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Potential Economic Impacts of the Managed Haying and Grazing Provision of the Conservation Reserve Program

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The Food Security and Rural Investment Act of 2002 included a new provision that allowed managed haying and grazing (including the harvest of biomass), if consistent with the conservation of soil, water quality, and wildlife habitat, in return for partial reductions in the annual CRP payments. The legislation provided for managed (or limited use) haying and grazing on the CRP acreage rather than prohibiting all use. This research analyzed whether or not the alternative grazing and haying scenarios would dramatically impact the price of beef or hay, and we estimated the impact such changes would have on state economies.

Key words: Conservation Reserve Program, Farm Service Agency, managed haying and grazing provision

Introduction

The recently enacted Food, Conservation, and Energy Act of 2008 continues the Conservation Reserve Program (CRP) that was initiated in the Food Security Act of 1985 "to assist owners and operators of highly erodible cropland in conserving and improving the soil and water resources of their farms and ranches" (Dicks, Llacuna, and Linsenbigler, 1988). The CRP offers annual rental payments and cost share assistance to establish a permanent vegetative cover while foregoing all other land uses for ten years. The CRP protects critical environments, such as wildlife habitats and watersheds, while simultaneously reducing agricultural production on fragile lands.

During the early years of implementation of the CRP, the criteria used to select eligible acres considered only erosion and government commodity program payment reductions, with no consideration given to wildlife habitat conservation (Dicks and Reichelderfer, 1987). Consequently, introduced grasses and legumes (CP1) comprised roughly two-thirds of the CRP acres (U.S. Department of Agriculture, 1989). Introduced plant species (not indigenous to the area) protect the land from erosion but may not support native wildlife. Some wildlife may use habitats comprised of introduced plants when native habitat is not available, but those wildlife species usually respond primarily to structure (i.e., height of grasses) as opposed to plant species composition. Conversely, some grassland wildlife species are habitat specialists requiring specific plant communities for suitable habitat (Dicks and McLachlan).

CRP was not the first land retirement program implemented by USDA to protect soils, reduce crop surpluses, control overproduction, and support commodity prices. The Soil Bank Act (1956) created a long-term acreage reduction program similar to the current CRP as well as an annual Acreage Reserve Program. Other short-term acreage reduction programs were included in the Agricultural Adjustment Act (1933), Soil Conservation and Domestic Allotment Act (1936), Emergency Feed Grain Program (1961), and Food and Agricultural Act (1962, 1965). Important

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shortcomings of these programs for wildlife were the short duration of contracts, a planting date not conducive to providing winter cover, undiversified planting mixtures, frequent disturbance, and lack of technical assistance. For example, annual acreage reduction under the Soil Bank Program and Feed Grain Program was accomplished using one-year contracts that required participants to plant cover (generally in mid to late July). Annual land retirement programs implemented between 1961 and 1983 resulted in increased soil erosion and contributed to declines in some grassland-dependent wildlife (Berner, 1984).

Amendments to the 1985 Farm Bill in 1990 and 1996 sought to enhance wildlife benefits of the CRP. Legislative improvements sought by wildlife conservation interests included the establishment of an application review procedure that ranked applications based on their environmental benefits (e.g., proximity to wildlife habitat, diversity of seeding, use of native plant species) and recognition of coequal status of wildlife with soil and water conservation.

Since the initial CRP sign-up in 1986, the CRP has undergone almost continuous modification. Most of the changes have come as a result of program assessments and the advent of new technology and new data for measuring environmental impacts. The Food Security and Rural Investment Act of 2002 included a new provision that allowed managed haying and grazing (including the harvest of biomass) if consistent with the conservation of soil, water quality, and wildlife habitat, in return for partial reductions in the annual CRP payments. The legislation provided for managed (or limited use) haying and grazing on the CRP acreage rather than prohibiting all use (except during emergencies such as drought) as in the past. The prescribed management practices were enabled to assist habitat restoration efforts. The United States Department of Agriculture (USDA), rural communities, farm and commodity groups, and conservation and environmental groups all have a stake in how the haying and grazing management provision is implemented. The regulations enabled CRP contract holders to modify their contracts for prescribed management in accordance with Natural Resources Conservation Service (NRCS) technical guides with the condition that rental payments be reduced by 25%.

The implementing agency within USDA, the Farm Service Agency (FSA), was interested in identifying feasible alternative sign-up procedures and management requirements that would allow greater rental rate equity between CRP fields. Farm and commodity groups were interested in workable management schemes that increased net returns. Rural communities, adversely impacted by loss of economic activity in the community resulting from the absence of use of the land in previous years, were interested in returning the land to some economic use. Finally, conservation and environmental groups considered the new use provisions as a potential method to improve and maintain wildlife habitat. Haying, fire, or grazing and their interactions create disturbances that provide habitat diversity. Habitat diversity increases the number of wildlife species that can exist in an area by furnishing variation in habitat structure and composition (Fuhlendorf and Engle, 2004; Askins et al., 2007).

The managed haying and grazing provision is an important addition to CRP, as it provides the opportunity to alter the vegetative structure of CRP habitat to suit the requirements of native wildlife. However, the haying and grazing provisions did not identify target wildlife species, nor desired habitat characteristics to be achieved through management. Furthermore, there was no method in place for evaluating the effects, if any, of managed haying and grazing on wildlife; therefore, it was only assumed that management was providing wildlife benefits.

The task of creating a managed haying and grazing scenario that met all requirements in each state and ecological zone and was economically beneficial for farmers was assigned to researchers from the Farm Service Agency (FSA) and Oklahoma State University. The study at Oklahoma State University, conducted by Dicks and Bidwell (2007), developed a comprehensive, site specific method for designing management scenarios that abided by limitations set forth by the National Environmental Policy Act (NEPA), the Food Security Act of 1985, and the Administrative Procedure Act. However, the method designed by Dicks and Bidwell (2007) was deemed too labor intensive and the FSA opted to use a simpler method that blanketed the entire nation under the same prescribed management scheme, which allowed managed haying and grazing to occur once every three years. This method did not specifically account for the wildlife needs of each region and in October 2007, the National Wildlife Federation (along with several State Wildlife Federations) filed a complaint challenging the provisions of managed haying and grazing on CRP land.

