (10 MAT). While no smooth brome was present the spring after treatments with the two highest glyphosate rates, all rates showed reduced smooth brome cover in September of 2010 compared to untreated areas. Fluazifop and sethoxydim treatments did not provide any short or long-term suppression from fall treatments. While glyphosate treatments were effective in suppressing smooth brome, increased broadleaf cover (mainly wild parsnip and sweet clover) was not observed within these plots. As these are biennial plants we may see increased cover in 2010, as seedlings that germinated in 2009, may not have contributed much to cover. Plant diversity was found to be improved by the 0.75 lbs ae/A treatment of glyphosate compared to untreated plots. Alternatively, fluazifop at 0.25 lbs/A had reduced plant diversity. It appears that some suppression of smooth brome can improve plant diversity from fall herbicide treatments, and that ineffective treatments may further reduce plant diversity.

Table 3. Percent cover of smooth brome and other cool season grasses after fall treatments at Horicon, WI.

Treatment	Active ingredient	Smooth Brome 10 MAT^	Broadleaf plants 10 MAT	Plant Diversity[1] 10 MAT
product/A	lbs/A	% cover		
Fusilade (12 fl oz)[2]	fluazifop (0.19)	53	26	1.1
Fusilade (16 fl oz)[2]	fluazifop (0.25)	67	20	0.8*
Fusilade (24 fl oz)[2]	fluazifop(0.38)	55	31	1.1
Poast plus (12 fl oz)[2]	sethoxydim (0.10)	54	25	1.1
Poast plus (24 fl oz)[2]	sethoxydim (0.19)	49	31	1.1
Poast plus (36 fl oz)[2]	sethoxydim (0.29)	62	25	0.9
Roundup (7 fl oz)[3]	glyphosate (0.25 ae)	41*	32	1.3
Roundup (14 fl oz)[3]	glyphosate (0.5 ae)	41*	33	1.4
Roundup (21 fl oz)[3]	glyphosate (0.75 ae)	32*	38	1.4*
Roundup (28 fl oz)[3]	glyphosate (1.0 ae)	26*	39	1.4
Untreated control		58	22	1.1

[1] Plant Diversity was calculated using the Shannon Weaver Index.
[2] included 1% crop oil concentrate and 2.5 lbs/A of ammonium sulfate
[3] included 10 lbs/A of ammonium sulfate
* indicates value is different than untreated controls within the column
^ MAT=Months After Treatment

INITIAL CONCLUSIONS

Although spring glyphosate was more effective at suppressing populations and allowing for establishment of other plant species (alfalfa) in the first year, no treatment differences were seen in smooth brome cover the following year. Management with glyphosate in the fall appears to enhance control of smooth brome, but this was only conducted at one site. Response of fluazifop and sethoxydim was variable, but fluazifop in the spring offered better suppression of smooth brome than sethoxydim. If desirable forbs (broadleaf plants) are present in smooth brome infestations, the use of fluazifop would be best to maximize smooth brome suppression while preventing injury to forbs. Disking, while effective in suppressing smooth brome did not provide suppression that lasted more than the year it was conducted. As many CRP fields in Wisconsin are prone to soil loss, this management method should only be used on lands that are not highly erodible. Broadleaf plants responded differentially to management between sites. The site dominated by smooth brome had a greater response in the year of treatment while the site that already contained some broadleaf plants present responded the year after treatment. This suggests that areas that already contain some desirable plants may not improve their cover one year after treatment from management of smooth brome. Fall applications of glyphosate may provide the best control of smooth brome, and since these applications are made in the late fall after many of the forbs have already senesced, it should have minimal effect to desirable forbs. These plots will continue to be monitored to document any changes in plant composition and diversity. Although visually a more diverse plant structure was observed between plots, only glyphosate at the highest rate had greater plant diversity the year following treatment. While the goals of CRP mid-contract management are to improve plant diversity and structure, it appears that management in the spring resulted in few changes to plant diversity, but improved plant structure. Although only one site was planted, it was successful in placing a desirable species into the mixture of plants. Future work should continue to access which species are beneficial and which are not and whether planting is warranted for specific CRP plantings.