The federal government and the National Wildlife Federation reached a settlement, and new haying and grazing requirements were established for certain states. Under this agreement, managed haying and grazing was not allowed during the primary nesting season (PNS). The PNS for each state included in the settlement is: (1) Idaho - April 1 to August 1; (2) Kansas - April 15 to July 15; (3) Montana - May 15 to August 1; (4) Nebraska - May 1 to July 15; (5) New Mexico - March 1 to July 1; (6) North Dakota - April 15 to August 1; (7) Oklahoma - May 1 to July 1; (8) South Dakota - May 1 to August 1; (9) Texas - March 1 to July 1; (10) Utah - April 1 to July 15; (11) Washington - April 1 to August 1. In each of these 11 states, the agreement limited managed haying to no more than once every 10 years. Managed grazing was limited to no more than once every 10 years in Idaho, New Mexico, Utah, and Washington and no more than once every 5 years in Kansas, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas.

The FSA considered implementing changes to the managed haying and grazing provisions that represented a compromise between the labor intensive method developed by Dicks and Bidwell (2007) and the simple method originally used. These changes applied to lands enrolled in the CRP after September 25, 2006, as well as existing contracts without authorized managed haying and grazing prior to that date. As part of this compromise, several alternatives for managed haying and grazing on CRP lands were developed for comparison to the implementation strategy for the settlement. A variety of concerns were voiced regarding the alternatives, as various groups fought for their own unique interests in the process.

A similar debate occurred during the initial development of the CRP in the Food Security Act of 1985. The precursor to the CRP, known as the Conservation Easement Program (CEP), provided for a permanent restriction of all annual cropping activities on specific "fragile" croplands. This would shift land use from cropping activities to haying and grazing and was seen as problematic by the cattle industry. Many were concerned that a shift of land into more forage production would lead to an expansion in the cow herd and reduced beef prices. In addition, cattlemen were concerned that this could create inequities by providing easement payments for cattle producers that had plowed out their forages during the high-priced crop years of the 1970s, while those that had maintained their forage bases received no additional payments (e.g. CRP rental payments). At the time, these arguments were persuasive enough to rule out any economic use of the CRP acres (Ervin and Dicks, 1988). As the acres in CRP increased, especially in the those areas where the CRP became a significant portion of the cropland area, cattlemen (especially beginning ranchers) were concerned about the shortage of forage and high rents on the remaining available lands.

By 1990, with more than 35 million acres enrolled in the CRP, and that enrollment highly concentrated in a small percentage of counties, a new set of studies focused on the lost economic activity and the hardships on many small communities in high enrollment areas. Impacts on local economies have been studied nearly since CRP was initiated by many researchers, including Martin et al. (1988); Standaert and Smith (1989); Mortensen et al. (1990); Broomhall and Johnson (1990); Hyberg, Dicks, and Hebert (1991); Henderson, Tweeten, and Woods (1992); Otto and Smith (1996); Hamilton and Levins (1998); Hodur, Leistritz, and Bangund (2002); and Bangsund, Leistritz, and Hodur (2002). Ample literature supports the finding that land retirement reduces input use and employment in businesses serving crop producers (Taylor, 1988; Standaert and Smith, 1989; Hyberg, Dicks, and Hebert, 1991; Abel, Daft, and Earley, 1994). Conversely, there are many studies of economic development associated with the environmental improvements induced by land retirement, particularly in the southeast, where forest cover was the alternative to crop production (Daniels, 1988; Parks and Schorr, 1997; Beck, Kraft, and Burde, 1999; Feather, Hellerstein, and Hansen, 1999; Johnson and Maxwell, 2001).

These two arguments–cattle producers' concerns that managed haying and grazing on CRP land may increase forage and beef production and thereby drive down cattle prices and the concerns of rural communities and agribusinesses that non-use of CRP acres has adversely affected their well-being–have continued to date. Several new arguments have risen over this time, including the belief by some cattlemen that the increase in forage production would cut cattle feeding costs and create additional economic impacts in the local economy, that CRP land use would aid young farmers and ranchers faced with tight land supplies, environmental groups' concern that grazing and haying activities would lower or eliminate the quality of wildlife habitat, and range management specialists' determination that haying and grazing could actually benefit specific native grassland birds. Environmental groups view the current grazing allowed on CRP land as a conflict with wildlife objectives of the CRP. The grazing of CRP land during the prime grazing season may conflict with the primary nesting season of some native bird species. Environmental and wildlife advocates believe that grazing is interfering with nesting of native birds, and these advocates are actively taking action against the current management of the grazing provision.

This research analyzed whether or not the alternative grazing and haying scenarios would dramatically impact the price of beef or hay, and we estimated the impact such changes would have on state economies. First, we examined whether it is economically beneficial for a farmer to hay or graze CRP land, given the reduction in rental payments associated with the haying and grazing option. Second, we projected the annual amount of beef and hay production by state under several scenarios based on the new regulations and estimated the impact of such production changes to beef prices. Finally, we estimated the economic impact of the estimated production changes on state economies. This study used the non-feedlot portion of the beef cattle industry and only considered the value generated annually from beef cows (pounds of beef produced times market value). The results of these analyses were used to assess whether additional analysis was warranted by the FSA to demonstrate the impact of the policies on market conditions. In addition to addressing these issues, this work adds a unique perspective to the literature on the Conservation Reserve Program and the growing literature on the Food, Conservation, and Energy Act of 2008. To our knowledge, no previous study has estimated the economic impact of such a policy change to state economies. Such analysis is critical to help policy makers and stakeholders understand the impacts of haying and grazing changes.

Data and Methods[1]

Four counties in each state were selected from high CRP participation counties to represent the land diversity within each state. Farm and county level data were collected for each of these counties to construct farm budgets for each CRP contract under the proposed haying and grazing scenarios. The farm budgets were used to determine the amount of CRP acreage that would likely be profitable for either haying or grazing activities. Once state-level estimates of profitable beef and hay production were calculated, the magnitude of change to the beef and hay industries resulting from restricted-use rules was estimated. The economy-wide impact of these changes was estimated using input-output analysis.

Building Farm Budgets

To estimate farmer profitability for haying and grazing activities under the new CRP restricted use policy, data on 560 fields currently in CRP were collected. These fields represented 10 fields in 4 counties for Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. Incomplete information was received from Colorado and Wyoming, so these states were not included in the analysis, reducing the

[1] Details of data and methods can be found in Dicks, Bidwell, and Campiche (2011).

Table 1. 2008 CRP Acreage, Hay Production, and Beef Cattle Production

	CRP Acres	Hay Production (tons)	Beef Cattle Production (1,000 lbs)
ID	769,738	5,588,000	1,140,140
KS	3,124,817	6,765,000	3,891,872
MT	3,291,198	4,080,000	969,752
NE	1,233,653	6,232,000	4,621,603
NM	570,146	1,516,000	700,851
ND	2,976,379	4,118,000	749,412
OK	981,636	5,278,000	2,036,412
OR	563,327	2,951,000	528,450
SD	1,301,723	7,840,000	1,480,253
TX	3,938,274	9,211,000	6,453,497
UT	198,951	2,629,000	210,880
WA	1,537,154	2,614,000	591,334

Notes: Figures come from the Farm Service Agency (CRP Acres), USDA NASS (Hay Production), USDA Meat Animals Production, Disposition, and Income 2008 Summary (Beef Production).

field count to 480. Table 1 shows hay production, beef cattle production, and CRP acreage in 2008 for the twelve states included in the analysis. Data were collected using a mail survey completed by FSA County Executive Directors (CEDs) and NRCS State and County Conservationists to collect number of acres, pounds of forage harvestable, previous crop base, previous program yield, water availability and proximity of cattle operations, haying and grazing restrictions, months available for grazing and haying, and percentage of forage removable. This information was gathered from CRP reports filed with the county FSA offices by program participants. The CEDs and Conservationists also submitted a GIS photo map of the field, soil map, and Environmental Quality Incentive Program cost share sheets for the county. The cost share sheets were used as estimates of the costs of fencing and delivering water.

The local CED and Conservationist chose counties and fields based on counties with a high percentage of CRP participation and the ecological diversity of counties within the state. The fields were chosen to represent the diversity of the CRP lands in each county. In addition to the actual, field-specific data, economic data from the U.S. Department of Agriculture, National Agricultural Statistics Service (2008), were used, including total CRP acres eligible for haying and grazing already under certain practices (CP1, CP2, CP4B, CP4D, CP10, CP18B, and CP18C, see Appendix A), total active CRP acres, all cattle and beef cows, 2004-2006 average wheat yield, and total managed haying and grazing acres. Using the farm and county specific data, enterprise budgets were developed for beef and hay production in each state. To construct the budgets, the haying and grazing production practices specific to each county were identified. These practices included a determination of typical equipment technology, size and type of hay bales, timing of haying, type of cattle operation, weight gain and value, available water and fencing, hay price and the cost of moving hay.

The FSA created haying and grazing scenarios ranging from conservative (restrictive) to liberal (lenient) and are described in Appendix B. For each state there were up to four different scenarios, which allowed the grazing and haying restrictions to vary. The limitations included duration (how many days the land can be used for haying and grazing), frequency (number of years out of ten) and period of inactivity (nesting season). Because the haying and grazing scenarios did not allow for continuous annual production activities, we assumed that there was no cow herd expansion and that the additional forage available in any year would be used to retain calves to a higher weight.

Determination of Potential Haying or Grazing

The contract acreage could be used for haying and grazing if it was determined to be economically beneficial based upon a positive net return calculated as follows:

$$NR = \pi - C - R, \tag{1}$$

where net return NR was calculated by subtracting costs C and rental rate reduction R from revenue π. The revenue for hay production was calculated by determining the value of hay using the following equation:

$$\pi = H \times P_t, \tag{2}$$

where H is harvested tons of hay per acre and P_t is the price per ton of hay.

We calculated the cost per acre for hay production, including transportation costs. The transportation cost was determined by the distance between the location of the contract acreage field/road edge and the next closest non-CRP acreage where the hay could be fed. If the distance was less than 5 miles, the transportation cost was \$5 per bale. If the distance was greater than 5 miles, the transportation was \$5 per bale plus \$0.50 for each additional mile per bale. Costs per acre (C) were estimated as:

$$C = (B_a \times P_b) + (\$5 + m \times \$0.50) \quad \text{where} \quad \text{m} = \text{miles} > 5, \tag{3}$$

where B_a is the number of bales per acre and P_b is the harvest cost per bale. The rental rate reduction associated with haying or grazing the land was computed by reducing the current annual CRP rental payment by 25% as required by law. Net returns were then calculated by taking the value of hay production per acre (revenue) minus the costs per acre minus the rental rate reduction.

Calculating the net returns for beef production followed similar steps. Initially, the amount of forage available and the quality of the forage was estimated. The quantity and quality of forage available depends on the number and timing of available days for grazing and the productivity of the site. Based upon estimates of forage quantity available per year, the number of animal units (AU) per acre per year was estimated as follows:

$$AU = Y_{FP}/D_g/F, \tag{4}$$

where Y_{FP} is the forage production available per year, D_g is the number of days per year allowed for grazing, and F is the amount of forage needed to achieve ideal weight gain.

The revenue generated from grazing cattle was calculated by determining the pounds of gain per acre per day (G_a) as:

$$G_a = AU \times G_d, \tag{5}$$

where G_d is the pounds of gain per day. The revenue (π) per acre per day is:

$$\pi = (P_g - C_g) \times G_a, \tag{6}$$

where P_g is the price of gain, and C_g is the cost of feed per pound of gain. Net returns were calculated by taking into account the availability of water; if no water was available or available at a distance greater than one mile, the grazing option was deemed infeasible for this contract acreage. The net return (NR) per year for cattle production was calculated as:

$$NR = (\pi \times D_g) - R, \tag{7}$$

where R is the per acre rental rate reduction.

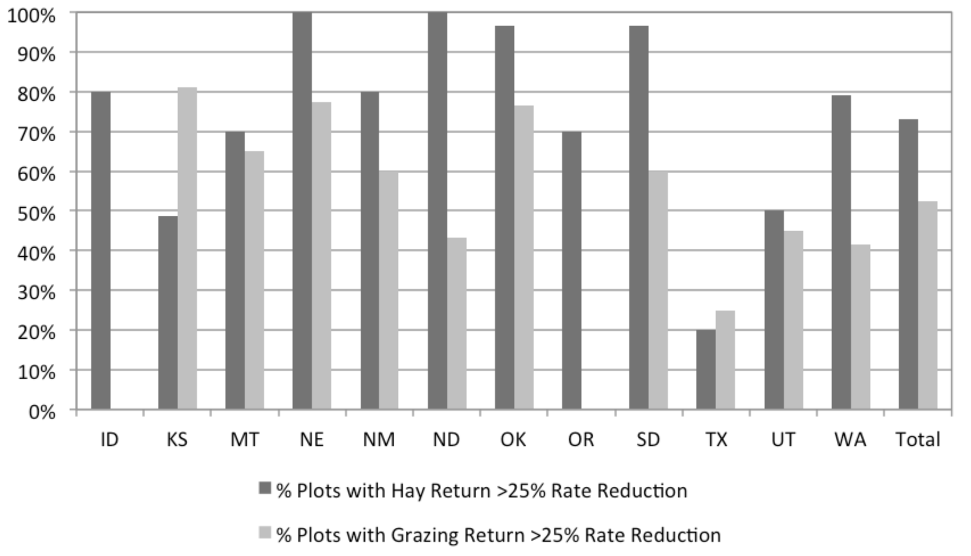

Figure 1. Proportion of Sampled Fields with Profitable Haying and/or Grazing

Finally, the increase in total pounds of beef produced was calculated by multiplying pounds of gain per acre per day by the number of grazing days and number of acres. After estimating the production that would occur for each contract based upon profitability, an expansion factor was used to determine the total number of profitable grazed and hayed acres for each county and state for each of the haying and grazing alternatives. County expansion factors were computed by finding the ratio of total CRP acres in the county to the number of CRP acres sampled from the county. This number varied from county to county. Similarly, state expansion factors were generated by dividing the total number of CRP acres across the state by the number of CRP acres in our sample. Using the state expansion factors, the percentage of acres likely to be hayed or grazed and the pounds of beef and hay produced were estimated. Figure 1 shows the actual proportion of sampled fields with profitable haying and/or grazing.

Input/Output Analysis

To estimate the economy-wide impact of the proposed CRP haying and grazing scenarios, an input-output (I/O) analysis was used. The I/O model is a mathematical representation of the purchases and sales patterns of a regional economy. The model was used to estimate the total regional change in output, employment, and income at a given point in time due to a change in final demand in an industry. The total change to an economy from a shock, such as the increase in beef or hay production, is summarized by a multiplier. For example, a multiplier of 1.42 means that $1 in additional final demand will generate an additional $0.42 of output because of inputs purchased to produce the first $1 of output and the consumption of households (paid by firms) impacted by this change in final demand. The multipliers used in this study were derived using the IMPLAN I/O model (Alward and Palmer, 1985) and the corresponding state data for 2007.

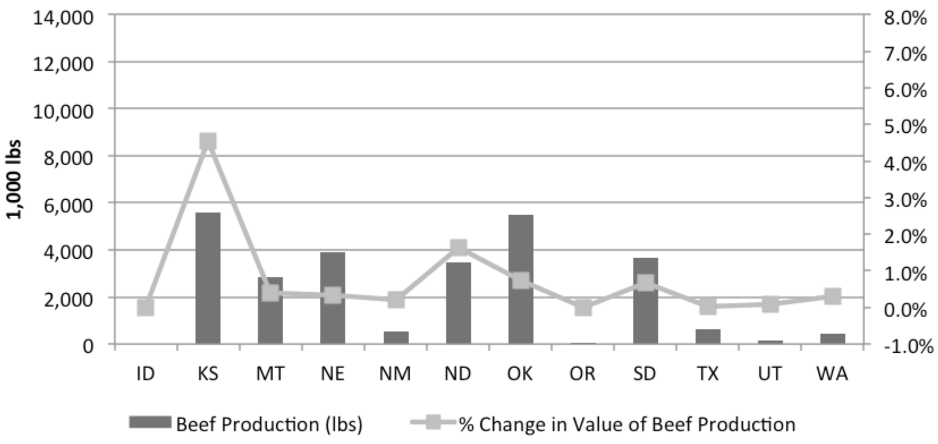

Figure 2. Beef Production - Scenario A

Results and Discussion

The most conservative option, scenario A, restricted haying to once every ten years and grazing to once every five or ten years (depending on the state). The grazing period ranged from sixty to ninety days. The primary nesting season for wildlife bird species is determined by the NRCS and varies by state but is generally between the months of April and July. The more liberal option, scenario B, allowed haying and grazing once every three or five years. The grazing period and primary nesting season remained the same. The most liberal option, scenario C, extended the grazing period of scenario B until December 31 for most states. The last option, scenario D, was a compromise between scenarios A and B that allowed haying and grazing once every five years with the grazing period and primary nesting season remaining the same. Every state was offered scenario A and B while only some were offered the additional scenarios C and D (see Appendix B).

Beef Production

The amount of beef produced and the percentage growth in the value of beef production were calculated for each scenario. The percentage growth in the value of beef production was calculated as the ratio of the state value of beef production resulting from the new CRP rules (as estimated above) to the value of total current state beef production on all lands. The economy-wide impact from beef production is the size of the increased value of state output from the potential grazing as a percentage of total state output (state gross domestic product). These measures were chosen since the USDA uses these indicators to measure the significance of potential impacts to decide whether further study is necessary.

A movement from the more conservative scenario A (figure 2) to the more liberal scenario B (figure 3) resulted in an increase in beef production, with the exception of South Dakota (due to the grazing frequency remaining the same between the scenarios). This was expected, since farmers and ranchers can graze the land more frequently under scenario B. In both scenarios, Kansas and Oklahoma had the highest production, while Idaho, Oregon, and Utah had the lowest production. In scenario B, Montana, New Mexico, Oregon (although not showing graphically because the numbers were so small), Utah, and Washington experienced an increase in production of more than 50% while all other states except South Dakota showed an increase of 40%. Adopting either scenario A or B had less than an 8% impact on the state beef industry. In scenario A, Kansas produced 5.6 million

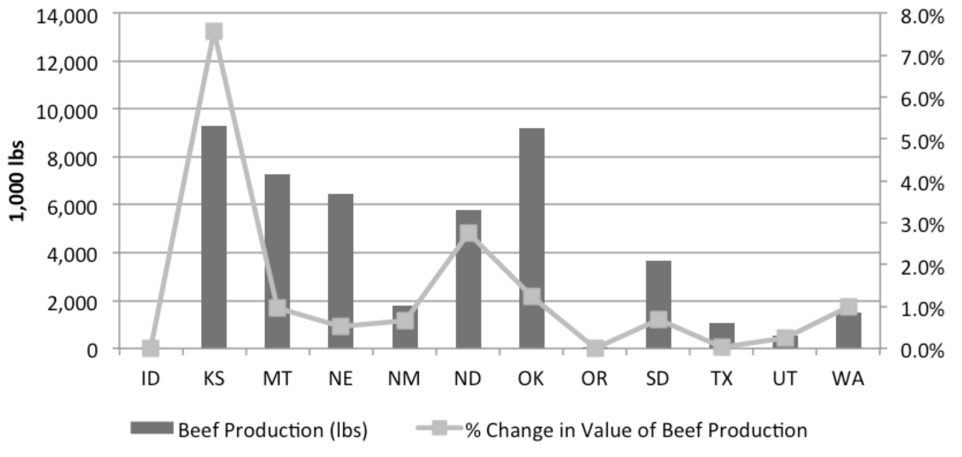

Figure 3. Beef Production - Scenario B

pounds of beef, a 4.5% impact, while North Dakota produced 3.5 million pounds, a 1.6% impact. In scenario B, Kansas again had the highest impact of 7.6% with 9.3 million pounds of beef, while North Dakota had the second highest impact of 2.7% with 5.8 million pounds. New Mexico, Oregon, Texas, and Utah had the smallest impact with less than 0.25% for either scenario. Oklahoma had the highest beef production for both scenarios, yet the industry impact was lower than both Kansas and North Dakota (0.74% and 1.23% respectively). This is due to differences in the value of the cow/calf industry and total GDP in Oklahoma, Kansas, and North Dakota. Oklahoma and Kansas are relatively close in terms of the value of beef and hay production change due to the haying and grazing program. Oklahoma has a larger Gross Domestic Product (GDP) than Kansas and thus the percentage impact will be smaller for Oklahoma (*ceteris paribus*) than for Kansas. For the industry impact, it is important to note that Oklahoma's cow/calf industry is roughly $750 million, while the cow/calf industry in Kansas is just $125 million. Thus, the same changes in output (nearly so for Oklahoma and Kansas) will have much greater percentage impacts on Kansas than on Oklahoma.

Figure 4 shows impacts resulting from scenario C, which is similar to scenario B but allowed grazing for a longer period of time and was less limiting than scenario A (Kansas, Nebraska, and Oklahoma were not offered scenario C). Montana, North Dakota, and South Dakota had the highest production with 8.5 million, 7.0 million, and 7.1 million pounds, while the lowest were Oregon with 85,000 pounds and Utah with 513,000 pounds. The median was Washington with 2.4 million pounds of beef. Although the numbers were very small, Oregon experienced the highest percentage change from scenario B to C with a 72% increase in production. The next highest percentage change occurred in South Dakota with a 48% increase. Texas and Washington realized a 35% increase, while production in Montana, New Mexico, and North Dakota increased by 15%. The least impacted states were Oregon, Texas, and Utah. Montana, which ranked second in production with 8.5 million pounds, only had an impact of 1.14%. North Dakota and Washington experienced an increase in the value of beef production from scenario B to C, as they benefited greatly from the extended grazing period.

Figure 5 presents results for the five states offered scenario D. Under this scenario, haying and grazing was limited to once every five years. All states showed a decrease in production relative to scenario C. In this case, North Dakota and Montana had the most production with 3.4 million and 2.9 million pounds and Idaho and Oregon had the least with no production and 14,000 pounds, respectively. The median again was Washington with 885,000 pounds. North Dakota had the highest

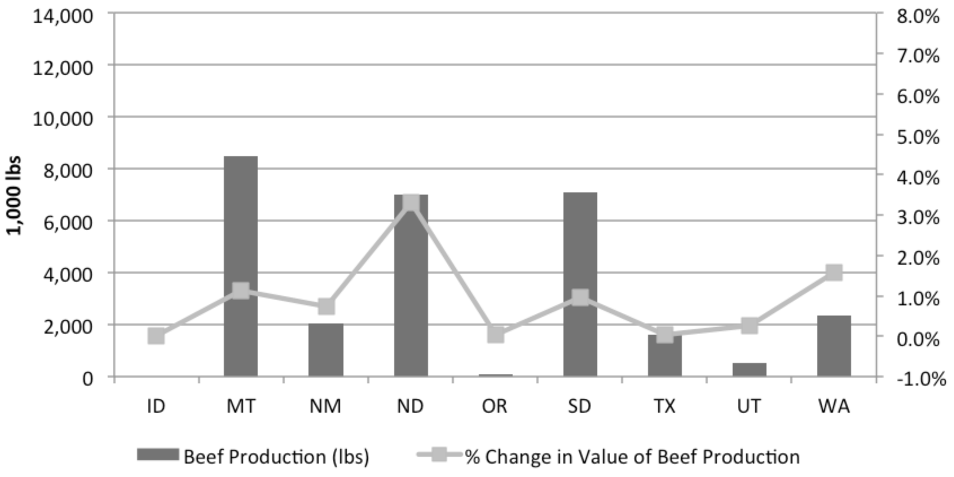

Figure 4. Beef Production - Scenario C

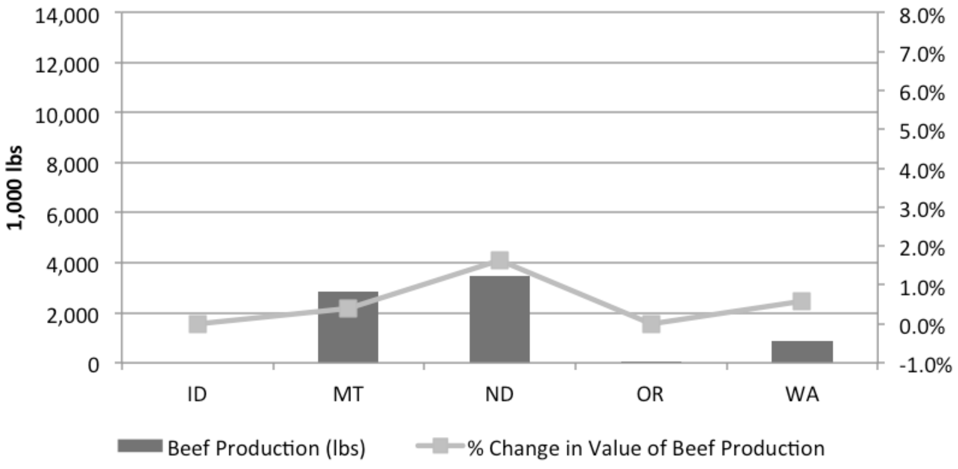

Figure 5. Beef Production - Scenario D

increase in the value of beef production with 1.64%, while Washington and Montana followed behind with 0.59% and 0.38%.

Because of economic linkages, there is a rippling effect throughout all industries when one local industry increases output. Therefore, multipliers generated from the I/O model were used and enabled the estimated impacts to be translated into changes in the state economy. Comparing the value of the total economic impact of the new CRP rules to the states' total output illustrates the magnitude of these changes on the state economy. First, note that all changes imply total impacts that were less than 0.1%. Both Montana and South Dakota's economies could have the biggest impact from any scenario, but Idaho, Oregon, Texas, and Washington would see little to no impact (figure 6). Scenario B showed an increase in economy-wide impacts in all states except for South Dakota, which is intuitive because the frequency of grazing did not change. Likewise, the most liberal option, scenario C, showed an increase in impacts for all states offering it. Scenario D matched perfectly

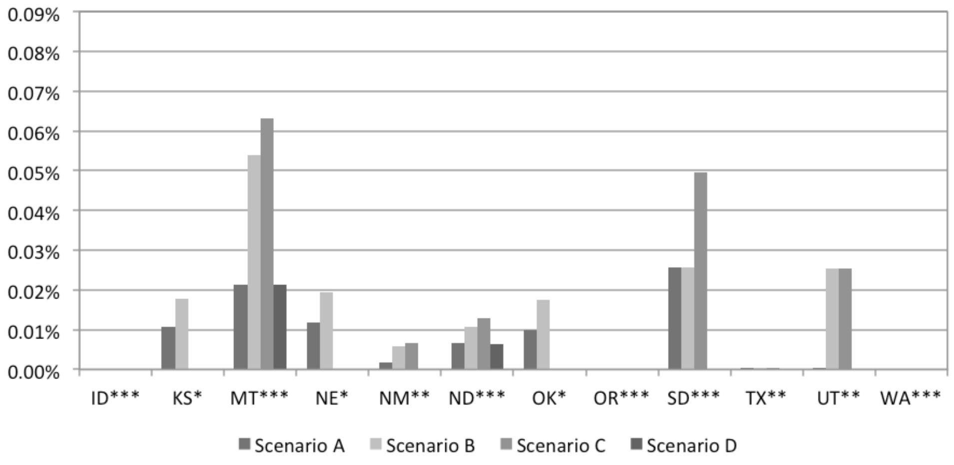

Figure 6. Economy-Wide Impacts from Beef Production

Notes: * Scenarios A & B were offered.
** Scenarios A, B, & C were offered.
*** Scenarios A, B, C, & D were offered.

with scenario A for those states that were offered D, because the frequency of grazing remained unchanged. We calculated the impact of changes in beef production under each scenario on the national market using an estimate of the beef own-price compensated demand elasticity from a recent study by Mintert, Tonsor, and Schroeder (2009). According to their estimate, a 1% increase in the price of beef led to an average 0.4% decrease in the quantity of beef demanded by U.S. consumers during the 1982-2007 time period. The percentage change in beef production represents the sum of the estimated pounds of beef produced across the twelve states for each scenario, divided by total U.S. beef production in 2007. The resulting price impacts on the national beef market resulting from the increase in beef production were estimated for each scenario. The change in beef production would cause the national beef price to decline by 0.03% under Scenario A, 0.05% under Scenario B, and 0.04% under Scenario C. Scenario D did not lead to a change in price.

Hay Production

Under both scenario A (figure 7) and scenario B (figure 8), hay production increased for all states. A movement from the more conservative scenario A to the more liberal scenario B led to an increase in production across all states. Montana, North Dakota, and Oklahoma produced the most hay for each scenario; Oregon, Utah, and Washington produced the least. Both scenarios A and B had less than a 5% impact on the state hay industry. In scenario A, North Dakota produced the greatest amount of hay yet the impact was only 0.97%. The next highest producer, Montana, had the highest impact with 1.17%. The states with the smallest impact for scenario A were Utah, Texas, and Idaho. In scenario B, North Dakota had the highest production but had a lower impact than Montana and Oklahoma, ranking first and second, respectively. The states with the lowest impact were Utah with a 0.12% increase and Texas with a 0.25% increase.

Figure 9 shows the resulting impacts of scenario C, which allowed for extra grazing until December 31 in most states. North Dakota produced the most hay with 487,000 tons, followed by Montana with 211,000 tons and South Dakota with 141,000 tons. The state producing the least amount of hay was Utah with 4,000 tons. North Dakota, South Dakota, Montana, and Texas were the only states that showed an increase in production from scenario B to C, while Idaho, New Mexico,

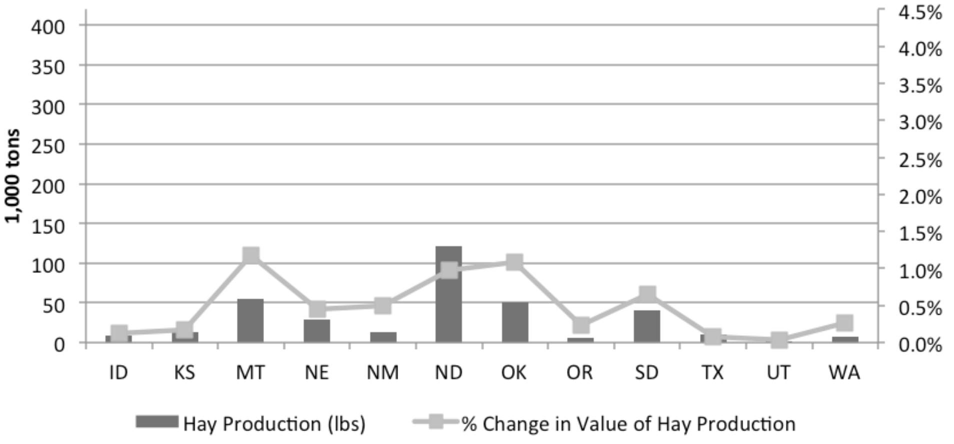

Figure 7. Hay Production - Scenario A

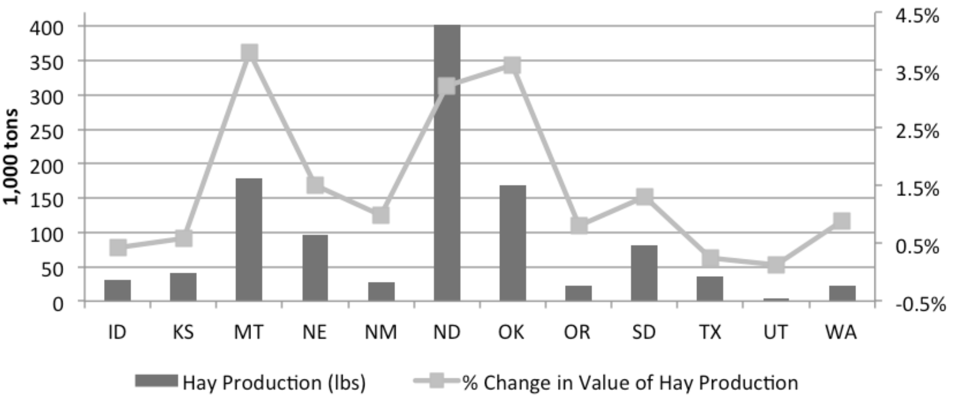

Figure 8. Hay Production - Scenario B

Oregon, Utah, and Washington remained the same. South Dakota had the biggest percentage change in hay production from scenario B to C with a 42% increase, next was Texas with an increase of 33%, then North Dakota and Montana with an increase of 16%. We expected scenario C to result in little to no change in hay production, since the only change between the scenarios was a longer grazing period. Results suggested that these predictions were mostly correct. As in scenario B, the highest impact occurred in Montana and the lowest impact occurred in Utah. Montana experienced a slight increase from 3.8% to 4.5% and North Dakota increased from 3.23% to 3.91%. All other states remained approximately the same.

For scenario D, all states decreased production compared to scenario C (figure 10), as seems reasonable since the frequency of haying decreased from once every three years to once every five years. North Dakota produced the most hay yet experienced the biggest decrease in production by 102%. Montana produced 110,000 tons but decreased by 92%. States producing less than 13,000 tons of hay were Idaho, Oregon, and Washington. The highest impact occurred in Montana with a 2.34% increase in hay value. The highest hay producer for scenario D was North Dakota with an impact of only 1.94%. The smallest impact occurred in Idaho with 0.25%, while Oregon and

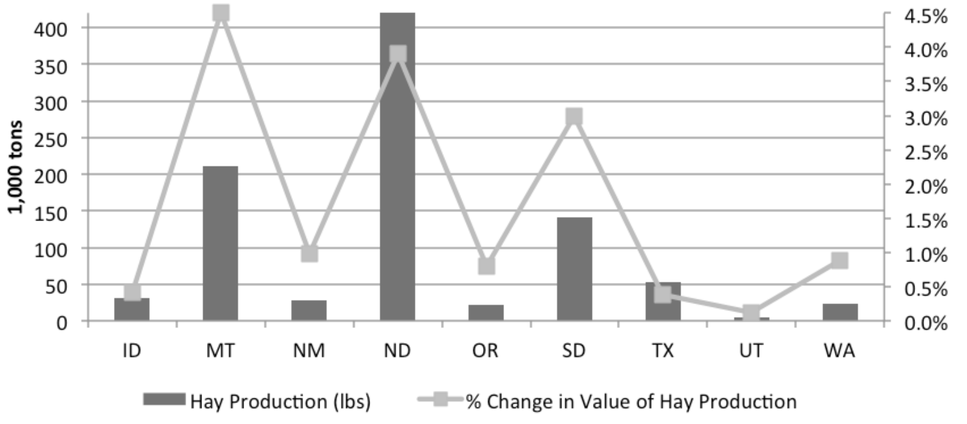

Figure 9. Hay Production - Scenario C

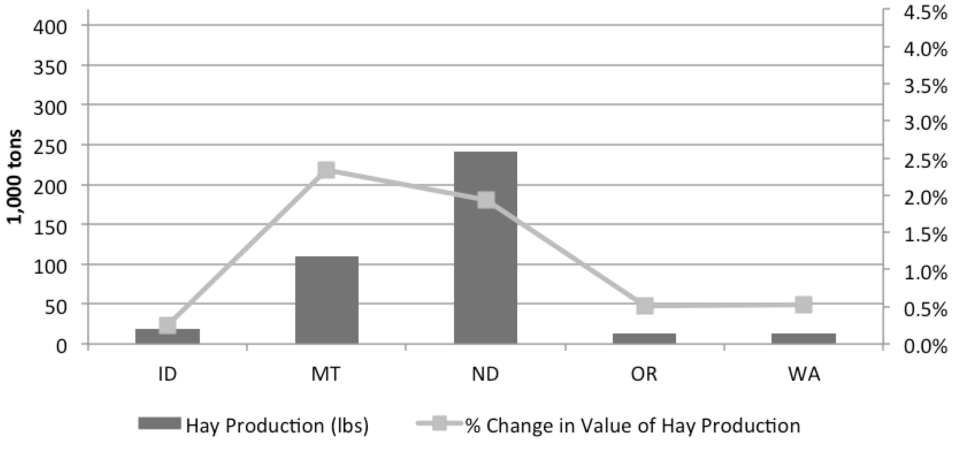

Figure 10. Hay Production - Scenario D

Washington were similar with about 0.50%. To look at economy-wide impacts, we considered the direct, indirect, and induced effects from the increased grazing allowing in the CRP. Figure 11 shows these impacts for all states and scenarios. It is important to emphasize the insignificant impact for all scenarios, since in all states the impact was less than 0.1% of the gross state product. However, scenario B had a higher impact over A where it was offered. Scenario C had a higher impact over B, and, where offered, scenario D had a higher impact over A. Montana, North Dakota and South Dakota had the biggest impact in any scenario while Idaho, Oregon and Washington had the least.

Conclusions

Cattle producers are concerned that increased forage and/or beef will lower beef prices. While this study does not directly estimate prices, results suggest that output quantity generated as a result of policy changes is likely to be small both in terms of current production levels and economy-wide impacts. This means that farmers will have an opportunity to take full advantage of their

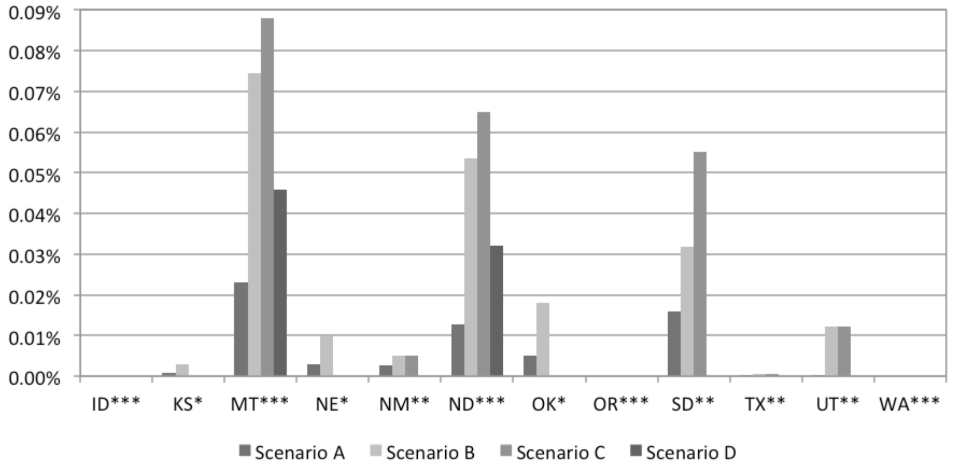

Figure 11. Economy-Wide Impacts from Hay Production

Notes: * Scenarios A & B were offered.
** Scenarios A, B, & C were offered.
*** Scenarios A, B, C, & D were offered.

CRP land and potentially decrease production costs by haying and grazing the land. Reducing costs and increasing beef production would increase farm incomes and economic activity in local communities.

This analysis reflects the magnitude of the changes likely to occur in the output of hay and beef from each of the haying and grazing scenarios at the state level. There are several assumptions, uncertainties, and limitations to the calculations and analyses used in this study. Since the scenarios only consider a one-in-three to one-in-ten year haying or grazing management scheme for the CRP acres, the results of this study cannot be extended to continuous haying and grazing activity. In addition, field selection is an issue that should be highlighted. In order to achieve a diverse selection, County Executive Directors conducted field selection because we felt they had the most accurate knowledge of CRP land in the county. Further research might look at randomized sampling of fields. Secondly, we have held prices constant over the ten year period. Further research could be done to estimate haying and grazing patterns, profitability, and economy-wide impacts with stochastic prices. Finally, in calculating aggregate production and value we assumed that the expansion rate remained the same from year to year. However, every year CRP contracts expire while new ones are created. Future work should consider the change in land quality of CRP acres and the implications of these changes on the expansion rate.

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Appendix A: Conservation Practices

CP1:	Establishment of Introduced Grasses and Legumes
CP2:	Establishment of Permanent Native Grasses
CP4B:	Permanent Wildlife Habitat Corridors (Non-easement)
CP4D:	Permanent Wildlife Habitat (Non-easement)
CP10:	Grass Already Established
CP18B:	Establishment of Permanent Vegetation to Reduce Salinity
CP18C:	Establishment of Permanent Salt Tolerant Vegetative Cover

Appendix B

State	Scenario	Managed Haying	Managed Grazing	Primary Nesting Season	Other
Idaho	A	1/10	1/10	April 1 - August 1	
	B	1/3	1/3	April 15 - July 1	
	C	1/3	1/3	April 15 - June 15	Fall grazing to December 31
	D	1/5	1/5	April 1 - August 1	
Kansas	A	1/10	1/5	May 1 - July 1	
	B	1/3	1/3	May 1 - July 1	
Montana	A	1/10	1/5	May 15 - August 1	
	B	1/5	1/3	May 15 - July 15	
	C	1/5	1/3	May 15 - July 1	
	D	1/5	1/5	May 15 - August 1	
Nebraska	A	1/10	1/5	May 1 - July 1	
	B	1/3	1/3	May 1 - July 1	
New Mexico	A	1/10	1/10	March 1 - July 1	
	B	1/5	1/3	March 1 - July 1	
	C	1/5	1/3	March 1 - July 1	Fall grazing to December 31
North Dakota	A	1/10	1/5	April 15 - August 1	
	B	1/3	1/3	April 15 - August 1	
	C	1/3	1/3	April 15 - July 15	
	D	1/5	1/5	April 15 - August 1	
Oklahoma	A	1/10	1/5	May 1 - July 1	
	B	1/3	1/3	May 1 - July 1	
Oregon	A	1/10	1/10	March 1 - July 15	
	B	1/3	1/3	April 1 - August 1	
	C	1/3	1/3	April 1 - July 1	Fall grazing to December 31
	D	1/3	1/5	April 1 - August 1	
Oklahoma	A	1/10	1/5	May 1 - July 1	
	B	1/3	1/3	May 1 - July 1	
Oregon	A	1/10	1/10	March 1 - July 15	
	B	1/3	1/3	April 1 - August 1	
	C	1/3	1/3	April 1 - July 1	
	D	1/5	1/5	April 1 - August 1	
South Dakota	A	1/10	1/5	May 1 - August 1	
	B	1/5	1/5	May 1 - August 1	
	C	1/3	1/3	May 1 - July 1	
Texas	A	1/10	1/5	May 1 - July 1	
	B	1/3	1/3	May 1 - July 1	
	C	1/2	1/2	March 1 - June 1	Fall grazing to December 31
Utah	A	1/10	1/10	April 1 - July 15	
	B	1/3	1/3	April 1 - July 15	
	C	1/3	1/3	April 1 - July 15	Fall grazing to December 31
Washington	A	1/10	1/10	April 1 - August 1	
	B	1/3	1/3	April 1 - August 1	
	C	1/3	1/3	April 1 - July 1	Fall grazing to December 31
	D	1/5	1/5	April 1 - August 1	

Notes: 1/10 is one out of every 10 years, 1/5 is one out of every 5 years, 1/3 is one out of every 3 years, 1/2 is one out of every 2 years.